Chalcid Forum

A Forum to Promote Communication Among Chalcid Workers

Volume 24. March 2002

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Welcome to the 24th issue of Chalcid Forum - Better late than never!! This issue our masthead features *Mymar taprobanicum*, another amazing digital photo by Klaus Bolte, CFS, Ottawa, courtesy of John Huber. This and all prior issues of CF are available on the SEL web site at www.sel.barc.usda.gov. Many thanks to Mike Gates and Tami Carlow who shouldered much of the burden of producing this issue.

Alert!

Mail going to and from the USNM remains problematic because of the anthrax issue. Incoming mail may takes weeks and may face being irradiated if not sent to the address below. Anyone mailing packages to or from the museum should check with a colleague at the museum first. Fax is encouraged. Temporary address for the editors: Smithsonian Institution, PO Box 37012, National Museum of Natural History, CE519, MRC 168, Washington, DC 20013-7012

Research Tidbits

James Munro: a second year, PEET/NSF funded, Ph.D. student in John Heraty's lab at UC Riverside (pray for him - he is already going nuts). His research focuses on a worldwide taxonomic and phylogenetic revision of the Azotinae (Aphelinidae). Topics to be investigated include the "*Ablerus* / *Azotus* debate" (was the sinking of *Azotus* justified?) and the "Aphelinidae Conundrum" (what is the placement of the Azotinae within the Aphelinidae, or for that matter, the Chalcidoidea?). A major aspect of James' research (i.e. the most time consuming and fun) will concentrate on the taxonomy of the Azotinae: descriptions and re-descriptions. Noyes documented 94 species of *Ablerus* and *Azotus*, with the majority of species occurring in the Australian Region. Many of the earlier species descriptions are inadequate and the types are poorly preserved. It is interesting to note that from a raid on Terry Erwin's canopy fogging samples, the "UCR gang" brought back around 1,100 Azotinae specimens. Initial sorting of only 200 of these specimens has revealed 25 morphospecies: that is 17 more potential species than described by DeSantis for the Neoptropical Region.

Jung-Wook Kim: a fifth year, PEET/NSF funded, Ph.D. candidate in John Heraty's lab at UC Riverside. His research focuses on the Aphelinidae, particularly *Aphytis*. *Aphytis* rank among the most important parasites of armored scale on citrus. Most species are extremely difficult to identify based on existing keys. Often the adults are identical or separated by only very marginal features, and only information from other life stages or behavior can be used to reliably recognize a species. This has, and will continue to be, a major impediment to using *Aphytis* in biological control programs. We are focusing our efforts on the characterization of species in the *Aphytis lingnanensis* group using both morphological and molecular data. We are looking at nucleotide sequences from four genetic regions (28S-D2, ITS2, COI and COII) of approximately 75 populations of about 30 species of *Aphytis*. This information will allow us to assess

geographic variability, look for fixed sites to develop molecular markers for the identification of species, and assess the relationships of species within *Aphytis*.

Albert Owen: a second year Ph.D. student in John Pinto's lab at UC Riverside. His research focuses on the trichogrammatid genus *Ufens* and morphologically similiar genera such as *Zagella, Chaetostricha,* and *Mirufens*. The last year's research activities have included exploring the diversity of the family Trichogrammatidae by examining museum holdings and collecting in both southern California and southeastern Arizona. Albert is currently working on a complete morphological study of the genus *Ufens,* utilizing whole mounted, slide mounted, and SEM material. Of particular interest, and also to be characterized morphologically, are specimens which do not fall directly within one of the generic concepts but which obviously fall into this group as a whole. He is also currently designing a website outlining both his research and the family Trichogrammatidae as a whole. Some preliminary molecular work has been accomplished, and he plans to dramatically expand the trichogrammatid molecular data set in the next year.

Behavior of Select Chalcidoidea
June 5-20, 2001
by Michael W. Gates

Rationale: The following is presented for those of you interested in *in situ* behavioral scenarios in general and those involving Chalcidoidea in particular. Site: Southern exposure in my backyard at 4113 Conrad Rd., Alexandria, VA (~1mi. NW jct. I-395 and Hwy 236). Eastern Red Cedar logs in woodpile infested with Scolytidae and Curculionidae. Logs were from recently-cut (April) trees. Most observations occurred in the afternoons on warm, sunny days. Observations: I first noticed a female *Eurytoma* sp. walking on our hose which is resting on top of our woodpile (mostly older split hardwood) and then glanced to the cedar logs where there was much activity involving various Chalcioidea. *Cleonymus magnificus* (Ashmead): Observed for ~15 min. on the first day and for a few minutes on two separate occasions later in the week. Generally, walks up and down the trunk near the top of the log (resting on-end), antennating constantly. Thoroughly explores crevices under the bark and fresh "push-out" of sawdust/frass from circular entrances formed by scolytids. Periodically pauses to clean hind legs by rubbing them together as often seen in muscoid flies. Probes with ovipositor 2 times for about 4-5 sec. each time. Spends almost entire time within a 6"x6" area. *Eurytoma* poss. *tomici* Ashmead: Observed every time I went to the woodpile. However, I never observed males. Moves a bit more slowly than either the *C. magnificus* or *R. tutela.* Some specimens move forward in short bursts of 1-5 sec. duration and then pause briefly, often "flicking" the wings. During this, the gaster may bob up and down. Antennae don't drum as rapidly as in *C. magnificus* and they are usually outstretched and vibrating slightly. Typically explores in an erratic pattern, often along the longitudinal axis of the log. This species often adopts a "resting" position with the antennae outstretched, immobile and the gaster usually closely appressed to bark surface. The entire body becomes immobile for minutes at a time. Intraspecific encounter: smaller of the two specimens cedes almost immediately with a 'startle' response and short hop backward. Oviposition behavior: Antennae moving rapidly, then held stiff; head directed ventrad; gaster oriented ventrad with tips of ovipositor sheaths appressed to bark surface. Defensive behavior: when approached by aspirator tip, specimens hop and/or tumble away from aspirator to a lower position on the log. *Theocolax elegans* (Westwood): Very few observed. Moves up and down the surface of the cedar slowly, with moderate antennation. When approached from front with aspirator, it stops and slowly backs away from it. *Rhopalicus tutela* (Walker): Numerous specimens observed nearly every day when I went

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outside; fewer near the end of the observation period. Antennae usually oriented ventrad, but occasionally pauses with antennae out and freezes' Usually 'rests' with head directed toward the ground. Does not explore crevices as much as *C. magnificus.* Interspecific encounter with *Eurytoma:* both antennate one another in face to face orientation, *R. tutela* partially flares wings, stiffens, and raises anterior portion of body; then lunges at *Eurytoma* with wings fully flared (briefly). *Eurytoma* retreats. 2nd encounter (same individuals): *Eurytoma* immediately flees. 3rd encounter (same individuals): brief antennation, then *Eurytoma* flees (short term memory??). Defensive beahvior: a sort of tumbling plummet away from aspirator to lower on the log OR fly away and require at least 30 sec. to land elsewhere on the log. *Eupelmus* ?sp.: Few observed. Very fast, jerky movements. Rapid antennation and typically walks quickly up and down the length of the upper half of the log. Miscellaneous taxa observed: Sphecidae: A single, small, black species searching on the logs on June 16. Very fast and rarely alit for more than a few seconds. Braconidae: Observed daily with two species collected. One was quite common, representing over 80% of specimens collected. Both were fairly slow moving by chalcidoid standards and readily aspirated. Usually stationary or moving slowly in search of hosts. Ichneumonidae?: Observed on two separate occasions. VERY fast and agile. Essentially a black blur, ~1-2cm in length that rarely alit for more than 1-2 seconds. Final note (very exciting to Eric Grissell): While walking past the garden on the west side of our dwelling last July, I noticed something with a long ovipositor hovering near one of our sunflower heads (Burpee's 'Paul Bunyan' variety). I waited for it to land to see that it was only a torymid (yawn), but collected it anyway since Eric would know what it was. Upon examination, he determined it to be *Zaglyptonotus,* an uncommonly collected torymid that he had never seen in the D.C. area before. Two described species are known from the Nearctic region (possibly synonymous; Grissell pers. comm.). No specimens in the collection had been found further east than Missouri, though this may not mean much in terms of the distribution of this genus since its host is widespread and attacks numerous genera of (cont. pg.4)

New Chalcidoidea CD-ROM!

