

HAMULI

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Fig. 1 *Tenthredo arctica* (Thomson, 1870) Abisko: Mt. Njullá above treeline (Sweden: Norrbottens Län); 900 m. 05.07.2012

Revising (half) the Nematinae (Tenthredinidae) of the West Palaearctic

By: *STI Nematinae Group (STING)*: Andrew D. Liston, Marko Prous, Stephan M. Blank, Andreas Taeger, Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany; Erik Heibo, Lierskogen, Norway; Hege Vårdal, Swedish Museum of Natural History, Stockholm, Sweden.

The Swedish Taxonomy Initiative (STI) has set the goal of documenting all the estimated 60,000 multicellular species in Sweden (Miller, 2005). One of the STI projects which recently received funding from the Swedish government is “The Swedish Nematinae (Hymenoptera, Tenthredinidae, except for *Nematina*)”. Duration of the project is three years (01.09.2012–31.08.2015). Andreas Taeger is the project leader and Marko Prous the main researcher.

Among the sawflies, taxonomy of Nematinae is arguably the most problematic because of high species richness and difficulties in identifying species limits. As a consequence, comparatively little attention has been paid to the group by symphytologists. The Nematinae comprises about 15% of

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ISH and That

By: John Heraty, University of California, Riverside, USA

Since I began in this field, there were three things that vastly changed how all of us (behaviorists and systematics) operate. It was not computers, planes or even yellow pan traps, because these were invented even before I was born. I could throw in the internet, but that is too easy. I would say that, for our science, the top three are handheld GPS devices, digital cameras, and the portable document format (PDF). The first two allow us to document localities, image habitats and specimens, document behavior, and to quickly exchange our data. Digital cameras of various forms allow us to digitize holotypes and labels and we can quickly

Heraty continued—

—*STING continued*

the Symphyta (or 20% of the Tenthredinidae), represented worldwide by about 1,200 species in 40 genera (Taeger *et al.*, 2010). The project focuses on roughly half of the ca. 600 West Palaearctic nematine species, two thirds of which are known to occur or expected in Sweden. First objective is to prepare a key to world genera of Nematinae, which is now nearly ready. This was originally planned as a key to only West Palaearctic nematine genera, but we decided to include the additional world genera because these are rather few. This key was written in cooperation with Stefan Schmidt (Zoologische Staatssammlung München, Germany), Dave Smith (National Museum of Natural History, Smithsonian Institution, USA), Matti Viitasaari and Veli Vikberg (Finland), Alexey Zinovjev (USA), Tommi Nyman and Tobias Malm (University of Eastern Finland, Finland). One idea behind the key is to improve the generic classification of Nematinae to reflect results of analysis of recent molecular sequence data gathered by Tommi Nyman (Nyman *et al.* 2006; 2010). The result is a significant reduction of genera (from about 40 to 29), a decision reached in consensus between many specialists in tenthredinid taxonomy during workshops on Symphyta in 2012 and 2013. Taxonomic revisions of West Palaearctic genera will follow the generic key. Planned scope of these revisions, summarily, includes the rather species-poor, phylogenetically basal genera (*Hoplocampa*, *Cladius*, *Stauronematus* and others), together with *Pristiphora* and the gall-makers (accounting for about half of the 'higher' Nematinae). It seems likely that when these revisions are complete we may be in a position to offer an improved generic key.

Taxonomic problems in the north European Nematinae are so numerous, that our objective of documenting the fauna of Sweden must necessarily be coupled with revision of the groups concerned. To this end, we are studying the type material of as many relevant nominal taxa as possible. Museum collections which are of major importance to us because of their sizeable holdings of nematine types are not only those at Stockholm and Lund

STING continued—

—*Heraty continued*

confirm our identifications with colleagues and experts. Lastly, the PDF puts the scientific literature in our pocket (laptop or handheld phone). The PDF also allows us to quickly format and produce newsletters such as *Hamuli*. This rapid communication between colleagues accelerates our science. The journal over the past year moved to a PDF-only format. The type of research papers and review process have not changed much for the journal, but the accessibility of information increased dramatically. *Hamuli* now offers us something else—rapid communication of relevant topics, travel stories (not really a journal responsibility), and a quick overview of some emerging technologies and techniques useful for our research. *Hamuli* is a free and easily delivered resource that now has an board of three exceptional editors (Deans, Longair and Mikó). What do we get with our ISH membership? We get communication of ideas, techniques and a sense of community. Please remember to renew your membership (check your status at <http://members.hymenopterists.org/>) and to encourage your colleagues and students to join ISH and become active participating members.

Sincerely,



ISH President

Have you renewed your membership for 2013? Go to the Society website for more details!
<http://hymenopterists.org/>

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See last page 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>

—*STING continued*

in Sweden, but also for example the Finnish Museum of Natural History, Helsinki (thanks here to Pekka Malinen for help already given). In addition to sizeable holdings of still unidentified Swedish Nematinae in some museums, the Swedish Malaise Trap Project has loaned us all their available Symphyta material of about 20,000 specimens (thanks here particularly to Kajsa Glemhorn, Dave Karlsson and Pelle Magnusson of Station Linné, Öland). Ole Lønnve and Trond-Elling Barstad have also generously loaned us Nematinae collected in Sweden. In 2012 Veli Vikberg and Matti Viitasaari donated voucher specimens of many northern Nematinae species to the Senckenberg Deutsches Entomologisches Institut. Finally, our material requirements are augmented by specimens collected by the project workers during field excursions. In 2012 we visited Abisko, Swedish Lapland, and in 2013 collected at sites on the island of Öland and in parts of Central and Southern Sweden, notably the Härjedalen. Fieldwork gives the team members the chance of using their considerable experience and knowledge of sawflies to undertake searches of particularly promising habitat types and individual plant species.



Fig. 2. *Tenthredo aaliensis* (Strand, 1898), Abisko National Park, E10 (Sweden: Norrbottens Län); 390 m. 19.06.2012

Of course, we have also collected many non-nematine sawflies during our field excursions. Although not a priority compared to the Nematinae, these specimens are being identified and the records databased at Müncheberg, so that they can soon be incorporated in the Swedish ‘Art-Databanken’ and thus made publicly available. At Abisko we obtained specimens of rarely recorded non-nematine sawflies such as *Tenthredo arctica* and *T. aaliensis*. The first of these has an exclusively subarctic-arctic, probably circumpolar distribution. At Abisko we found it only on Mt. Njulla, above the tree line (from ca. 700–900 m a.s.l.). No details have yet been published on the host plants or



Fig. 3. *Tenthredo* sp. (*arcuata* group) Abisko National Park, E10 (Sweden: Norrbottens Län); 390 m. 19.06.2012

immature stages of *T. arctica*. We found most adults (but only a total of 7) at catkins of *Salix lanata* (Fig. 1). One specimen was collected dead from a snow patch, a phenomenon noted for this species by Malaise in his paper about sawflies of the Abisko area (Malaise, 1931). Seeing live individuals was a great thrill, and the capture of the first one by Andreas was announced with “I’ve got it. We can go home now”. Fortunately, this was our last day in Abisko anyway. By contrast, *T. aaliensis* (Fig. 2) was locally abundant along parts of the embankment of the main road at Abisko (ca. 400 m a.s.l.), on or at least near *Astragalus alpinus*, one of its known hosts (as worked out by Veli Vikberg). In contrast to *T. arctica*, small, isolated, and more or less endangered populations of *T. aaliensis* occur in Central Europe. Also present at more or less the same times and places near patches of *A. alpinus* beside the main road were numerous individuals of a still undescribed *Tenthredo* species of the *arcuata* group (Fig. 3). Remarkably, for day after day at Abisko we found it easy to collect large numbers of a wide variety of sawflies, including many Nematinae, from scrub growing close to

STING continued—



Fig. 4. *Dineura pullior* Schmidt & Walter, 1995 cf., Abisko 9 km E (Stordalen) (Sweden: Norrbottens Län); 400 m. 17.06.2012

—*STING continued*

roads and around the National Park car park. Amongst the more interesting of these species was *Dineura pullior* (Fig. 4), which is not known to occur to the South of 68°N. Collecting in apparently more natural locations away from the roads nearly always produced only a small fraction of the number of species or individuals, although areas not far above the tree line on Mt. Njulla also yielded respectable catches. The material from Mt. Njulla is also valuable because it contains many nematines and other sawflies not found (or only rarely) at lower altitudes (e.g. *Empria alpina* Benson, 1938, *Pristicampus arcticus* (Lindqvist, 1959), *Amauronematus malaisei* Hellén, 1970 and *Pachynematus clibrichellus* (Cameron, 1878)). Andreas and Andrew stayed at Abisko from 11.6.–5.7.2012 and enjoyed nearly continuously good weather. Somewhat annoyingly, weather conditions temporarily worsened just as the 16th International Sawfly Workshop started on the 15th of June (Fig. 5). If collecting results were slightly disappointing during this time, this was made up for by the lively discussions and some delicious reindeer stew.

In 2013 we undertook successful searches for some individual nematine species by sweeping and examining their potential host. Examples include a *Pristicampus* species associated with *Potentilla* (= *Dasiphora*) *fruticosa* on Öland and *Hoplocampa alpina* (Zetterstedt, 1838) from inflorescences of *Sorbus aucuparia* in Central Sweden. Neither of these Nematinae seems to have been previously found in Sweden. Examples of some of the particularly interesting non-nematines collected in 2013 are *Pamphilius*

jucundus (Eversmann, 1847), *P. fumipennis* (Curtis, 1831), *Empria hungarica* (Konow, 1895) and *Arge metallica* (Klug, 1834), all of which possibly represent new records for Sweden. Species such as *E. hungarica* may prove to be centered in Sweden on, or restricted to, the special types of habitat found on Öland, such as nutrient-poor, herb-rich grassland on limestone (in the Baltic countries known as “alvar”). One significant advantage of having fresh material is that it is more suitable for sequencing of genetic material than specimens which are many years old. In cooperation with Tommi and Tobias, fresh tissue (usually a single leg) of selected nematine taxa is being used to fill in some of the remaining gaps in ongoing phylogenetic studies. As far as possible—and this depends mainly on constraints on available manpower—Swedish specimens of all sawfly groups are being included in the ‘Barcode of Life Data Systems’, in order to build up a comprehensive data library (as part of a larger project to barcode sawflies, in cooperation with Stefan Schmidt, Olga Schmidt and Manfred Kraus of the Zoologische Staatssammlung, Munich). These sequences can then be used to help solve a variety of problems. Apart from helping to answer some purely taxonomic questions, comparison of barcode data can sometimes allow the correct association of males with females, or the identification of larvae without the need to rear them to the adult stage.