I am pleased to advise you all that the second (first revised) edition of the World Chalcidoidea (Insecta, Hymenoptera) Database on CD is now available. It can be obtained directly from Dicky Yu (E-mail: DickyS._Yu@telus.net; or Dicky S. Yu, P.O.Box 48205, Bentall Centre, Vancouver B.C., V7X 1N8, CANADA; see also www.taxapad.com). The price is an absolute snip at $190 for a first purchase or $95 for an upgrade on proof of purchase of the first edition which was published by ETI. There will be a small additional charge to cover postage, etc. The CD contains information on all aspects of the taxonomy, biology and distribution of more than 26,000 taxa of Chalcidoidea published up to April 2001 and includes many corrections of errors that were present in the first edition. It contains information equivalent to more than 20,000 printed pages. There are also more than 300 images of living chalcidoids (for those that are interested in images of living invertebrates). Dicky has included many new features such as a distribution map facility (which is very nice indeed) and an improved capability for host searches so that it is now possible to search for hosts of parasitoids at any taxonomic level (family, subfamily, genus, species). Using the CD is a little more complex than with the first version and so I would strongly advise browsing through the manual to find all its capabilities. I think Dicky is to be congratulated on the database design, which, although basically the same as in the previous version is much more pleasing on the eye to use and vastly superior in functionality. As with the previous version, the CD is aimed at Windows users and should work on any platform, including Windows 95 to Windows 2000 and NT. So far as I know it has not been tested on XP. Mac users should be able to use the CD with "SoftWindows" or "Virtual PC". If anyone tries the CD on XP please could you let me know how it performs so that I can pass it on.

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(cont. from pg. 3)Asteraceae (see below). Resolved, I decided to stalk this beast with the hopes of acquiring more. So, each afternoon I would walk by the sunflowers and wait. I would typically see *Neotephritis finalis* (their seed-feeding tephritid host) and species of Lauxaniidae (feed on decaying vegetable matter) walking about as well as the common apids visiting the flowers and the occasional *Eurytoma* sp. on the stems and flower heads. I did manage to collect 4-5 more *Zaglyptonotus* over the next few days with one of these oriented head down, apparently trying to "burrow" toward the inflorescence receptacle.

Hymenoptera Parasitica: Taxonomy and Biological Control - an International Scientific Symposium
by John Huber

This international symposium was held from 14-17 May, 2001, in Köszeg, Hungary. Köszeg is a picturesque historic town of about 12,000 people, 2 km from the Austrian border and about 2 hours drive (120 km) south of Vienna. The town is known to Hungarians as the "Jewel Case" of Hungary, and surrounds a walled fortress dating from before the Middle Ages. The area was settled well before that, however, as indicated by bronze-age relicts. The city was captured and recaptured by various invading armies - Hungarians, Tartars, Germans, Austrians, and Turks over the centuries. The castle as it presently stands was rebuilt in the 1770's and contains a museum. A large Lepidoptera collection is currently housed within part of its massively thick walls. The scenic Köszeg Mountains, rising to about 900 m just north of town, form the extreme eastern foothills of the Alps, and contain Irottko National Park. A magnificent oak-chestnut forest was within a half hour walk from the hotel we stayed in.

The conference was held in the new, three-star Irottko Hotel, just outside the old city walls and five minutes walk from the Systematic Parasitoid Laboratory, near the main square and castle. At a cost of US$20 per night, with meals included, it was a fantastically cheap, if rather unusual, venue for a conference. The indoor balconies of the 4 floors overlooked a large central atrium, in which chairs and poster boards were set up for the conference. One could literally sit up in bed, open the room door, look over the balcony railing, and listen and watch the conference proceedings. The four-day program included 56 talks and 35 posters on all aspects of parasitic Hymenoptera. Thirty-two countries were represented, but only 4 people were from the Western Hemisphere, 3 from Canada (Lubo Masner, Gary Gibson and John Huber) and one from Brazil. Somewhat surprising was the complete lack of hymenopterists from the USA. Apart from an echo due to the high atrium roof, the place was fine for a conference, with facilities to give PowerPoint or slide presentations. Gary gave PowerPoint, but being the old fashioned sort I am I used slides, much to my dismay as the European projector ate my thin North American slides. This reenforced the equally important fact that there was a bar in the corner of the main floor, which one could zip into for a break at any time. Conference organizers please note. I spoke on "the basal lineages of Mymaridae", whereas Gary ranted about "Cleonyminae: generic diversity and putative relationships". The majority of the other talks also related to some aspect of chalcid systematics, diversity or biology.

The real aim of the symposium, according to the 4 organizers (Czaba Thuroczy, George Melika, Istvan Eke and Janos Kaldy) was to present the Systematic Parasitoid Laboratory, opened 4 years ago, to the international scientific community and to create the widest scientific and technical cooperation with colleagues worldwide. For that purpose, attractive post-conference programmes were offered as well as excursions, insect collecting trips, and research work at the laboratory in Köszeg and the Hymenoptera Collection of the National Museum of Natural History in Budapest. For us chalcid workers, Czaba had already borrowed a good proportion of the chalcids from the National Collection, including all types, so there was no need to go there to study chalcids. A Proceedings containing the complete texts of the lectures and posters will be published in 2002.

Gary and I arrived at around 9.00 p.m. in Vienna, having left the day before at about the same time. A 6-

hour stopover in London did not help much. We had arranged to be picked up in Vienna by someone from the Systematic Parasitoid Lab. This happened around midnight, the delay being the result of a previous meeting that was supposed to occur in Sopron (in Hungary) to pick up Zdenek Boucek and Lubomir Masner who were arriving by bus from the Czech Republic. Somehow, that reunion did not occur and time was spent by our hosts waiting around in bus stations. By the time we were picked up, by Istvan Eke (a student of proctos) and Maria Bechtold (technician of George Melika), in a Volkswagen van modified for collecting trips, everyone was exhausted, as our drivers had been up since around 5 that morning, driving to Budapest to pick up colleagues from China. Nonetheless, in pitch dark, we took off and a few minutes into the trip Maria offered us beer and cookies for the drive. Not something one might see in North America, but certainly much appreciated. Since neither Istvan nor Maria spoke much English and our Hungarian was non-existant, we made the best of the two-hour drive conversing inGerman, a little broken English from Istvan, and a lot of waving-of-arms-and-gesticulating language. A rather interesting experience. Luckily, customs formalities at the border were minimal and we got to the hotel at around 2.30 A.M., checked in, and collapsed in bed.

The next day, Sunday, was a glorious, warm late May day, so after an excellent Hungarian-continental breakfast (great salami) Gary headed for the forest to set up traps and do some sweeping with the first people we met, Chao-dong Zhu and Nai-quan Lin from China. I went off later on my own just to relish the fauna and flora, which brought back fond memories of my own youth in Switzerland. The difference was that here things were pretty well untouched, much as I remember them in the 1950's and 1960's around Geneva, and not the sad relicts of nature that now remain in much of western Europe.

No concurrent sessions were held during the conference. So everyone heard everything they wanted to and at coffee breaks we had a chance to speak to anyone who was there. For me, the best thing was to meet such a diversity of nationalities, and colleagues with whom I had corresponded for years but never met. Many came from eastern Europe, Russia, Ukraine, and China, and there was a good representation from western Europe as well. Several professors and students in German and Austrian universities drove to Köszeg, many of whom are working on ecology or biocontrol, which almost by definition means working with chalcids. Symposia topics included Taxonomy and Evolution, Host-Parasitoid Relationships, Biological Control, Fauna and Evolution, Taxonomy of Chalcidoidea, Taxonomy of Mymaridae, Biology and Ecology, Karyology and Molecular Biology in Chalcidoidea, and Taxonomy of Chalcidoidea and Proctotrupoidea. Interestingly, several speakers talked about the horse chestnut leafminer, Cameraria ohridella, a recent gracillariid pest that is devastating Aesculus in eastern and central Europe and which is still spreading. No one is sure where it originated or where it will stop, despite having about 30 native parasitoids hitting it. North America beware!

A noteworthy aspect to the conference was the number of chalcidologists present, from the doyens of chalcidology, Z. Boucek and V. Triapitsyn, to several young students in European or eastern universities who are work on biology or systematics of chalcids. Some of the noteworthies were: Hannes Baur (Switzerland), Klarissa Dzhanokmen (Kazakhstan), Chao-dong Zhu (China), Gérard Delvare (France), John Noyes (England), Oleksiy Gumovsky (Ukraine), and Vladimir Gokhman (Russia). For mymarids alone, my pet group that I love to hate, there were 7 specialists, E. Chiappini, C. Solinas, and G. Viggiani (Italy), A. Donev (Bulgaria), N. Lin (China), C. Thuroczy (Hungary), and J. Huber (Canada). Adding two more, S. Triapitsyn (USA) and P. Fidalgo (Argentina), would have made a clean sweep of world mymarid workers.