The general composition of the sawfly material collected in Swedish Lapland in 2012 differed strikingly from that which we brought back from more southerly parts of the

STING continued—



Fig. 5. Participants of 16th International Workshop on Sawflies in Abisko from left: Hege Vårdal, Marko Prous, Tommi Nyman, Stephan Blank, Trond-Elling Barstad, Andrew Liston, Ole Lønnve, Matti Viitasaari, Andreas Taeger.



Fig. 6. *Tenthredopsis auriculata* (Thomson, 1870), Mora (Kopparbergs Län), 15.6.2013

—*STING continued*

country in 2013. Whilst almost half of the approximately 5500 specimens from Lapland were Nematinae, these made up only about a fifth of approximately 3500 specimens collected further South. The representation of most other major groups of sawflies was roughly similar, except for *Dolerus*, which although comprising comparatively few species in the North, made up a major proportion of the number of individuals (about a sixth of the total). *Dolerus* accounted for only around one tenth of the total in the 2013 catch (based on number of individuals). Unsurprisingly, none of the several species of Cephidae or *Athalia* (Tenthredinidae) that occur in South Sweden has been found as far North as Abisko. More remarkable is that species such as *Tenthredopsis auriculata* (Fig. 6), in Europe only known from Fennoscandia and northern Russia, do not occur at Abisko. We frequently encountered this attractive and rather easily recognised species at many localities in Central Sweden (see also Fig. 7). It is likely that larval development in several sawfly taxa (as is known for *Tenthredopsis*: Benson, 1936) takes too long to allow them to inhabit areas with such a short summer. Differences in the North-South gradient in abundance of Nematinae may of course partly have been caused by differences in phenology between the two years. We nevertheless had the strong impression that even at high altitudes in south-central Sweden, nematines were not nearly as abundant in terms of individuals as they were in Lapland. The reasons for this apparent difference may well be complex, but one significant factor might be a much greater abundance of ants in the more southerly regions. Ants are major predators of sawfly larvae (Boevé, 2006). A comparison of species richness of Nematinae at different latitudes in Sweden would be interesting, but at present we still have insufficient data to assess this.

We look forward in the medium term to providing identification tools for West Palaearctic Nematinae that should be considerably more reliable than those which were previously available. As one of the compensations for working

with an insect group that is taxonomically by no means ‘easy’, we can also look forward to the next field season in Sweden. For the reasons outlined above, this is likely to be further north than the areas visited during 2013. ❖

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- Boevé, J-L (2006) Differing Patterns of Chemically-Mediated Defence Strategies in Nematinae versus Phymatocerini larvae (Hymenoptera: Tenthredinidae). pp. 63-71. In: Blank, S. M.; Schmidt, S.; Taeger, A. (eds.) *Recent Sawfly Research: Synthesis and Prospects*. - Goecke & Evers, Keltern: 704 pp.
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- Taeger A, Blank SM. & Liston AD (2010) World Catalog of Symphyta (Hymenoptera). *Zootaxa* 2580: 1–1064.



Fig. 7. Hege Vårdal, collecting in June 2013 Vemdalen (Härjedalen), a locality for *Aglaostigma gibbosum* (Fallén, 1808).

Webmaster update: Image contest and website beautification

By: Katja Seltmann, American Museum of Natural History, New York, NY, USA

The ISH website has some important updates worth sharing with the membership. First, ISH is having an image contest to collect Hymenoptera images for website beautification. See the announcement (right) for full details. All ISH members are welcome to enter, and we look forward to a great deal of participation.

Secondly, we are now developing a more robust private section to the ISH site. Right now you can access the most recent *Hamuli* by signing into the site (see screenshot below). The link to *Hamuli* will then appear in the menu. Additional features, such as the voting form for the image contest, will be added to the private side of the ISH site, as added benefit for ISH members.

Finally, if anyone has an article or announcement for the blog, ISH website suggestions and updates, or a little spare time and willingness to improve website content let me know (enicospilus@gmail.com). We have many opportunities for members to get involved. ❖

International Society of Hymenopterists

Logged in as: Seltmann / Edit My Profile / Log Out / Hamuli Newsletter / Admin Edit

Search

(search by name, institution and interests of ish members)
Total members: 274, Institutional: 30, Regular: 180, Student: 12, Life: 1

title	name	institution	department	city	prov/st
Ph.D.	Aguilar, Alexandre P.	Universidade Federal do Espírito Santo	Ciências Biológicas	Vitória	ES
Dr.	Ahlstrom, Kenneth R.	North Carolina Department of Agriculture and Consumer Services	Plant Industry Division	Raleigh	NC
Dr.	Antropov, Alexander V.	Zoological Museum MGU	Entomology	Moscow	
PhD candidate	Arias Penna, Diana C.	University of Illinois at Urbana-Champaign 320 Morrill Hall	Entomology	Urbana	Illinois

Screen capture, showing how to access most recent issue of *Hamuli* (red arrows) after logging in.

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ISH Image Contest!



Photo by James Niland (CC BY 2.0)
<http://flic.kr/p/9zhRV9>

The website is due for an overhaul. So, in order to beautify the site, and show of the talents of our members, ISH announces an image contest. All members are welcome to participate! Here are the guidelines:

- (1) Email Katja Seltmann (enicospilus@gmail.com) the image anytime before **October 1, 2013**. You can enter up to 5 times.
- (2) Images can be SEMs, cartoons, field images, children in bee costumes, new taxa, old researchers, in situ, paintings, woodcuts, *etc.* Anything goes as long as it references Hymenoptera or ISH in some meaningful way.
- (3) Images must include specific information about how to credit the image and the "story" behind the image.
- (4) All images must be available for use on the ISH website after the contest.

After October 1, 2013 a voting form will be placed on the ISH website and opened to all members. We will announce the voting opportunities via email. Winners will receive free membership for one year, and their image projected and associated story told at this year's ESA/ISH meeting in Austin, TX.

Good news from the Albany Museum, Grahamstown, South Africa!

By: Friedrich and Sarah Gess, Albany Museum, Grahamstown, South Africa

Recently we wrote to *Hamuli* expressing our concern about the uncertain future of the important Hymenoptera collection in the Albany Museum. The principal concern was that since we retired more than 10 years ago there had been no entomologists appointed in the Department of Entomology and Arachnology, apart from a dipterist, who was appointed on contract for three years. The Department has continued to function to date with us as voluntary unpaid curators.

The good news is that as from 1 July this year an enthusiastic and energetic young entomologist, John Midgley, has been appointed in one of the vacant posts. John has been an 'understudy' in the Department since January and in April this year was awarded a PhD from Rhodes University, Grahamstown. John, although not trained as a Hymenopterist, has understood the importance of the Department's long established specialisation in Hymenoptera and will shortly be joining ISH. He has decided to pursue systematic research on pompilids and to undertake ethological studies. With John's appointment we have handed over the Department with a confident belief that it is in good hands and will continue to develop in the future.

We trust that before too long the other vacant curatorial post will be filled and that the post of collections manager promised since 1984 will come into being. ❖



John Midgley, newly appointed Curator of the Department of Entomology and Arachnology, Albany Museum, with Friedrich (Fred) Gess, Curator Emeritus.

HEY GUYS, HE IS HERE AGAIN, I BET YOU CAN GUESS,
IT IS OUR REGULAR GUEST, HEAR DR GESS,
HE WHO HAS A DOMINE AND BURNING GRASP
OF THE GRAVE ELODY AND GLEANING GLOOM
CONTAINED IN THE LIFE OF AN ACULEATE WASP!



OH, PIPE DOWN, *Priocampidaris*,
IT WAS SUCH GULLIBLE GAUDINESS
THAT GOT YOUR BROTHER GORED ON A PIN
IN A GROTESQUE MUSEUM DISPLAY BIN!

Update from the Albany Museum: Some sad news, as well, to report from Grahamstown. As this issue was being finalized we got word from Sarah Gess that Fred Gess lost his long battle with cancer. An obituary is in prep. (Caricature above by Gerhard Marx.)

The Wasp

*Where the ripe pears droop heavily
The yellow wasp hums loud and long
His hot and drowsy Autumn song:
A yellow flame he seems to be,
When darting suddenly from high
He lights where fallen peaches lie:

Yellow and black, this tiny thing's
A tiger-soul on elfin wings.*

—William Sharp 1884

Challenges of large-scale taxonomy in the Whitfield lab

By: Jim Whitfield, Department of Entomology, University of Illinois, Urbana-Champaign, IL USA

Over the past two decades, our group has been accumulating vast quantities of braconid wasps, especially reared Microgastrinae, from various large and long-term collaborative inventory projects in Costa Rica (Guanacaste Conservation Area), Ecuador (Yanayacu and Narupa Stations), Fiji, Papua New Guinea, and Colombia. Needless to say, a number of new species have been recovered in these projects (!), but until recently we have largely confined our taxonomic efforts to describing new genera, unusual or rare taxa, or dramatic new host records, other than the occasional Ph. D. thesis revising a moderate-sized genus. The most species-rich genera seem to sit on the shelf as being too difficult and requiring too much time to take on. I expect this is a familiar picture to most of you!

We've been trying to change this picture over the last few years. Recent estimates of world microgastrine species richness have reached as high as 40,000+ species (Rodriguez *et al.*, 2013), meaning that at this point, as little as 5% of the world's fauna may be described! Even if those richness estimates are high, we have a lot of work to do! The availability of software facilitating taxonomic organization (mx, LucID, *etc.*), vastly superior tools for photography, rapid and cheaper molecular systematic methods, and the advantages of web distribution all point towards being able to accelerate taxonomic productivity. But how to do this without sacrificing quality and scholarship?

One of the hurdles of taking on large genera is that the amount of material in collections can be truly enormous. For instance, assembling all worldwide material of *Apanteles* Foerster would mean housing, and examining, several million specimens, clearly not feasible for a taxonomist unless an entire lifetime and huge resources are available. So, our tack has been to either limit our task to a regional focus, or to limit our studies only to the huge batches of reared species for which extensive natural history data exist. Even then (and we are well aware of the phylogenetic limitations of these approaches), the task can still be huge.