After two days of intensive meetings we had a break and were taken to Ferto-Hansag national park, about two hours from Koszeg. This park is being considered for world heritage site status, as it is a major waterfowl area in vast reed marshes on the lake shared by Austria and Hungary. Although we were not allowed to collect, the walk to the marsh and the view from the (still standing) steel 10 m observation tower was splendid. The tower is a useful relic of the Soviet military observation towers, which were used to prevent people escaping to western Europe rather than to prevent invasion. A visit to the park headquarters to see the nature museum in a beautiful thatch-roofed building was noteworthy. As our young guide, in fluent English,

told us about the park and warned us not to collect, several intrepid collectors stepped outside the park gate, found an old stump and promptly collected stephanids and orussids. This was repeated elsewhere. Gary is still bitter that he was not so lucky. On the way back to Köszeg we stopped at a fine eatery and historic site for traditional Hungarian goulash. This meal was notable among the many fine meals, which no doubt have resulted in increased girth of all present. We had one more day trip to a forest south of Szombathely, right on the Austrian border. Collecting was variable but it was an interesting place to visit. Gary and I spent a few hours hanging around piles of freshly cut pine logs, looking for parasitoids of wood-boring insects. Ultimately, the best results were from sweeping and the pan traps Lubo set up in the forest and along streams in the Koszeg mountains. Sorting the residues in Ottawa on our return yielded plenty of chalcids.

After the last day of talks was a mammoth meal a-la-kings of old within the Koszeg castle, a few minutes walk from the hotel. No utensils in sight, simply platters of meat and potatoes served by serving wenches, and music in a long, dim chamber conducive to fine eating, drinking and merry making. The gastronomic extravaganza continued after the conference for those who stayed on for up to 10 days after the meetings. Even during the meeting we had the opportunity to visit the parasitoid lab, converted from a charming old complex with an inner courtyard surrounded by massive, high stone walls into a comfy, almost living-room style lab with arched ceilings and old fashioned furniture but with modern microscopes and computers. The courtyard was shared with a historical pharmacy museum, whose curators grew many different medicinal plants. After a few hours of microscope work it was always a pleasure just to step outside either to visit this museum or look at the interesting herbs, with their Hungarian and latin names, for those who have a penchant for knowing such esoterica. Several chalcid workers packed into the rooms to study types and other material, and occasionally taking shifts at the microscopes. A few people went on a 4-day collecting trip to eastern and southern Hungary but Gary and I went our separate ways beforehand, Gary to Vienna and ultimately to London to look at types and I to the lab to go through as many mymarids as possible that Czaba had accumulated from various European museums for study.

All in all, the conference was one of the best we have attended, in a most delightful place, well run, and with superb hospitality on the part of our Hungarian hosts. In particular, it was a once in a life time opportunity to meet so many colleagues from countries that one would almost never see in relatively costly western Europe or North America.

New or Updated websites on Chalcidoidea

Agriculture Canada (Gary Gibson): A few changes were made to the About Chalcidoidea page:
http://res2.agr.ca/ecorc/apss/chalintr.htm

These changes mostly reflect important new publications on chalcid systematics since the last update. Also, the list of my publications available online as pdf documents is now up to 10, available at:
http://res2.agr.ca/ecorc/apss/chalrepr.htm.

"New" additions include my 1985 "Pro- and mesothoracic structures" study, and the 1986 papers on monophyly and relationships of the Chalcidoidea and on skeletomusculature and jumping in Eupelminae. I have also added my Internet key to the North American chalcid parasitoids of filth flies as a pdf document:
http://res2.agr.ca/ecorc/apss/chalkey/chalkey.pdf.

For those not particularly interested in filth fly parasitoids, the key will serve to identify virtually all the North American species of *Spalangia*. Our webmaster informs me that my pdf bibliography of chalcids associated with filth flies:
http://res2.agr.ca/ecorc/apss/biblio.pdf
was the most downloaded document on our entomology site this last year. Very likely there are a lot of people out there downloading "filth" who got a big surprise. All the best.

Hymenoptera Site: USDA-ARS-SEL by Mike Gates

The Eurytomidae page was updated and expanded and the following interesing new pages were added: Eurytomidae & Epiphytes (Gates) and Collecting Chalcidoidea (Gates & J. W. Kim). All below addresses follow the common prefix:
http://www.sel.barc.usda.gov/hym/chalcids/
eurytomid/EuryAroids.html
eurytomid/eurytomd.html
ecollecting/coll_chalc.html

Searchable database of *Encarsia* species of the world (Woolley & Heraty)
http://chalcidoids.tamu.edu/ENCARSIA/encarsia.htm

Key to the *Encarsia* species on greenhouse and silverleaf whitefly (Stefan Schmidt)
http://www.ento.csiro.au/science/encarsia/key1.htm

Sorting Trips to USNM collection

Three students from the University of California at Riverside, James Munro, Jung-Wook Kim (both under John Heraty) and Albert Owen (under John Pinto) visited for two weeks in March, 2001 to sort through canopy fogging materials from Terry Erwin's samples. The visit was productive as they made their way through hundreds of vials and eventually pulled out well over 2,000 specimens of Aphelinidae and Trichogrammatidae.

A recently-matriculated MS student of John Pinto's, Roger Burks, visited in November for two weeks in order to sort through identified Eulophidae and Pteromalidae. He is currently working on web-based generic keys to both families, so keep your eyes peeled on the UCR web site.

John Noyes (BMNH) visited for three weeks in the Spring to sort through Terry Erwin's canopy fogging samples and to look through literature files.

Klarissa Dhzanokmen (Inst. Zoology, Kazakhstan) visited for two months in the Fall to examine USNM holdings of Pteromalidae.

Necrology

Geoffrey J. Kerrich (1909-2002) passed away on December 22, having lived into his early 90's. He was born in England and obtained his degree at Cambridge University (1927-1930) and his DSc from Manchester University in 1972 or 1973. He first worked at the University of Cambridge Museum and somewhere in Glasgow (for Agriculture?) (1930-1941). He then worked in Manchester Museum from 1941 to 1947(?) and joined the then Commonwealth Institute of Entomology (now defunct) in 1947 housed in the British Museum (Natural History). He will be remembered for his work on the systematics of Ichneumonidae, Chalcidoidea and Cynipoidea, of which he published over 60 papers between 1932 and 1986. Among other families of Chalcidoidea, he published on Encyrtidae, Pteromalidae, Perilampidae, Chalcididae, Eucharitidae and Eulophidae. Most often, these works focused on taxa which attacked economically important pests like mealybugs and leafminers, although he occasionally reported upon the results of surveys of an area (e.g. Campbell Island, Africa or the tropical regions). Married (wife died in 1999) and had three children (2 boys and one girl). *Thanks to John Noyes who provided much of the biographical information (Eds.)* .

A review of the hosts and biologies of Chalcidoidea
by John S. Noyes

Most readers of Chalcidoidea Forum will be aware of the first edition of the World Catalogue of Chalcidoidea on CDrom that was published in August 1998. About that time I extracted host and biological data from the Chalcidoidea database in order to summarize this information for an annual one week course that we run at Imperial College at Silwood Park: The Taxonomy and Biology of Parasitic Hymenoptera. At the back of my mind I had the vague intention of publishing these data formally perhaps in collaboration with a tame ecologist. This never happened for various reasons and so I am presenting these data here in the hope that they may be of interest to several of you.

Although the data are four years old they are a pretty good representation. It is likely that new data published during the intervening three and a half years will have altered the proportions of the histograms very little. The data summarize the hosts and biology for the Chalcidoidea overall and for each of the families currently recognized within the superfamily (with the exception of the Elasmidae which, in 1998, was generally regarded as a valid family). I think that, with the exception of the Agaonidae (see below), most of the histograms will be very representative of the host utilization and biology of the respective groups.