Two projects just completed, and expected to be appearing soon in *ZooKeys*, illustrate the scale we are dealing with. The first is an NSF-funded project headed up by Paul Marsh, along with my former postdoc Alex Wild and myself, focusing on the Costa Rican *Heterospilus* (Doryctinae) (Fig. 1). Even limiting the geographic focus that much, and utilizing the material from only a few major

collections, resulted in Paul's description and Alex's photodocumentation of 280 species of this genus, an astounding 277 of which are new to science. At this scale, we were able to conduct some taxon-rich phylogenetic studies using 5 genes, and test the phylogenetic versus diagnostic utility of Paul's morphological characters (Wild *et al.* 2013). We are under no illusion that we yet have a phylogeny-based classification of this group, but we do have a much clearer view of which characters are highly associated with clades and which are not. Paul and Alex now have a spectacular LucID interactive key linked up to the *ZooKeys* paper soon to appear (Marsh *et al.* in review). We expect the key to be useful well beyond the borders of Costa Rica.

The other large effort has been done in collaboration with my former student Josephine Rodriguez (currently joining the faculty at University of Virginia-Wise), Jose Fernandez Triana and Sophie Cardinal at the Canadian National Insect Collection, and a Costa Rica-based team headed up by Dan Janzen and Winnie Hallwachs (Fig. 2). Jose has picked up the descriptive taxonomic effort after Josephine's detailed molecular phylogenetic studies during her Ph. D. of host specialization in the huge microgastrine genus *Apanteles* Foerster. In this case we limited the ef-



Figure 1. (Left) Female of *Heterospilus*. (Right) Alex Wild and Paul Marsh working on the revision in Illinois.

fort to the *Apanteles* reared over several decades from the ACG (Guanacaste Conservation Area) in NW Cost Rica. Even so, we (actually Jose, using Josephine's earlier notes initially as well as host data and DNA barcoding results) described and sumptuously illustrated 186 new species, plus the 19 previously described species known from Mesoamerica (Fernandez-Triana *et al.* in review). While this may be only half or less of the total *Apanteles* species even just in Costa Rica, and maybe only 5% of those in the World, all 186 have host data, providing an unprecedented window into the evolution of host ranges in this group, when combined with Josephine's upcoming analyses of the group's phylogeny.

Counting other smaller studies, our "extended lab" has

Whitfield continued—

—Whitfield continued

thus churned out about 500 new species this year, certainly a personal record! It has to be kept in mind that these studies actually took years to do (6 in the case of *Heterospilus*, 2 in the case of *Apanteles*) with multiple personnel and good funding, and even more years to accumulate the excellent base of material. Thus there is hope that we can accelerate the rate of description in this hyperdiverse group well over historical levels, and we feel the quality of the taxonomy is higher than ever due to the



Figure 2. (Upper left) Female of *Apanteles*. (Upper right) Jose Fernandez Triana working on *Apanteles* on a visit to Illinois. (Lower left) Josephine Rodriguez in the field. (Lower right) Jim Whitfield at his scope in Illinois.

combination of molecular and morphological and natural history data, standardization of terminology (the *Apanteles* project makes full reference to the Hymenoptera Anatomy Ontology – Yoder *et al.* 2010), and extensive use of color photography and ESEM.

If we are to go much faster than this, as it might take to make a decent dent in the diversity during our lifetimes, what can be streamlined? How can the costs of publication be brought down? How applicable will such studies be across large geographic scales? Will funding continue to be available at a sufficient rate to support such studies? These are all questions we will have to face. ❖

Fernández-Triana, J.L.; Whitfield, J.B.; Rodriguez, J.J.; Smith, M.A.; Janzen, D.H.; Hallwachs, W.; Hajibabaei, M.; Burns, J.M.; Solis, M.A.; Brown, J.; Cardinal, S.;

Goulet, H.; Hebert, P.D.N. In review. Review of *Apanteles* (Hymenoptera: Braconidae, Microgastrinae) from Area de Conservación Guanacaste, Costa Rica, with keys to all described species from Mesoamerica. Submitted to *ZooKeys*.

Marsh, P. M., Wild, A. L., and Whitfield, J. B. In review. The Doryctinae (Braconidae) of Costa Rica: genera of the Tribe Heterospilini. Submitted to *ZooKeys*.

Rodriguez, J. J., Fernández-Triana, J. L., Smith, M. A., Janzen, D. H., Hallwachs, W., Erwin, T. L. and Whitfield, J. B. 2013. Extrapolations from field studies and known faunas converge on dramatically increased estimates of global microgastrine parasitoid species richness (Hymenoptera: Braconidae). *Insect Conservation and Diversity* 6: 530–536.

Wild, A. L., Marsh, P. M. and Whitfield, J. B. In press. Fast-evolving traits are best for species identification in a group of Neotropical wasps. *PLoS ONE*.

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Hymenoptera Emporium

By: Mike Sharkey, Hymenoptera Institute, University of Kentucky, Lexington, KY USA

Here at the Hymenoptera Institute, as part of the Hymenoptera Institute Collection of Kentucky (HICK), exists the Hymenoptera Emporium. We have hundreds of Malaise trap residues in a -30 freezer. These are mostly local, from within a 150 km radius, but there are a few hundred samples from international collection events. Except for Braconidae these samples are complete. All Braconidae have been pulled. The Agathidinae have been processed but all other bracs are in vials sorted to subfamily or family in a -80 freezer. The material is all in fine condition for DNA extraction. Those of you who are interested in the material please contact me. I am very interested in similar collections that ISH members may have to share or borrow. ❖

Eois rearing survey, Panama, May 27-June 20

By: Kyle Parks, Department of Entomology, University of Illinois, Urbana-Champaign, IL, USA

Other members of Dr. James Whitfield's lab and I are involved in a collaborative project investigating evolutionary patterns of organisms at three trophic levels in Central and South America. *Piper* is a diverse and very common genus of tropical plants. Members of this genus, which includes *Piper nigrum*, or black pepper, produce a large diversity of secondary metabolites. *Eois* is a genus of small geometrid moths that nearly exclusively attacks *Piper* plants. There are several genera of parasitoid wasps that attack *Eois*, and we are currently focusing our efforts on the most common wasp genus reared from *Eois*, *Parapanteles* (Braconidae: Microgastrinae).

Our collaborators from the University of Nevada Reno and Miami University Ohio are investigating *Eois* and *Piper* respectively. The majority of our specimens have been obtained through long term rearing programs at Yanayacu Field Station in Ecuador, and La Selva Field Station in Costa Rica. We have also been going on short trips to other locations to collect and rear *Eois* caterpillars and (with some luck) a handful of parasitoids. The purpose of these trips is to increase our geographic coverage, albeit with much smaller sample sizes than the long-term programs.

This past May to June, nine of us travelled to Panama to collect and rear *Eois* caterpillars for three weeks. During the first 12 days of the trip, we travelled west from Panama City to Reserva Forestal Fortuna in Chiriqui province. On the way, we made collecting stops at Altos de Campana, Parque Nacional Omar Torrijos, Las Lajas, Volcán Barú, Cerro Punta, Bosque Protector Palo Seco, and Chiriquí Grande. During this leg, we spent nearly all of our time collecting in mountain forests above 1000 m in elevation.



Typical *Eois* damage on *Piper* leaves



Rearing cups for *Eois* caterpillars



Lunch in the field, Reserva Forestal Fortuna

After returning to Panama City, most of the team left Panama while four of us remained for another 13 days. We lodged in Gamboa and made day trips to collect in Parque Nacional Soberanía, Cerro Azul, La Eneida, Alto de Pacora, El Llano (Cartí road), Santa Fé (near Colon), and Parque Nacional Metropolitano.

In all, we covered habitats from sea level to 2200 m. Most of the time in the field was dedicated to caterpillar hunting, but we also did some sweep netting and set four malaise traps. One Malaise trap was set in Altos de Campana, one was set in Reserva Forestal Fortuna near the Smithsonian Field Station, and the other two were set in Gamboa (Sendera Laguna and Pipeline Road). The Malaise traps were set in or near large stands of *Piper*, but yielded unusually low numbers of microgastrines. Other Hymenoptera were well represented in these traps, especially evaniids.

Parks continued—



Eois caterpillar on *Piper* leaf

—Parks continued

The major challenge of this trip was collecting enough caterpillars to have a decent chance of rearing parasitoids from as many locations as possible, all while keeping an army of caterpillars from diverse habitats and host plants alive on the road. While many caterpillars survived to pupation and we even reared a handful of parasitoids, we had a nearly 2/3 mortality rate for caterpillars. Many of the caterpillars we found were 1st or 2nd instar at the time of collection, and mortality among caterpillars that young are particularly high even in ideal conditions. Furthermore, moving from mountain habitats to lowland rainforest certainly contributed to our high caterpillar mortality rate. In the future it may be safer to travel from lower warmer locations to higher cooler locations rather than vice versa, if at all possible. For me, the mortality rate of caterpillars on this trip simply underscores the amount of patience and frustration that goes into field work in general, and rearing surveys especially.

Even with all of the dead caterpillars, this trip yielded lots of valuable specimens. All caterpillars, including the dead ones, have host *Piper* records and are preserved at whichever life stage they ultimately achieved. Many of the dead caterpillars are in good enough condition for DNA sequencing and we may be able to identify them through COI. We collected samples of all 20 *Piper* species we found *Eois* feeding on, and many of the numerous other *Piper* species that we encountered. These will be analyzed phylogenetically as well as phytochemically. We now have several more microgastrines with complete host caterpillar and host plant data. We were able to get reared samples at each trophic level from Panama. Predictably the most robust collection was at the lowest trophic level and worst at the highest. Still, we will have a better and more complete picture of the clades that are interacting in our tritrophic system and have explored a little bit of the ground between Costa Rica and Ecuador. ❖

Relying on catalogues

By: Gavin R. Broad, Department of Life Sciences, the Natural History Museum, Cromwell Road, London SW7 5BD, UK; g.broad@nhm.ac.uk

As a reviewer of papers and a subject editor for a couple of journals (as are many of you), I am rapidly becoming an embittered old soul, railing against the incorrect use of ‘Figs.’ instead of ‘Figs’, ‘forewing’ instead of ‘fore wing’ and other such calumnies. Of course, these sorts of errors make little or no difference to the meaning of a paper and mainly serve to highlight my pedantry. However, another error that I very frequently need to highlight is more egregious and has a potential impact on the reliability of published work. This particular sin is the misuse of data in catalogues.