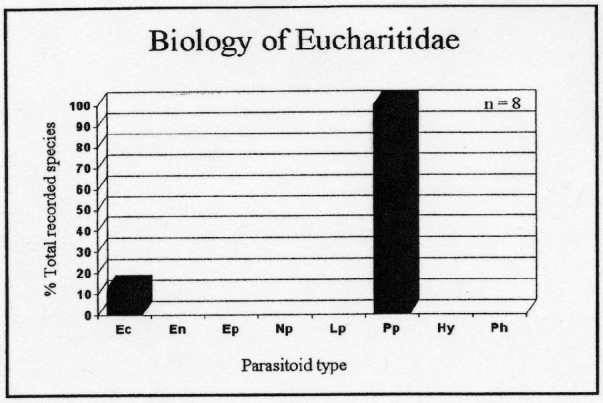
In the context of this summary, the Agaonidae is treated in Boucek's (1988) sense with five subfamilies being included. As you know, recent molecular work by Jean-Yves Rasplus and collaborators has shown that only the fig pollinators (Agaoninae) themselves should be treated as true agaonids. The problem is that if we treat only the agaonines as true Agaonidae then at least two of the subfamilies recognized by Boucek cannot be assigned with confidence to any other chalcidoid with any degree of certainty. Therefore I am continuing to include all five subfamilies in the Agaonidae until this uncertainty can be solved. Another problem with the Agaoninae is the lack of specificity in publications with regards to the host utilization in Agaonidae (sensu Boucek). We all know that all Agaoninae are gall formers in the ovules of figs, but very few publications on actual species state this. This uncertainty is also true of the taxa belonging to the other subfamilies, either because authors genuinely do not know whether the species is phytophagous, parasitic, or whatever or because they just fail to note exactly how the immature stages develop in the syconium.

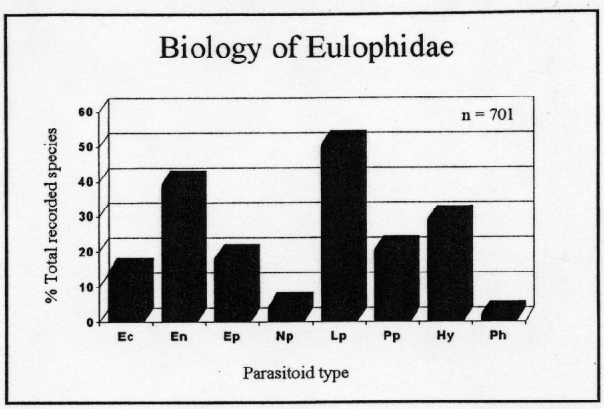
One of the problems with compiling these data was to keep the information as simple as possible. For this reason I treated only four stages of hosts: egg, nymphal, larval and pupal. Thus egg-larval parasitoids were counted both as egg parasitoids and larval parasitoids, larval-pupal parasitoids were counted both as larval and pupal parasitoids and so on. I did not score for prepupal parasitoids as these were treated as larval parasitoids. I also did not score for adult parasitoids as these are so rare, except in parasitoids of "Homoptera" (s.l.) where adult parasitism is quite common, but difficult to score, e.g. in Encyrtidae. I also did not score for predation because this is comparatively rare. However, in retrospect, for the purposes of this note it was a pity that these types of host utilization were not scored separately. Maybe next time. It should be noted that since egg-larval parasitoids, etc. were scored as separate host stages then some percentages may total more than 100%, because some species will be noted as egg parasitoids and larval parasitoids, etc.

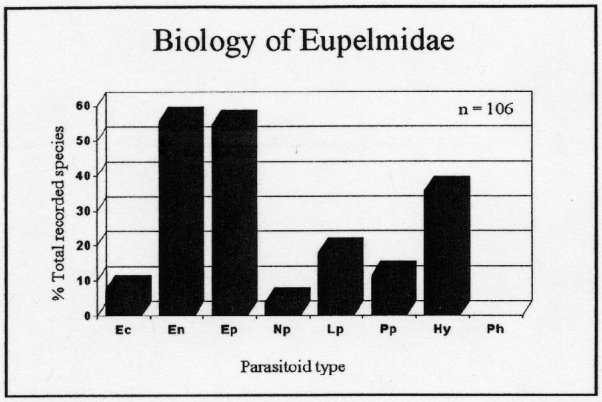
The histograms summarize data as follows:

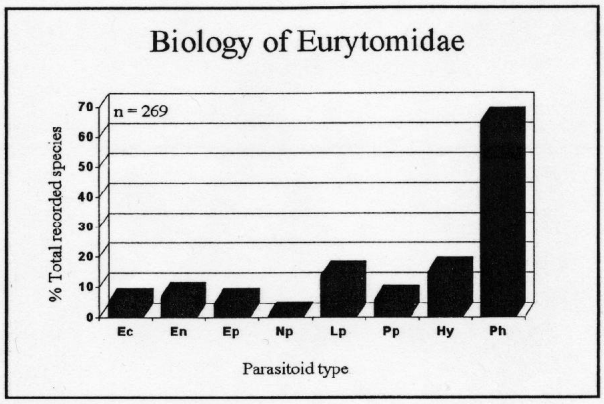
Host summaries:

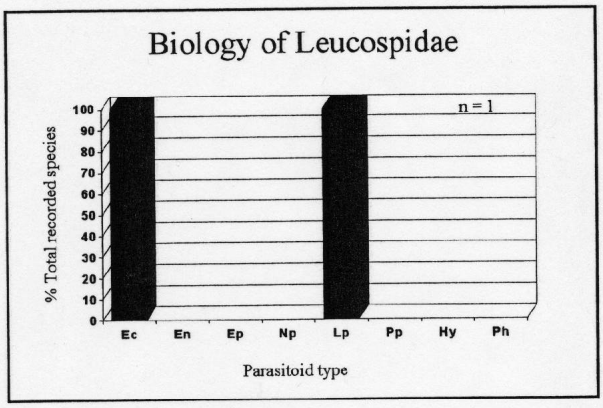
1) The number of arthropod families acting as hosts is given directly below each family title .
2) The total number of chalcidoid species for which host information was recorded is given as "n" followed by the total number of valid species recorded for that family, e.g. for the Pteromalidae there were host records for 1136 species for a total of 3373 valid species.
3) Each bar represents the proportion of records that refer to a particular host group given as a percentage

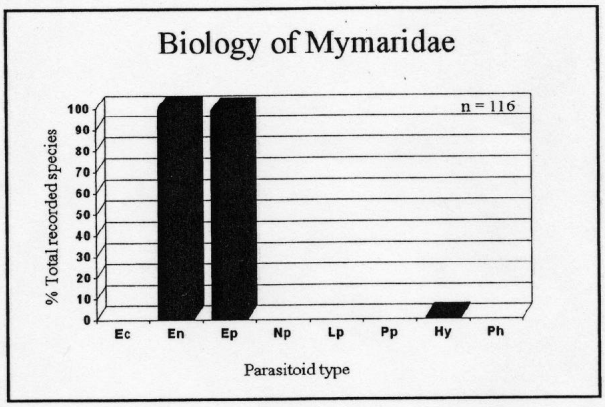

Biology of Eucharitidae
n = 8
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

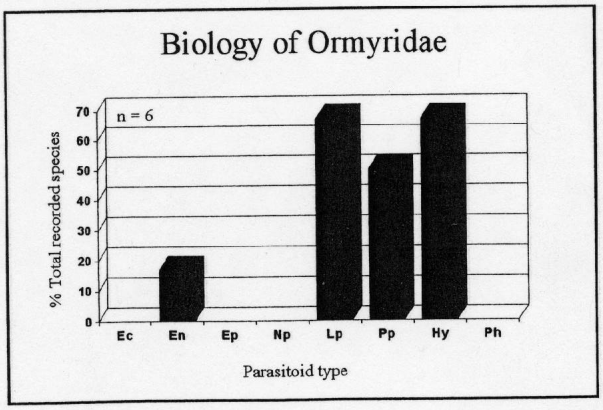

Biology of Eulophidae
n = 701
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

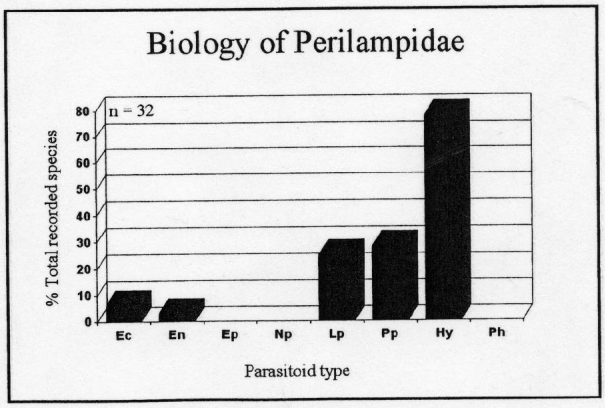

Biology of Eupelmidae
n = 106
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