Because I work on ichneumonoids, Taxapad (Yu *et al.*, 2012) is my example, but I could equally be referring to the Universal Chalcid Database (Noyes, 2013) or other catalogues out there. The Ichneumonoidea is, of course a huge (and obviously the most important and interesting...) superfamily of Hymenoptera. This group has a massive and scattered associated literature and Taxapad offers an invaluable window onto this literature. But if a search of Taxapad produces a list of hosts and countries for a particular species of ichneumonoid, this should not be taken to be its actual host range and distribution. These are the data as gleaned from the published literature and they are remarkably erroneous in many cases. This essential qualification is really rather important and is surprisingly frequently missed by authors (but none of you, obviously). Let’s make it clear that I am not criticising Taxapad in itself—I use it every working day and it really is an invaluable resource—but rather the use of this resource.

It’s very easy, when summarising the biology and distribution of a species, to just extract the information from a catalogue. Both Mark Shaw and John Noyes (Shaw, 1993; Noyes, 1994) have highlighted the various ways in which errors in identification (of parasitoid and host) are promulgated to build up a seemingly secure body of literature relating to a parasitoid, that can actually be completely false. Despite the well known problems with the accuracy of reported identifications and host associations I still constantly receive papers for review that will list, for a specialised parasitoid of a few Lepidoptera species, hosts including ten families of Lepidoptera, a sawfly, some Coleoptera, a 1968 Buick Riviera ... Similarly, summaries of distribution will often be taken direct from Taxapad rather than more authoritative checklists, for which the many er-

Broad continued—

—*Broad continued*

roneous records will hopefully have been expunged.

What is to be done? Well, graduate students should be made aware of the uses and limitations of catalogues and should read useful papers such as Noyes (1994) and Shaw (1993); I suppose it's just a matter of instilling good practice in each generation of hymenopterists. There is also a need for databases that compile, as far as possible, accurate data on parasitoid-host associations and distribution. For British Ichneumonoidea, I am working on setting up just such a database, of data from reliably identified ichneumonids. But that's just one country. And it is, of course, possible to track down all those references in a catalogue and assess which are likely to be of some worth. It is easy at the moment to access distribution data, on GBIF and more local systems such as the NBN Gateway (www.searchnbn.net), but these data are mostly inaccurate for poorly known organisms such as ichneumonids. Try looking at all the available data for the distribution and hosts of *Ophion luteus* in, for example, Taxapad. This is a species for which we actually know next to nothing about its biology and is confined to parts of Europe. And a lot more dodgy data will be coming online in the near future, as mass digitisation of museum collections ramps up. But that's another rant ... ❖

Noyes, J. S. 1994. The reliability of published host-parasitoid records: a taxonomist's view. *Norwegian Journal of Agricultural Sciences* 16: 59–69.

Noyes, J.S. 2013. *Universal Chalcidoidea Database*. World Wide Web electronic publication. <http://www.nhm.ac.uk/chalcidoids>

Shaw, M. R. 1993. An enigmatic rearing of Dolopsidea indagator (Haliday) (Hymenoptera: Braconidae). *The Entomologist's Record and Journal of Variation* 105: 31–36.

Yu, D. S., Achterberg, C. van and Horstmann, K. 2012. Taxapad 2012, Ichneumonoidea 2011. Database on flash-drive. www.taxapad.com, Ottawa, Ontario.

yūzakura ari mo nedoko wa mochi ni keri

evening cherry blossoms—
the ants also
have a place to sleep

—Issa, 1811

Wasps on the phone

By: Gavin R. Broad, Department of Life Sciences, the Natural History Museum, Cromwell Road, London SW7 5BD, UK;
g.broad@nhm.ac.uk

Mobile phones are, of course, not really phones these days (I rarely use mine to actually talk to anybody). One of the features I've been impressed by is high definition video capability. This has made it possible to record interesting behaviours of wasps in the field, when I've chanced upon them. I have a Samsung Galaxy S2 but I'm sure other phones have even better cameras (mine is already ancient). There are various settings for video recording but I use the defaults of superfine image quality and maximum resolution (3264×2448). Having a small log pile at the side of my house, and living next to some nice woodland, I've found various ichneumonids running around, searching for hosts and inserting their ovipositors in the wood. Although I don't own a video camera, I do usually have my phone with me. Some short videos have been uploaded to YouTube:

Podoschistus scutellaris (Gravenhorst) searching for hosts
- <http://youtu.be/G8cpPenzk-w>

Xorides fuligator (Gravenhorst) searching for hosts - <http://youtu.be/DYnvLmm00Gc>

Podoschistus and *Xorides* belong to different ichneumonid subfamilies (Poemeniinae and Xoridinae, respectively) and are not thought to be at all closely related. Their behaviours, in searching for hosts, are very different; unfortunately, though, I don't yet know whether *P. scutellaris* is a parasitoid of wood-boring beetles or other ichneumonids (perhaps as a cleptoparasite), as both strategies are known in the Poemeniinae. I've not been successful in rearing *P. scutellaris* from these logs, which were full of larvae of *Clytus arietis* (Coleoptera: Cerambycidae) but also other ichneumonids (*Xorides fuligator* and *Dolichomitus mesocentrus* (Gravenhorst), a pimpline). *Clytus* are almost certainly the hosts of *X. fuligator*.

The antennae are deployed in very different ways. *Podoschistus* has extraordinarily flexible antennal tips, which are wriggled around constantly, exploring cracks in the wood. The antennae are only held still once the ovipositor is inserted in the wood. I had never seen this degree of flexibility in a hymenopteran antenna before but perhaps others have noticed this. This female was very interested in particular cracks, which presumably provided potential access to the hosts within; the ovipositor of this species is not

Broad continued—



Fig. 1. Frames from video sequence of *Podoschistus scutellaris* antennating dead wood.



Fig 2. The same *P. scutellaris* (as Fig 1) inserting its ovipositor; still photo taken with the same phone.



Fig. 3. Rather fuzzy close-up from video frame, showing abruptly bent antenna tip of *Xorides fuligator*.

—Broad continued

robust enough to be drilling through wood and has very weak teeth, so is threaded through cracks.

The antennae of *Xorides* are used very differently, as hammers, analogous to the way a doctor will tap a patient’s chest. Donald Quicke and I (Broad & Quicke, 2001) had presumed that xoridines employ this vibrational sounding (essentially echo location via a solid medium) based on the morphology of females, and these observations support the inference. The antennal tip of *Xorides* species has a bend,

often an abrupt, 90° angulation, with rods of solid cuticle on the ventral side of the antennal flagellum just before the bend. The host-searching *Xorides* female sweeps her antennae, held at least 90° apart, across the surface of the wood, presumably tapping away in her search for hosts within burrows. Some simple observations like this are rather useful in deducing something about the biology of species which are, inevitably, rather poorly known.

For those of us too lazy (or perhaps too poor) to try filming with proper cameras, it’s reassuring that standard smart phones can do the job of basic filming of interesting

Broad continued—



Fig. 4. Frames from video sequence of *X. fuligator* sweeping and rapidly tapping its antennae across the wood.

—Broad continued

behaviours, with admittedly rather large wasps (*X. fuligator* is ca.15 mm long, excluding antennae and ovipositor, *P. scutellaris* 20 mm). With the next generation of phones, maybe I'll be doing the same for mymarids. ❖

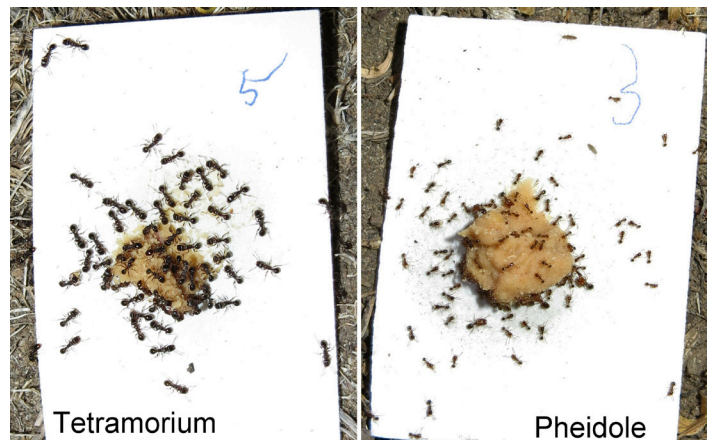
Broad, G. R. and Quicke, D. L. J. 2000. The adaptive significance of host location by vibrational sounding in parasitoid wasps. *Proceedings of the Royal Society of London B* 267: 2403-2409.

Hidden Terrors in the American West

By: John Heraty and Austin Baker (University of California, Riverside) and James Johnson (University of Idaho, Moscow)

This past June we had the pleasure of visiting a research site in Idaho to follow up on a host record made by Johnson et al. (1986). More than 30 years had passed since the original research at Hells Gate State Park near Lewiston, ID documented an association between rubber rabbitbrush (Asteraceae: *Ericameria nauseosa*), *Formica subnitens* (Formicidae) and the potential ant parasitoid *Orasema coloradensis* (Eucharitidae). Since *Orasema* is virtually always a parasitoid of myrmicine ants, this was an important case to verify or deny. Ding Johnson was able to help us out with all of the local logistics, so this was potentially an easy thing to resolve. Not so. Ding was amazed at the changes that had taken place at the site, with tremendous reduction in the numbers of *Ericameria* and the almost total absence of any *Formica* (we found one stray worker far from the site). The paper had documented the dominant ants as *Formica subnitens*, *Pogonomyrmex owyheei*, *Pheidole californica*, *Solenopsis molesta* and *Tapinoma sessile*. Some quick peanut butter baits set at dusk to monitor for *Pheidole* (basically a nocturnal ant) revealed something different. Only three of 20 bait cards were dominated by *Pheidole*, whereas the rest were all dominated by *Tetramorium cf. caespitum*, the introduced Pavement ant. Within half an hour, two of the *Pheidole* dominated cards were overrun by *Tetramorium*. According to Frank Merickel (Collection Manager, Barr Museum, University of Idaho), *Tetramorium* first appeared as a pest ant in Moscow (pronounced Mosco) in the 1970s. At Hells Gate, we still found *Pogonomyrmex*, and a few *Solenopsis*

Heraty et al. continued—



Peanut butter baits, set for ants.



Field site at Hells Gate State Park near Lewiston, ID.

—Heraty *et al.* continued

and *Pheidole* at the baits, but bait cards placed both day and night across our study site were quickly overwhelmed by *Tetramorium*. Something much harder to document is the potential change in habitat, with a reduction in the population of *Ericameria* and a shift to an open grassland, and still limited invasions of rush skeleton weed (Asteraceae: *Chondrilla juncea*) and yellow starthistle (Asteraceae: *Centaurea solstitialis*). Phil Ward (UC Davis) observed similar takeovers by *Tetramorium* in Utah and Nevada in native habitats close to riparian areas. According to Phil, an even worse scourge could be the Japanese Pavement ant, *Tetramorium tsushimae*, which is a polygynous and unicolonial species introduced into St. Louis. Peanut butter baits are biased to myrmicine ants, but they are a good means of monitoring invasives such as *Tetramorium* and *Wasmannia*. Combined with a digital camera with good macro capability, we have the power to more generally monitor and document these changes in our natural areas. Perhaps instead of a butterfly day, we should organize a national (or worldwide) peanut butter-ant monitoring day (or night) to map the advances of invasive ant species and changes in our local habitats. ❖

Johnson JB, Miller TD, Heraty JM, Merickel FW (1986) Observations on the biology of two species of *Orasema* (Hymenoptera: Eucharitidae). *Proceedings of the Entomological Society of Washington* 88: 542–549.

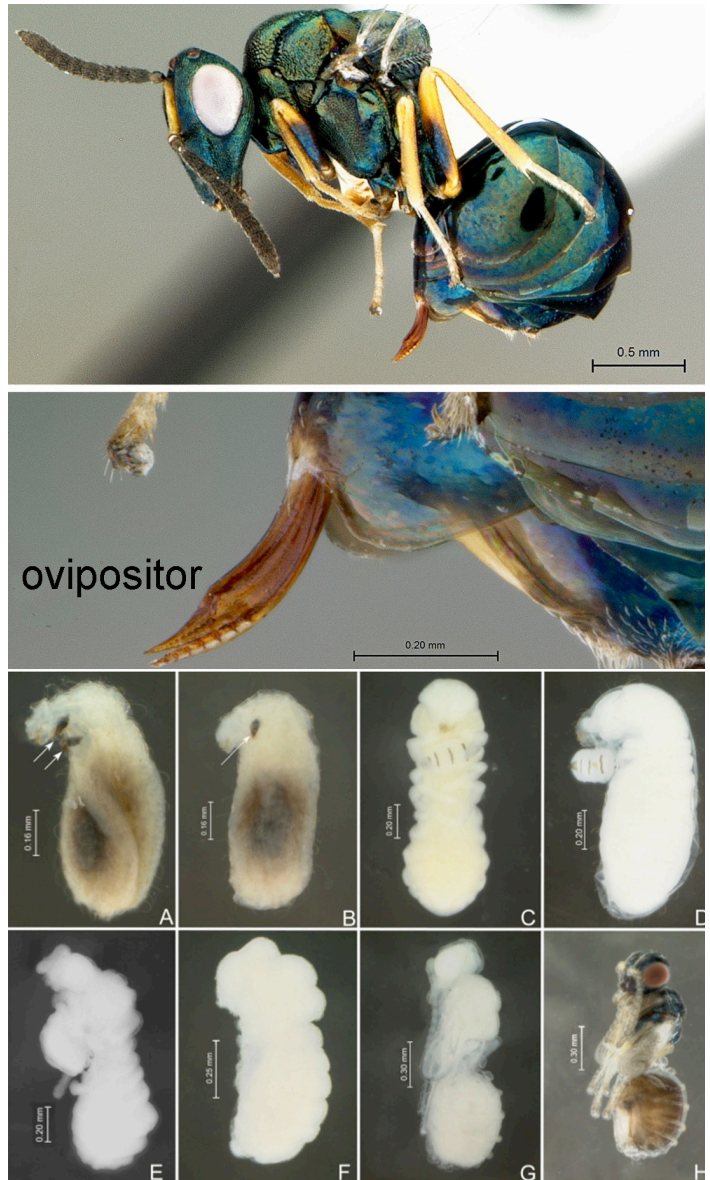
Orasema: facts and a request

By: John Heraty, University of California, Riverside, CA, USA

Oraseminae (Eucharitidae) is a monophyletic group of ant parasitoids. Most species are parasitoids of the larvae of myrmicine ants (primarily *Pheidole*, *Solenopsis*, *Monomorium*, *Temnothorax* and *Wasmannia*), although there are

some potentially spurious records from *Formica* and *Ecton*. *Pheidole* is the only host known from the Old World, for both *Orasema* and other orasemine genera (*Orasemomorpha* and *Timioderus*), and is the predominant host for *Orasema* in the New World. Four genera are recognized, but most of the undescribed diversity is in the New World species of the genus *Orasema*. Eggs are laid into an incision made into plant tissue by the enlarged ovipositor (see photo). First-instar larvae may be transported to the

Heraty continued—



Figs. Adult *Orasema cockerelli* with enlargement of ovipositor. Immature stages of *Orasema minutissima* on *Wasmannia*: a, two first-instar larvae external on ant host (arrow); b, first instar larva burrowed into ant host (arrow); c-d, first instar feeding in external position on host pupa; e, second instar feeding on host pupa; f, mature third instar; g, early stage pupa; h, mature adult.

—Heraty continued

larval host through associations with prey items or nectary sources of foraging adult ants. Once in the nest, they attach to the larval ant host and then develop on the ant pupa.

Our lab currently has one postdoctoral researcher (Jason Mottern) and two graduate students (Judith Herreid and Austin Baker) working on various revisionary and biological studies of *Orasema*. We are interested in receiving adults and immature stages (along with their ant host records) of Oraseminae (ethanol preserved, 85–100%). Of course any information is fantastic, and digital images are great sources of additional information, including potential plant host records. Please contact John Heraty (john.heraty@ucr.edu) for additional information. For old and recent papers, see Wheeler (1907) and Carey et al. (2013). ♦

Wheeler, W.M. 1907. The polymorphism of ants with an account of some singular abnormalities due to parasitism. *Bull. of the American Mus. of Nat. Hist.* 23: 1–108.

Carey, B., Visscher, K. and Heraty, J. 2012. Extrafloral nectaries for gaining access to an ant host by the parasitoid *Orasema simulatrix* (Hymenoptera: Eucharitidae). *Journal of Hymenoptera Research* 27: 47–65

Tiny Hymys

By: Mike Sharkey, University of Kentucky, Lexington, KY, USA

I have been sorting through a backlog of this year's Malaise traps that I run locally near Lexington KY and in the process a tiny braconid (see figure at right) caught my attention. It is a male alysiine of either *Dinotrema* or *Aspilota* (I would have to mount it to determine which). I took an image and incorporated a scale bar using Auto-montage software. "Holy Cow" I thought, "it is less than 1.0 mm. This got me to thinking about what the record for ichneumonoids was, not that I thought this was near the record. So I contacted the ichneumonoid information guru, Dicky Yu, the author of TaxaPad, which is a database of all ichneumonoid species. I asked Dicky for records of the smallest Ichneumonoids and he sent me the following list:

Ichneumonidae

Tycherus blanki Diller, 2003 0.5 mm, Ichneumoninae
Colpognathus heinzelleri Diller, 2003 0.6 mm, Ichneumoninae

Braconidae

Esterella aciculata (Sharma & Gupta, 1985) 0.5mm.,
 Doryctinae

Ephedrus primordialis Brues, 1933 0.6 mm, Aphidiinae
Masona prognatha van Achterberg, 1995 0.6 mm, Masoninae
Trioxys bajariae (Györfi, 1958) 0.7 mm, Aphidiinae
Aspilota curta Marshall, 1895 0.7 mm, Alysiinae
Binodoxys hirsutus (Wang & Dong, 1993) 0.7 mm, Aphidiinae

So the smallest ichneumonoids are 0.5mm. and ichneumonoids and braconids are tied for this record. My specimen is almost twice the length of the smallest ichnoids.

What spurred my interest were two recent articles. One is by my Canadian colleague Brian Brown (2012) who described the world's smallest fly, *Euryplatea nanaknihalia*, (phorid) 0.40 mm long. Another Canadian, John Huber, co-authored a paper with John Noyes (2013) on the smallest winged insect, *Kikiki huna*, a fairyfly (Mymaridae). It measures 0.158 mm long; to get an idea of how small that is I have included it as an inset in the braconid figure and reduced it roughly to the same scale as the braconid. According to Huber and Noyes (2013) the smallest of

Sharkey continued—



—Sharkey continued

all Hymenoptera is the wingless mymarid, *Dicopomorpha echmepterygis*, at 0.139 mm described by Mockford (1997).

Well, all this being written, I thought it might be interesting for our readers to send in the smallest and largest measurements for their taxon of interest. If you send them to me (msharkey@uky.edu) along with any information and images you would like to include, I will put together an article for the next issue of *Hamuli* for your reading pleasure.

Those providing the smallest (certified) measurements for their taxon of interest will receive the next issue of *Hamuli* free of charge ... as long as they are members of ISH.

Happy Hunting. ❖

Brown B. 2012. Small size no protection for acrobat ants: world's smallest fly is a parasitic phorid (Diptera: Phoridae). *Annals of the Entomological Society of America* 105: 550–554.

Huber JT and Noyes JS. 2013. A new genus and species of fairyfly, *Tinkerbella nana* (Hymenoptera, Mymaridae), with comments on its sister genus *Kikiki*, and discussion on small size limits in arthropods. *Journal of Hymenoptera Research* 32: 17–44.

Mockford EL. 1997. A new species of *Dicopomorpha* (Hymenoptera: Mymaridae) with diminutive, apterous males. *Annals of the Entomological Society of America* 90: 115–120.