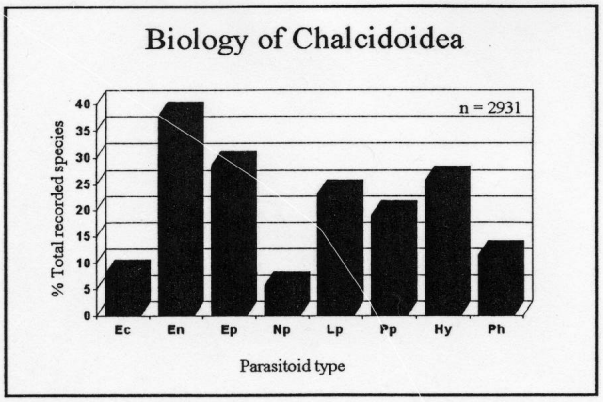

Biology of Eurytomidae
n = 269
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

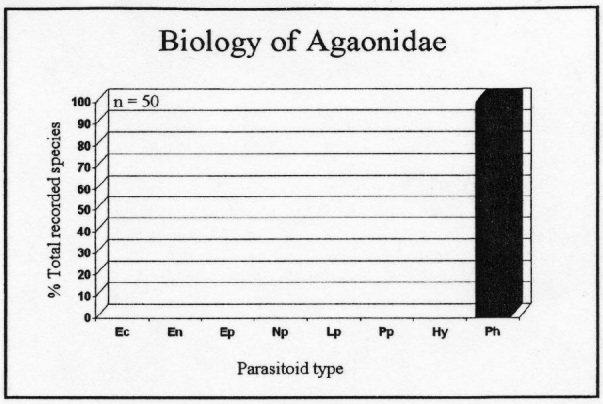

Biology of Leucospidae
n = 1
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

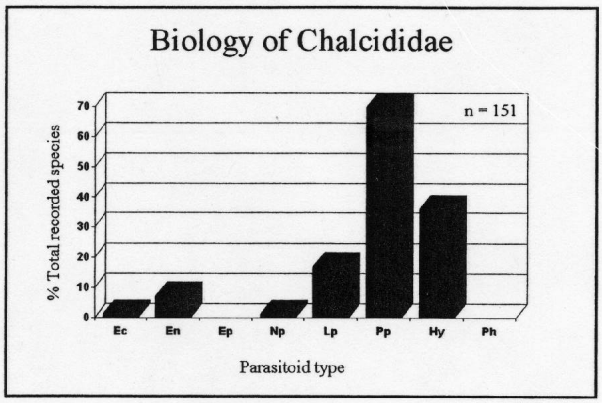

Biology of Mymaridae
n = 116
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

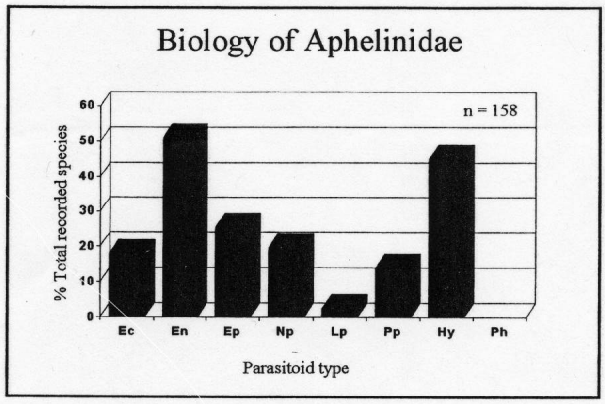

Biology of Ormyridae
n = 6
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

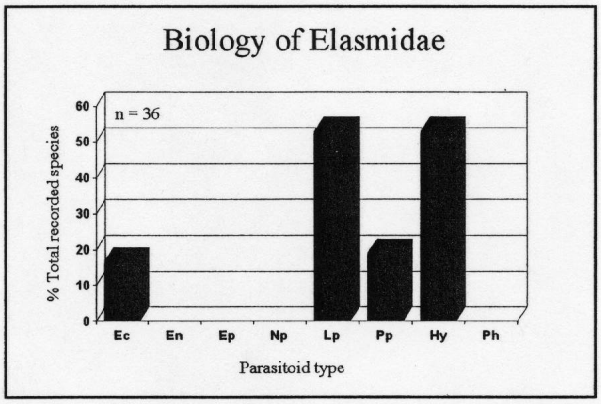

Biology of Perilampidae
n = 32
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

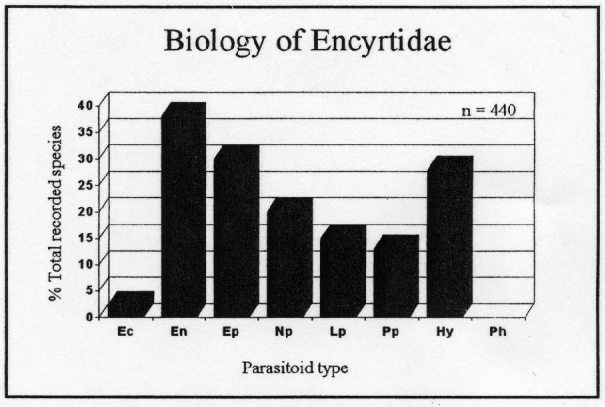

Biology of Chalcidoidea
n = 2931
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

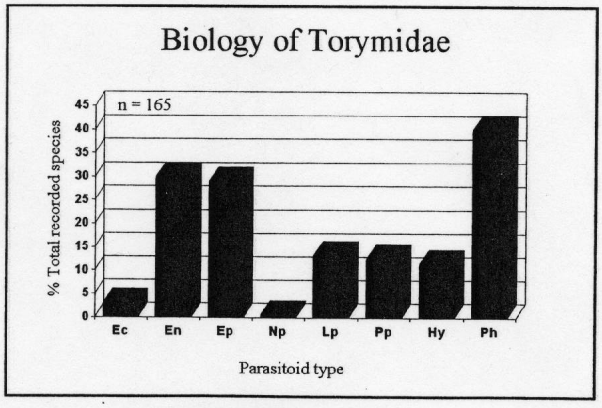

Biology of Agaonidae
n = 50
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

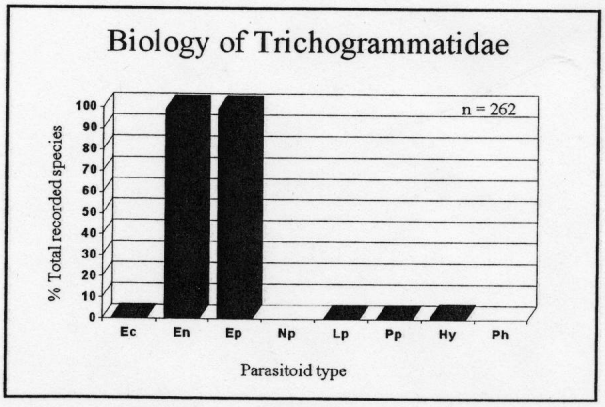

Biology of Chalcididae
n = 151
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

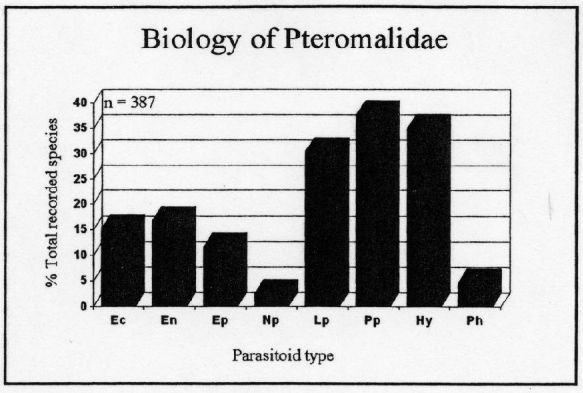

Biology of Aphelinidae
n = 158
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