Announcement: 2nd Neotropical Hymenoptera Course

By: Mike Sharkey, University of Kentucky, Lexington, KY, USA

I am pleased to announce the 2nd Neotropical Hymenoptera Course. It will take place from July 27 to August 6, 2014 at the Villa Carmen Biological Station, Manu Biosphere Reserve, Peru. These dates are immediately after the International Society of Hymenopterists Congress of that will be in Cusco from July 20–25, 2014 (see page 25). There will be transportation from the ISH Congress to the workshop. For more details on the course and how to apply contact me or visit the website:

<http://bit.ly/NeoTropHymCourse> ❖



International Meeting on Wasps

July 1st to 5th
Manaus, Brazil

Invited Speakers:

James Carpenter
American Museum of Natural History - New York, EUA

Robert L. Jeanne
University of Wisconsin - Madison, EUA

John W. Wenzel
Carnegie Museum - Pittsburgh, EUA

Fernando Barbosa Noll
UNESP - São José do Rio Preto, Brazil

Orlando Tobias da Silveira
Museu Paraense Emilio Goeldi - Belém, Brazil

Gilberto Marcos de Mendonça Santos
Universidade Estadual de Feira de Santana, Brazil

Program:

- Conferences
- Poster presentations
- Workshop on taxonomy of wasps (Sérgio Andena and James Carpenter)
- Field trip to Ducke Reserve

Registration Fees:

Undergraduate Students	US\$ 25,00
Master Students	US\$ 50,00
PhD Students	US\$ 75,00
Professionals	US\$ 100,00

Workshop registration fee: US\$ 50,00

Location:
Instituto Nacional de Pesquisas da Amazônia/INPA
Av. André Araújo, 2936
Aleixo, Manaus - AM

Promoting Institution:
INPA
INSTITUTO NACIONAL DE PESQUISAS DA AMAZÔNIA

Sponsorship: **Support:**

Report from: I Encontro Internacional Sobre Vespas

By: Jim Carpenter, American Museum of Natural History, New York, NY USA

“I ENCONTRO INTERNACIONAL SOBRE VESPAS” was recently held in Manaus and was organized by Marcio Oliveira, Fernando Noll and Alexandre Somavilla; it dealt primarily with social wasps, but there were also some talks and posters on Eumeninae. The inspiration for the meeting was articulated by Fernando as “As we all must have thought already in some time, although the wasps (Vespidae) are a quite important group in the neotropical area, the community of scientists that study them has been having very little contact compared to other groups. There are biannual encounters for the specialists of bees and ants, but not for wasps.” With funding from several Brazilian agencies, about 80 workers met from July 1–5; there were presentations on social (Polistinae) and solitary wasps (Eumeninae), a mini-course for identification, and a field trip to the Reserva Ducke. The conference was judged a huge success by attendees, and I can safely say that a good time was had by all. ❖

A small trick for better lighting

By: István Mikó, Frost Entomological Museum, Penn State University, University Park, PA USA

As with many other “microhymenopterists” we quite often critical point dry (CPD) our specimens. With this great tool, not only are softer regions of the integument preserved in a more feasible way for study, but also the intima of minute (and not just minute) wasps are kept intact for further morphology research, *e.g.*, dissections or collection of microCT/synchrotron data. Among the numerous kinds of CPD stubs, we always preferred to use the small ceramic stubs, given that our specimens are really not that big. We usually image specimens after critical point drying, prior to mounting, so we can position them more easily. Also, imaging specimens on a pin or point is sometimes difficult when one uses a compound scope for creating image stacks. So, our easy protocol is to remove the specimens from the stub and place them on Blue-tack. Lighting is almost always a problem, especially when the surface sculpture of a small and dark specimen

is the subject. The usual protocol is to put a cylinder of Mylar around the objective, but the adjustment of fiber optics requires a decent amount of time. Once (urged by a rapidly approaching deadline) we had to image a specimen ASAP, so we did not remove the specimen from the stub, but rather positioned it in the middle and started imaging. Well, to be honest, the “quick and dirty way” should usually be avoided during research. Because we were interested only in imaging the sculpture on the lower part of the mesopleuron we set up only one of the fiber optics. The result we got was stunning! Despite using light source only from one direction the entire specimen was evenly “enlightened”. Since that experience we use only CPD stubs as light dispersers, when imaging minute specimens. Usually we cut off the bottom part of the stub and use it as a ring surrounding the specimen.

We are currently revising a very interesting taxon, *Trassedia*, so we chose a *Trassedia* specimen to demonstrate the differences between using the CPD stub (Fig. 3) and Mylar cylinder (Fig. 2). This is also an opportunity

Mikó continued—

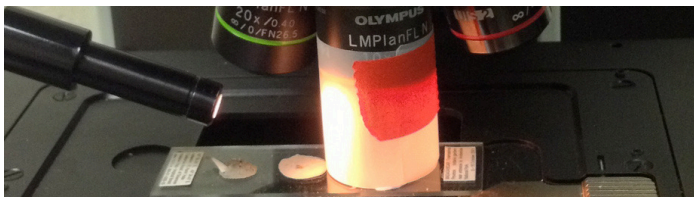


Figure 1. Imaging setup with Mylar cylinder and brightfield image of the head of *Trassedia luapi*.

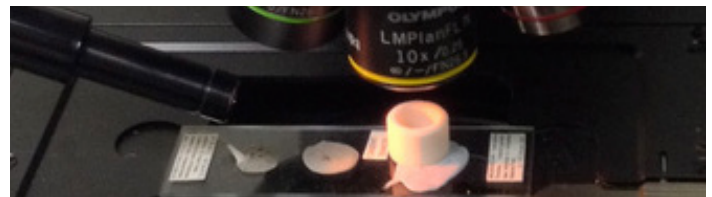


Figure 2. Imaging set up with CPD stub and brightfield image of the head of *Trassedia luapi*.

—Mikó continued

to put out the call for more specimens! *Trassedia* was described as a megaspiline based on the presence of the pterostigma on the fore wing and the number of female flagellomeres. However, the middle tibia has one apical tibial spur (two in all megaspilids), and Waterston's organ (the heavily sculptured and impressed area around the opening of an exocrine gland on the 5th metasomal tergum) is present. These phenotypes suggest that this beast is somewhere in-between Megaspilidae and Ceraphronidae (but see Ernst *et al.* 2013 and Mikó *et al.* 2013). Although *Trassedia* is rare, it turned out that researchers usually misidentify *Trassedia* specimens as *Conostigmus* or *Dendrocerus*, so it is possible that there are numerous representatives of this taxon hidden in the general megaspiline collections. Let us use this opportunity to ask you guys to take a closer look at your megaspiline collection and if you find *Trassedia*, please contact us: istvan.miko@gmail.com or adeans@gmail.com. ❖

Ernst AF, Mikó I, Deans AR (2013) Morphology and function of the ovipositor mechanism in Ceraphronoidea (Hymenoptera, Apocrita). *Journal of Hymenoptera Research* 33: 25–61. doi: 10.3897/JHR.33.5204

Mikó I, Masner L, Johannes E, Yoder MJ, Deans AR (2013) Male terminalia of Ceraphronoidea: diversity in an otherwise monotonous taxon. *Insect Systematics and Evolution* (in press)

What is fluorescing?

By: István Mikó and Andy Deans, Frost Entomological Museum, Penn State University, University Park, PA USA

Dried specimens can easily be visualized with a compound microscope and image stacker software (*e.g.*, Helicon focus, Zerene Stacker or CombineZM), with even better resolution than what we can observe using a stereomicroscope with the same magnification (see figs 2 and 3 of the article “A small trick for better lighting” page 18). Brightfield imaging of “wet” samples, however, almost always provide a lower quality image than expected. That is mostly the result of the incompetence in z-stack system for visualizing overlapping structures (Fig. 2) and the lack of the 3D view that we certainly gain from studying specimens with a stereomicroscope.

With the advent of Confocal Laser Stereomicroscopy (CLSM) a new and very simple way of wet sample imaging became available (Michelis and Gorb 2012, Deans *et*



Figure 1. Bisected and bleached hind tibiae of *Pelecinus polyturator* in glycerin droplet between 1.5 thickness coverslips supported by Blu-Tack marbles.

al. 2012). Using CLSM 2D and 3D images we are able to share what we see when dissecting specimens under wet conditions. Besides providing a very easy way of 3D reconstruction (even if it is limited to a certain depth of the tissue) there is another great advantage of using CLSM, and that is an exceptional tissue specific contrast. Soft and sclerotized structures of the insect body emit slightly different fluorescence light. This recently discovered phenomenon (Michelis and Gorb 2012, Mikó *et al.* 2012, Deans *et al.* 2012) has rarely been utilized in insect systematics (but see Ernst *et al.* 2013). Below we provide a very quick manual for producing CLSM micrographs and media files of small (well, everything is relative) anatomical structures from the specimen preparation to some ideas about their publication.

1. Specimen preparation. For CLSM images we usually use alcohol-stored specimens, but one can make nice images with air or critical point dried hymns, too. As a first step, we transfer the specimen from ethanol to glycerin for one hour, before imaging, making sure the ethanol evaporates. Then we place a glycerin droplet in the middle of a coverslip. Every microscope company, at least for the most commonly used microscopes, set their objectives for 1.5 thickness coverslips. Although it might be tempting to buy the 1.0, please always try to use the 1.5.

The size of the droplet should be as small as it is possible, otherwise it might reach the edge of the coverslip, causing the specimen to move (not a good thing for imaging). Create four, very small marbles of Blue-tack and place them at the corners of the coverslip. Place the specimen in the droplet (remember, by now the specimen has been sitting for one hour in glycerin) and cover it with another coverslip (Fig. 1). The Blue-tack marbles keep a comfortably adjustable distance between the coverslips (so

the specimen will be not crushed by them).