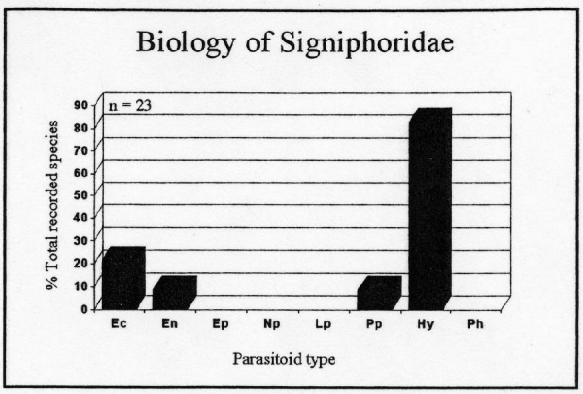

Biology of Elasmidae
n = 36
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

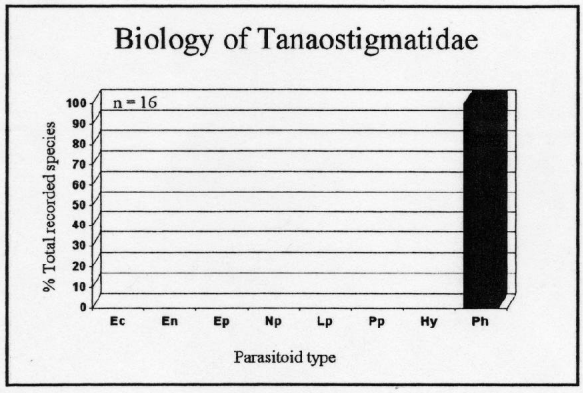

Biology of Encyrtidae
n = 440
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

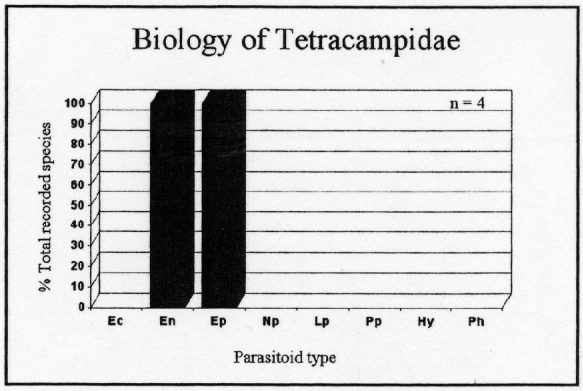

Biology of Torymidae
n = 165
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

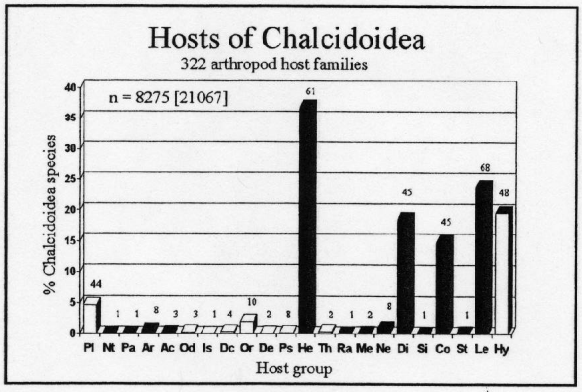

Biology of Trichogrammatidae
n = 262
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

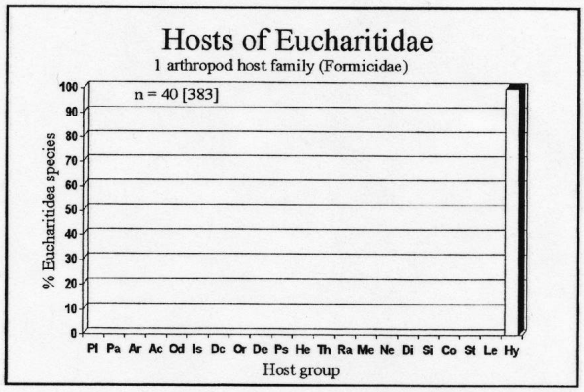

Biology of Pteromalidae
n = 387
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

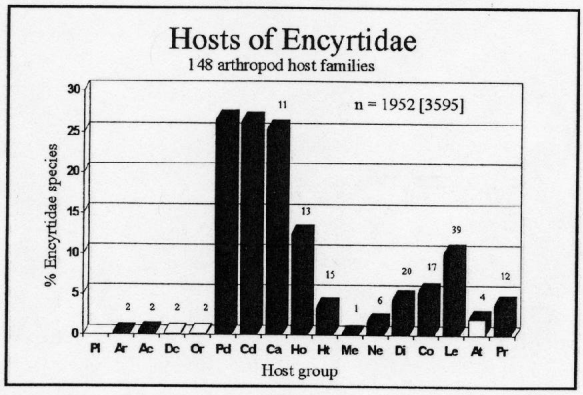

Biology of Signiphoridae
n = 23
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

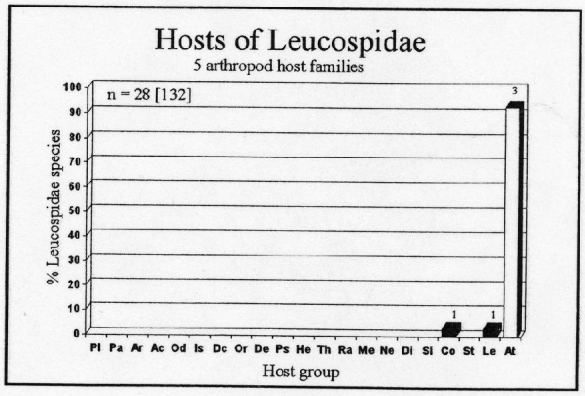

Biology of Tanaostigmatidae
n = 16
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

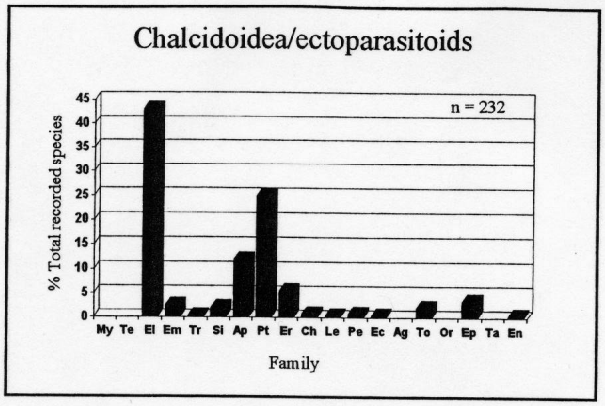

Biology of Tetracampidae
n = 4
% Total recorded species
Ec En Ep Np Lp Pp Hy Ph
Parasitoid type

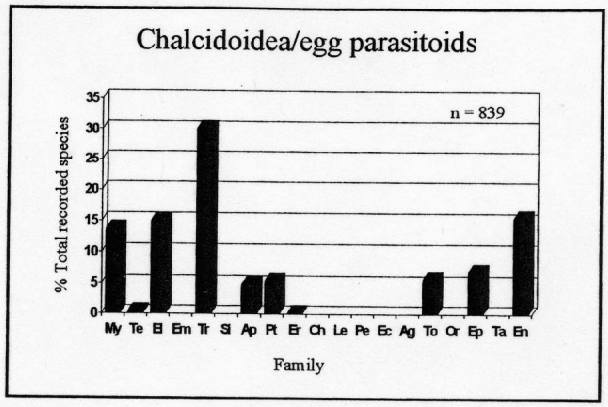

Hosts of Chalcidoidea
322 arthropod host families
n = 8275 [21067]
% Chalcidoidea species
Pl Nt Pa Ar Ac Od Is Dc Or De Ps He Th Ra Me Ne Di Si Co St Le Hy
Host group

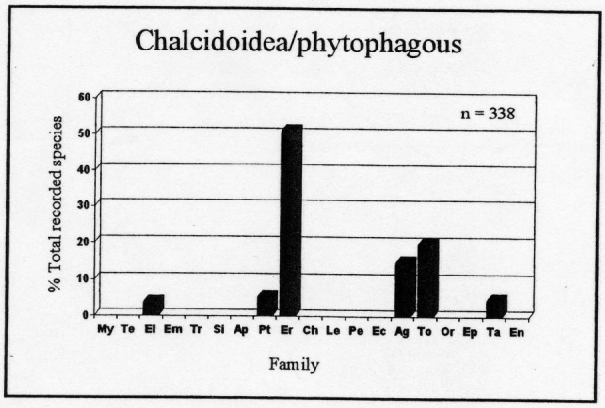

Hosts of Eucharitidae
1 arthropod host family (Formicidae)
n = 40 [383]
% Eucharitidea species
Pl Pa Ar Ac Od Is Dc Or De Ps He Th Ra Me Ne Di Si Co St Le Hy
Host group