2. Imaging. CLSM microscopes are usually inverted but otherwise very similar to a normal compound microscope, with one fairly large difference: the CLSM is capable of detecting not only the transmitted light but also the fluorescence light emitted from the sample that is excited by a laser. For visualizing Hymenoptera specimen parts we normally use the 488 nm (blue) laser that will result in the emission of fluorescence light mostly between 500 nm and 700 nm wavelengths. Although the fluorescence spectrum of most structures in insects spans this interval, soft structures tend to fluoresce with a higher intensity in the lower end, whereas sclerotized structures fluoresce in the higher wavelength intervals. Utilizing this difference in fluorescence we detect the emitted light using two channels and thus separate data of the 500–580 nm from those of the 580–800 nm intervals (Fig. 2). Consequently, micrographs rendered from dataset of different intervals have differences

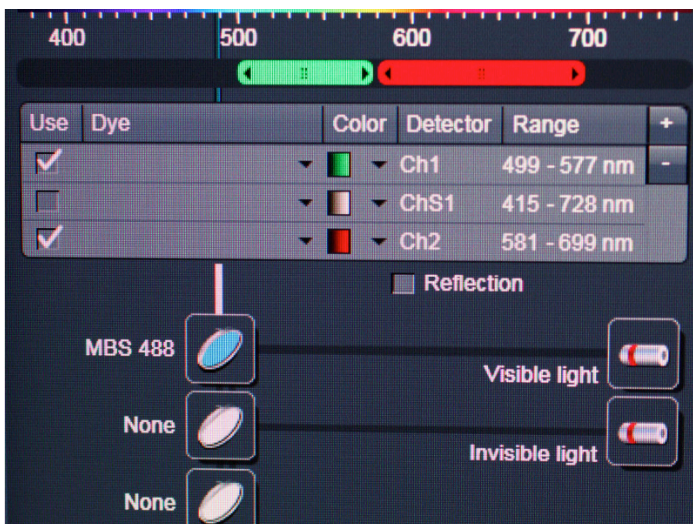


Figure 2. Screenshot from Zeiss CLSM software, showing the low and high wavelength channels.

in their intensity pattern: soft structures will be brighter in one channel whereas sclerotized structures on the other (compare Figs 3 and 4).

3. Visualization of CLSM data. Although we could use pricey software (Imaris Bitplane® or Amira®) for visualization (maximum intensity projection or 3D reconstruction), in most cases ImageJ (ImageJ 2013) provides almost everything a systematist needs for the gross morphology of autofluorescent regions. ImageJ is able to recognize datasets from Leica and Zeiss, but you might have to download a plugin for other systems (e.g. Olympus).

After opening the CLSM data in ImageJ you must separate the channels (if they are not automatically separated)

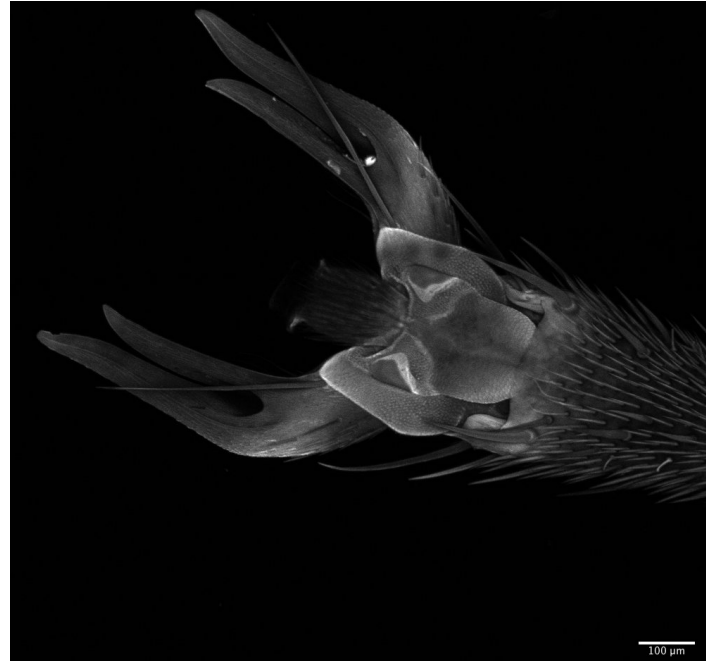


Figure 3. CLSM volume rendered micrograph showing Pretarsus of *Bombus impatiens*. Emitted fluorescence light collected between 580–700 nm.



Figure 4. CLSM volume rendered micrograph showing Pretarsus of *Bombus impatiens*. Emitted fluorescence light collected between 500–580 nm.

with Image/Color/Split channels. If a third channel for transparent light was also created (*NB*: it is smart to collect transparent light data for documenting structures that are visible through transparent light) it must be closed and further processed on the two resulting CLSM images. For easy volume rendering it is important to change the image

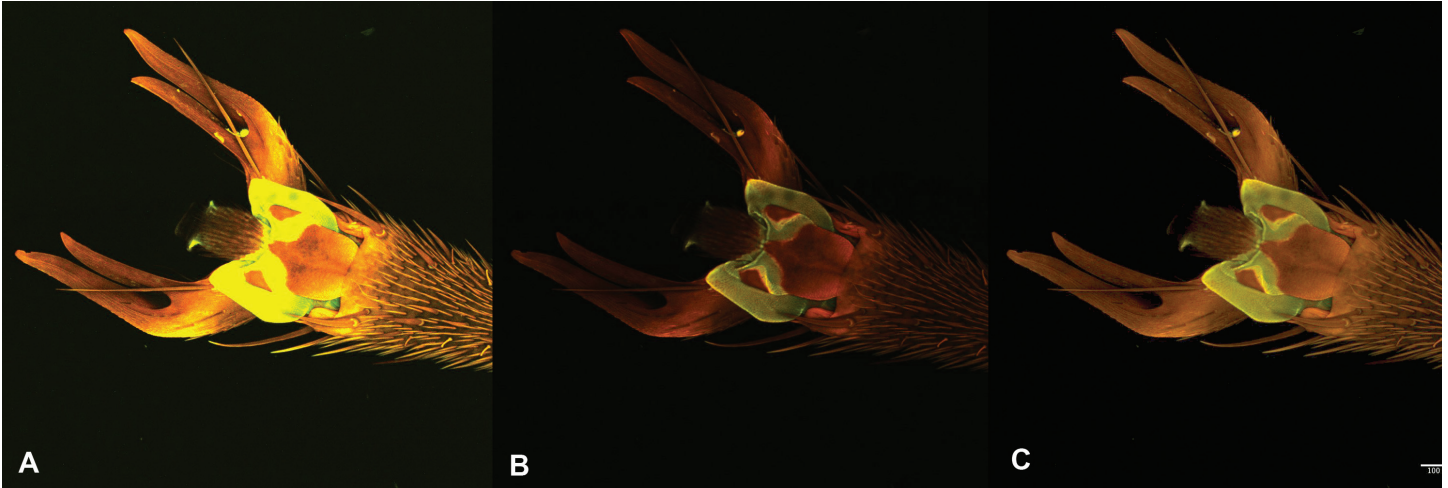


Figure 6. CLSM volume rendered micrographs showing the pretarsus of *Bombus impatiens* A: oversaturated image based. B: Low contrast image after application of threshold in ImageJ. C: low contrast image after adjustment with gamma correction in Adobe Photoshop CS6.

type to 8-bit (some systems create 16-bit images in which you cannot handle different channels) (Image/Type/8-bit). As it was described earlier, there is a difference in the intensity between soft and sclerotized structures, between the two channels. To visualize this intensity we overlay the two data sets with different “pseudocolors”. I usually use green for 500–580 nm and red for the 580–700 nm channels (Figs 5, 6) (Image/Lookup Tables/Green and Image/Lookup Table/Red). Once the pseudocolors have been created the two channels have to be merged again before further procedures (Image/Color/Merge Channels). From that point images can be processed in numerous ways, but what we usually use in gross morphological descriptions are the Z-projection (Image/Stacks/Z-project...) and the 3D projection (Image/Stack/3D-project...). The former results in a 2D micrograph (Fig. 7.), while the latter results in a volume-rendered video file (e.g. <http://dx.doi.org/10.6084/m9.figshare.95704>; we usually set the Initial angle at 45°, total rotation 30° and the rotation angle increment at 1, when applying the 3D project, and we select Max Intensity for the z-projection).

In the final results, due to the selections of pseudocolors (green for lower and red for higher wavelength intervals), soft structures appear green and skeletal structures red. The last thing before saving the video and 2D image (usually in .avi and .jpg format) is to place the scale bar on (Analyze/Tools/Scale Bar...).

Although there are ways to eliminate oversaturation on a CLSM image (set Image/Adjust/Threshold; Fig. 8), it is most reasonable to collect data with a lower contrast even if parts of the image are seemingly not contrasted enough. Less visible parts on low contrast images can be visualized using gamma correction in Photoshop (Figs 9, 10) without

altering the original dataset and changing windows and level on media files in ImageJ (Image/Adjust/Window/Level...).

4. Publication. Although the most elegant way of publishing 3D datasets are the interactive PDFs (figure_S1.pdf in Mikó *et al.* 2012 or figure 2D from Deans *et al.* 2012; <http://dx.doi.org/10.6084/m9.figshare.94272>) with the presently available computational background it is nearly impossible to create interactive pdf files using the rich dataset generated by CLSM. Our solution for publishing our dataset in the highest possible resolution, while allow-

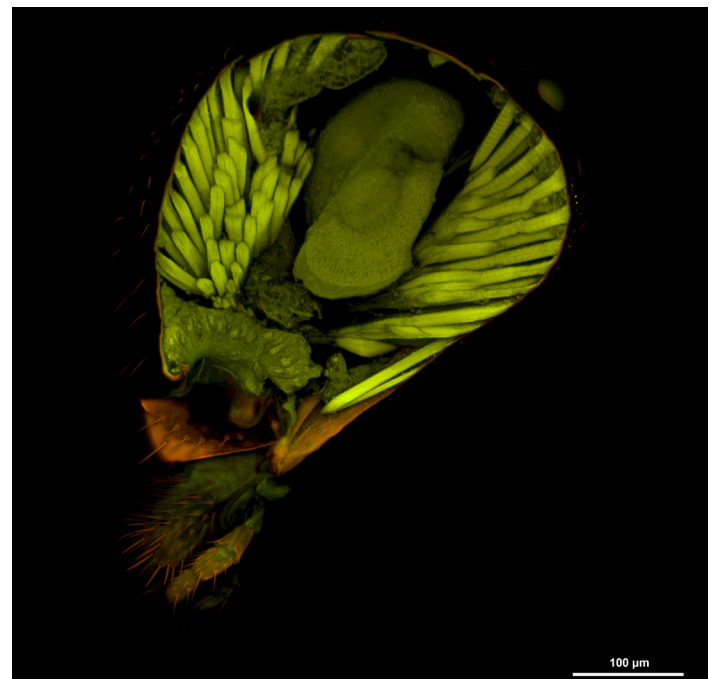


Figure 7. CLSM volume rendered micrograph showing the mandibular adductor muscle and the mandibular gland of *Nasonia vitripennis*.