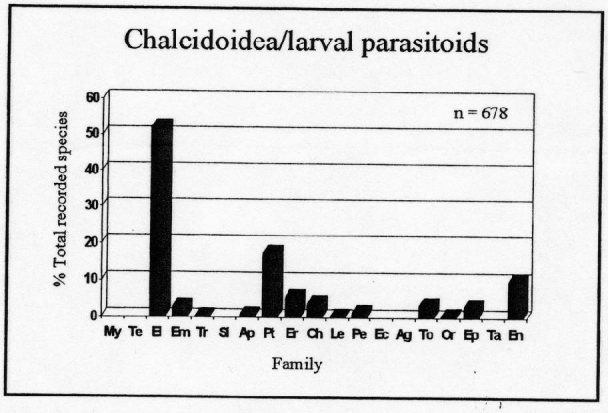

Hosts of Encyrtidae
148 arthropod host families
n = 1952 [3595]
% Encyrtidae species
Pl Ar Ac Dc Or Pd Cd Ca Ho Ht Me Ne Di Co Le At Pr
Host group

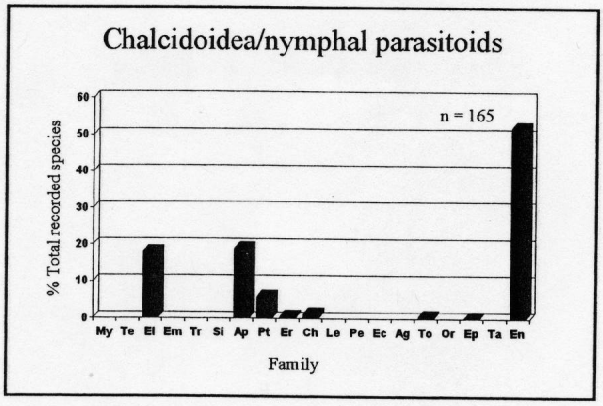

Hosts of Leucospidae
5 arthropod host families
n = 28 [132]
% Leucospidae species
Pl Pa Ar Ac Od Is Dc Or De Ps He Th Ra Me Ne Di Si Co St Le At
Host group

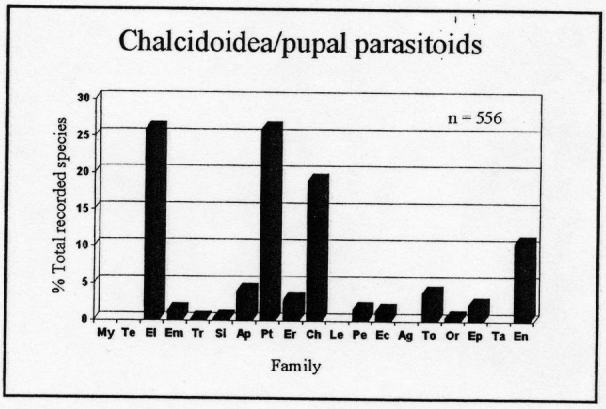

Chalcidoidea/ectoparasitoids
n = 232
% Total recorded species
My Te El Em Tr Si Ap Pt Er Ch Le Pe Ec Ag To Or Ep Ta En
Family

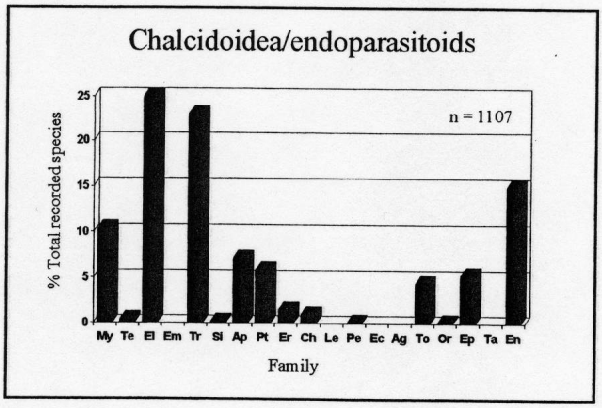

Chalcidoidea/egg parasitoids
n = 839
% Total recorded species
My Te El Em Tr Si Ap Pt Er Ch Le Pe Ec Ag To Or Ep Ta En
Family

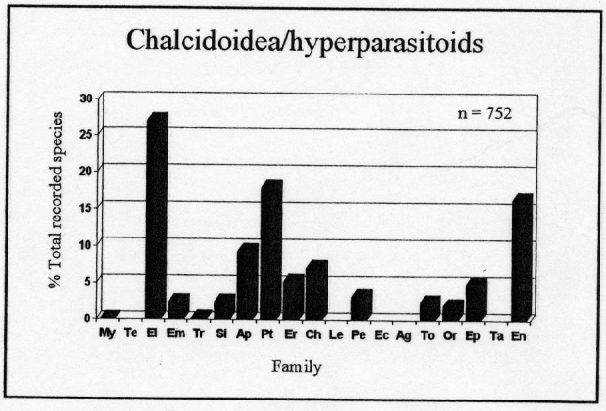

Chalcidoidea/phytophagous
n = 338
% Total recorded species
My Te El Em Tr Si Ap Pt Er Ch Le Pe Ec Ag To Or Ep Ta En
Family

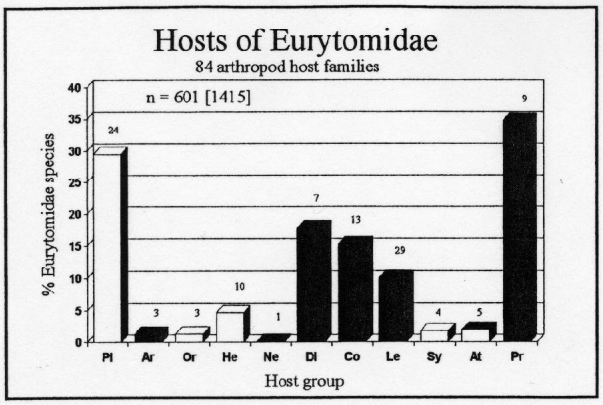

Chalcidoidea/larval parasitoids
n = 678
% Total recorded species
My Te El Em Tr Si Ap Pt Er Ch Le Pe Ec Ag To Or Ep Ta En
Family

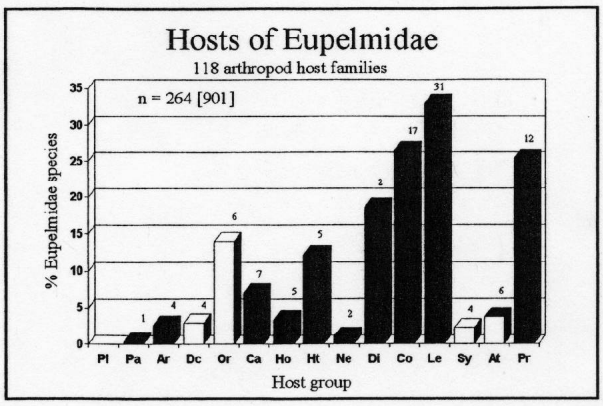

Chalcidoidea/nymphal parasitoids
n = 165
% Total recorded species
My Te El Em Tr Si Ap Pt Er Ch Le Pe Ec Ag To Or Ep Ta En
Family

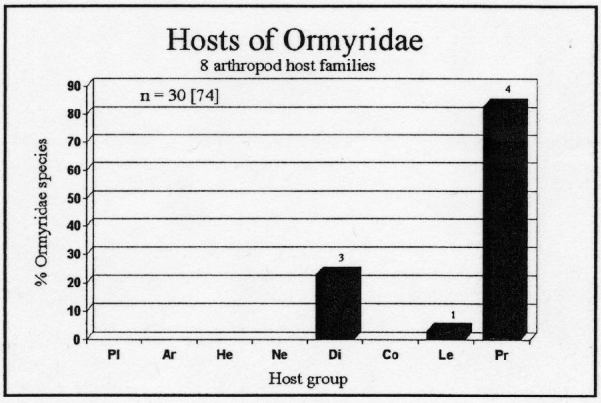

Chalcidoidea/pupal parasitoids
n = 556
% Total recorded species
My Te El Em Tr Si Ap Pt Er Ch Le Pe Ec Ag To Or Ep Ta En
Family