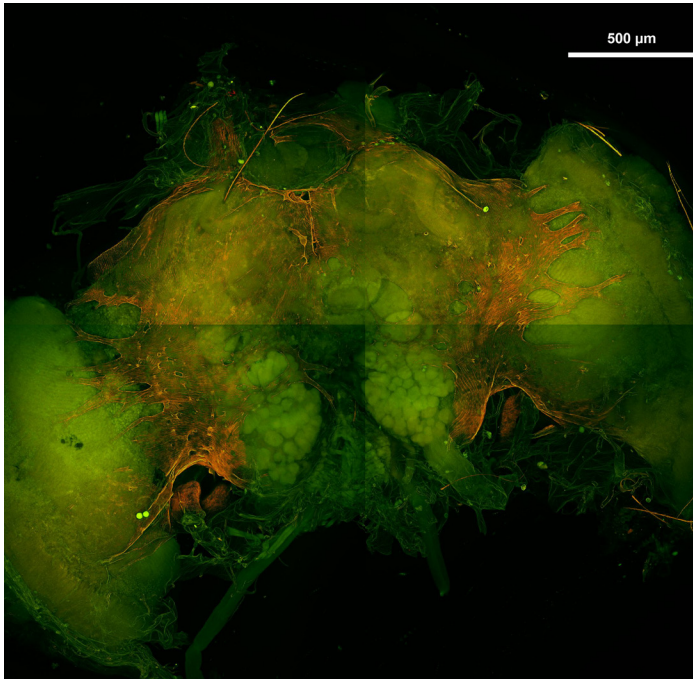


Figure 8. CLSM volume rendered micrograph showing the brain of *Apis mellifera*.

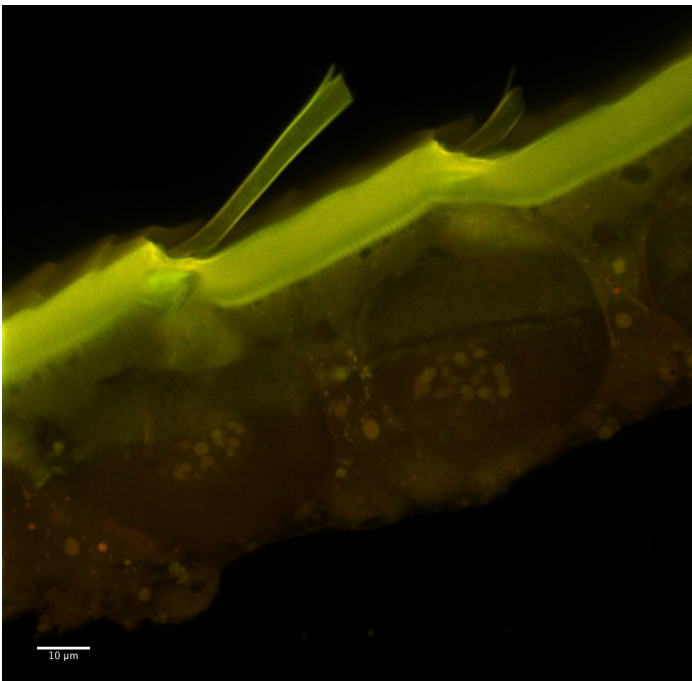


Figure 9. CLSM volume rendered micrograph showing the integument on T2 of *Bombus impatiens*.

ing the reader to see the structures in 3D, is to publish 2D micrographs as figures in the paper and 3D media files (in this case AVI) stored on a website as supplementary files, linked to the 2D images. We find Figshare (<http://figshare.com/>) to be a reasonable choice for storing CLSM data since it can handle video files and also provides a unique

identifier (DOI) for annotated images or media files.

5. Some examples. During the last few years we have visualized quite a few different anatomical systems spanning the size range from millimeters to a few micrometers, including the skeletomuscular system (Fig. 11), exocrine glands (Fig. 12), brain (Fig. 13) and epidermal cells (Fig. 14).

We really hope that this article will catalyze interest in this method, which is about as expensive as the commonly used SEM but much less time consuming, and let us visualize (and sometimes to better understand) even the inside of our lovely hymns. ❖

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Hymenoptera at the Frost Entomological Museum

By: Andy Deans, Frost Entomological Museum, Penn State University, University Park, PA USA

Most of you are probably aware of my recent move to Penn State, where I now serve as curator of the Frost Entomological Museum (PSUC). Well, here's a quick summary of the state of the Hymenoptera collection here: at 28,863 specimens it's relatively tiny. Stuart Frost, the museum's namesake, was an amazing entomologist, whose interests spanned many orders (especially Diptera), but he didn't invest a lot of time and resources growing his Hymenoptera

collection. We spent some time this summer inventorying the collection, to understand more about its strengths. Here's an alphabetical list of families and the numbers of specimens we have (see also <http://bit.ly/PSUCinventory>; bolded taxa will grow substantially in the near future):

Agaontidae (1 species, 1 specimen)
 Alloxystidae (1 specimen)
 Ampulicidae (9 specimens, 1 species)
 Andrenidae (255 specimens, 38 species)
 Anthophoridae (317 specimens, 21 species)
Apidae (903 specimens, 20 species)
 Argidae (97 specimens, 13 species)
 Aulacidae (6 specimens, 1 species)
 Bethyridae (23 specimens, 6 species)
 Braconidae (1,365 specimens, 94 species)
 Cephidae (40 specimens, 4 species)
Ceraphronidae (9 specimens, 1 species)
 Chalcididae (168 specimens, 5 species)
 Chrysididae (122 specimens, 19 species)
 Cimbicidae (25 specimens, 4 species)
 Colletidae (58 specimens, 12 species)
 Cynipidae (321 specimens, 9 species)
 Diapriidae (27 specimens, 2 species)
 Diprionidae (20 specimens, 11 species)
 Dryinidae (23 specimens)
 Encyrtidae (50 specimens, 2 species)
 Eucharitidae (4 specimens)
 Eucolilidae (9 specimens)
 Eulophidae (184 specimens, 12 species)
 Eupelmidae (38 specimens, 3 species)
 Eurytomidae (98 specimens, 6 species)
Evaniiidae (20 specimens, 6 species)
 Figitidae (7 specimens, 1 species)
 Formicidae (9,187 specimens, 236 species)
 Gasteruptionidae (25 specimens, 4 species)
 Halictidae (320 specimens, 47 species)
 Heloridae (2 specimens, 1 species)
 Ibalidae (6 specimens, 1 species)
 Ichneumonidae (4264 specimens, 105 species)
 Megachilidae (415 specimens, 34 species)
Megaspilidae (4 specimens)
 Melittidae (3 specimens, 1 species)
 Mutillidae (121 specimens, 35 species)
 Myrmecidae (4 specimens, 1 species)
 Orussidae (7 specimens, 1 species)
 Pamphiliidae (32 specimens, 21 species)
 Pelecinidae (16 specimens, 1 species)
 Pergidae (84 specimens, 4 species)
 Platygasteridae (21 specimens)
 Pompilidae (287 specimens, 51 species)
 Proctotrupidae (15 specimens, 3 species)
 Pteromalidae (256 specimens, 9 species)
 Rhopalosomatidae (1 specimen, 1 species)
 Sapygidae (14 specimens)
Scelionidae (17 specimens, 4 species)
 Sclerogibbidae (1 specimen, 1 species)
 Scoliidae (64 specimens, 8 species)
 Siricidae (32 specimens, 7 species)
 Sphecidae *s.l.* (917 specimens, 76 species)



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Stephanidae (2 specimens)
 Tenthredinidae (1,887 specimens, 155 species)
 Tiphiidae (107 specimens, 7 species)
 Torymidae (349 specimens, 7 species)
 Trigonalidae (2 specimens, 2 species)
 Vespidae (1,982 specimens, 77 species)
 Xiphydriidae (18 specimens, 5 species)
 Xyelidae (47 specimens, 3 species)
 Hymenoptera not sorted to family (3,733 specimens)

Approximately 60% of all specimens are determined to species, so there is a lot of curation yet to be done on this collection. You probably also noted the outdated taxonomy (*e.g.*, Eucolilidae). We welcome visitors and loan requests! We'd also love to have paratypes and other specimens, should you be looking to distribute specimens. ❖



New: Postgraduate Corner!

By: *Rebecca Kittel, University of Adelaide, South Australia*

Hi everyone, welcome to the new postgraduate corner of ISH! Let me start by introducing myself: I am Rebecca, a third year PhD student working under the supervision of Andy Austin in lovely Australia. Here, I am working on the revision of Australian chelonine wasps (Braconidae).

Well, I was at the International Congress of Entomology in South Korea and during the ISH meeting the question came up of how to get students more interested in ISH. My idea was to have a postgraduate representative, who will (hopefully) help the student community to feel better integrated into ISH. For now, that's me! As such we will be starting a postgraduate corner in each *Hamuli* issue where students have the opportunity to give their five cents about student related topics and later I hope we can have an ISH students meeting during ESA and other conferences.

So drop me a line if you have anything you want mentioned or general suggestions. ❖

Have you renewed your membership for 2013? Go to the Society website for more details!

<http://hymenopterists.org/>

Paper wasps get official respect

By: *Chris Starr, Department of Life Sciences, University of the West Indies, St Augustine, Trinidad & Tobago*

On a recent road trip through Canada I noticed that the current definitive postage stamps are a set depicting "Beneficial Insects". The 11 stamps are in denominations of one cent through 10 cents, and 25 cents. Some of insects are fairly obvious, such as a ladybird beetle (one cent), bumble bee (five cents) and dragonfly (10 cents). I was pleased to see a paper wasp, *Polistes fuscatus* among them (four cents; see below), although the likeness leaves much to be desired, especially in Canada, where this species has a black ground colour with sparse red and yellow markings. In looking in barns and other buildings for wasps, I had occasion to talk with several farmers and made a point of advising them to leave *Polistes* colonies in place where these did not pose a hazard to children or livestock, explaining their beneficial nature for agriculture. It is good to see that the government of postal service takes the same view. ❖

Have any suggestions for future iterations of *Hamuli*? We're looking for article ideas but also feedback on our layout.

adeans@gmail.com

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