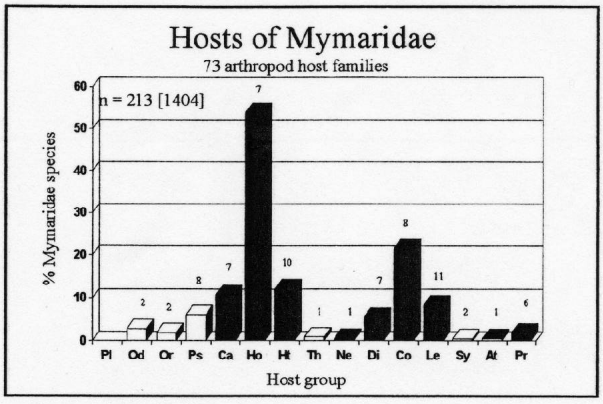

Chalcidoidea/endoparasitoids
n = 1107
% Total recorded species
My Te El Em Tr Si Ap Pt Er Ch Le Pe Ec Ag To Or Ep Ta En
Family

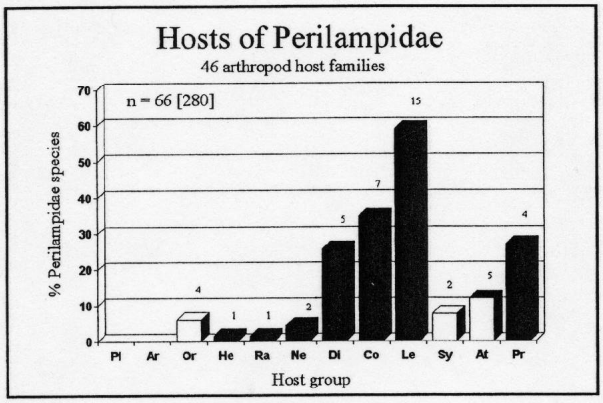

Chalcidoidea/hyperparasitoids
n = 752
% Total recorded species
My Te El Em Tr Si Ap Pt Er Ch Le Pe Ec Ag To Or Ep Ta En
Family

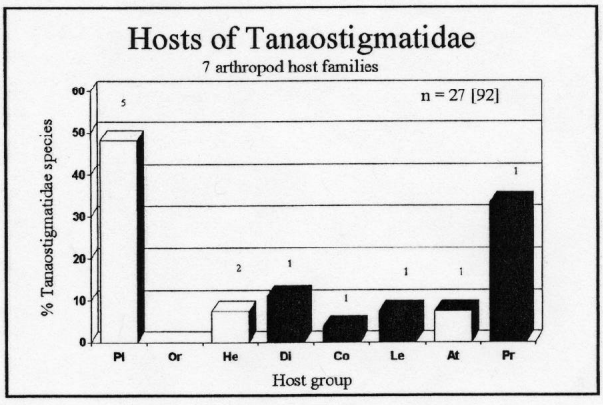

Hosts of Eurytomidae
84 arthropod host families
n = 601 [1415]
% Eurytomidae species
Host group
Pl Ar Or He Ne Di Co Le Sy At Pr
24 3 3 10 1 7 13 29 4 5 9

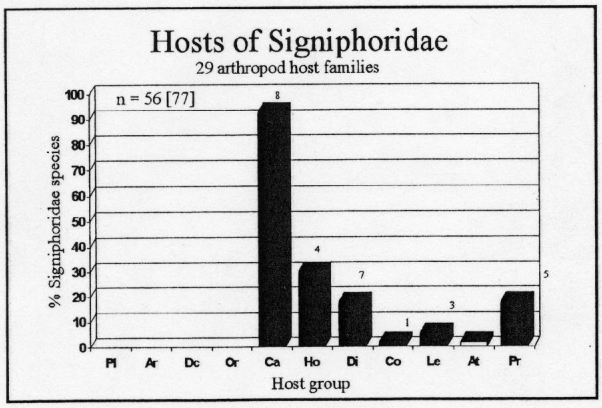

Hosts of Eupelmidae
118 arthropod host families
n = 264 [901]
% Eupelmidae species
Host group
Pl Pa Ar Dc Or Ca Ho Ht Ne Di Co Le Sy At Pr
1 4 4 6 7 5 5 2 8 17 31 4 6 12

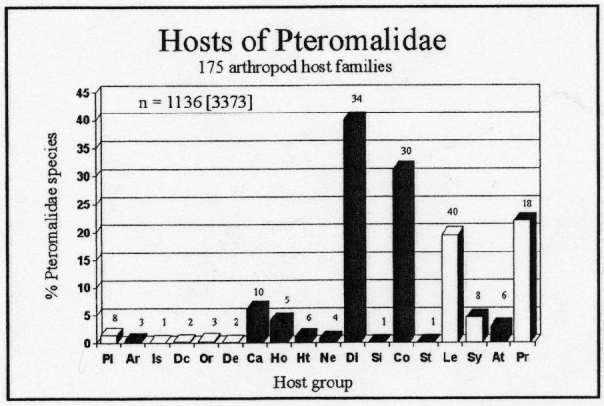

Hosts of Ormyridae
8 arthropod host families
n = 30 [74]
% Ormyricae species
Host group
Pl Ar He Ne Di Co Le Pr
3 1 4

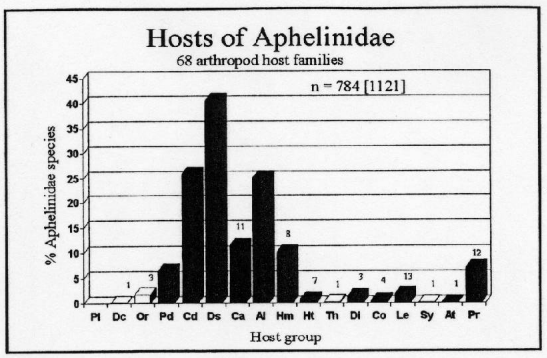

Hosts of Mymaridae
73 arthropod host families
n = 213 [1404]
% Mymaridae species
Host group
Pl Od Or Ps Ca Ho Ht Th Ne Di Co Le Sy At Pr
2 2 8 7 7 10 1 1 7 8 11 2 1 6

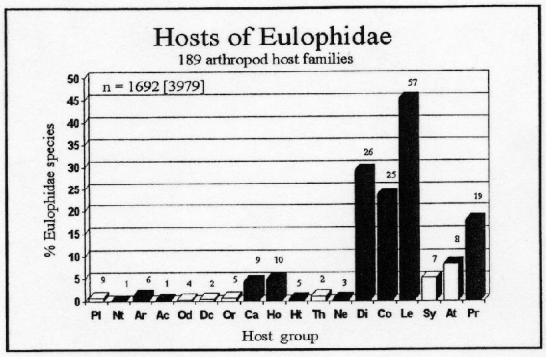

Hosts of Perilampidae
46 arthropod host families
n = 66 [280]
% Perilampidae species
Host group
Pl Ar Or He Ra Ne Di Co Le Sy At Pr
4 1 1 2 5 7 15 2 5 4

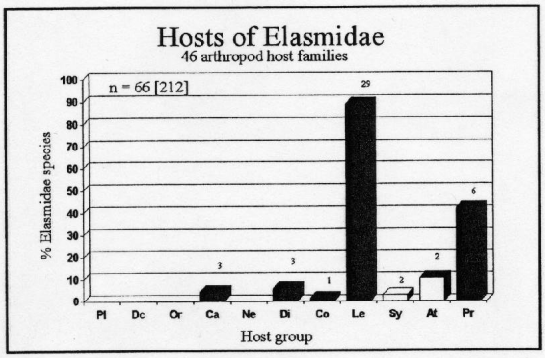

Hosts of Tanaostigmatidae
7 arthropod host families
n = 27 [92]
% Tanaostigmatidae species
Host group
Pl Or He Di Co Le At Pr
5 2 1 1 1 1 1

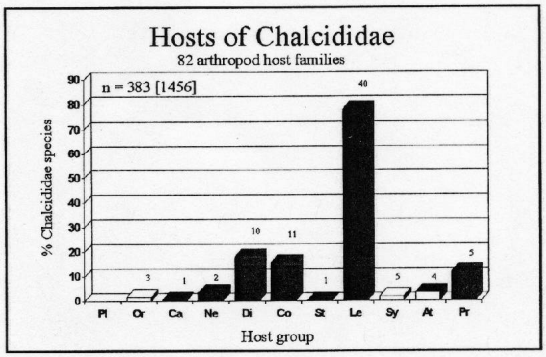

Hosts of Signiphoridae
29 arthropod host families
n = 56 [77]
% Signiphoridae species
Host group
Pl Ar Dc Or Ca Ho Di Co Le At Pr
8 4 7 1 3 5

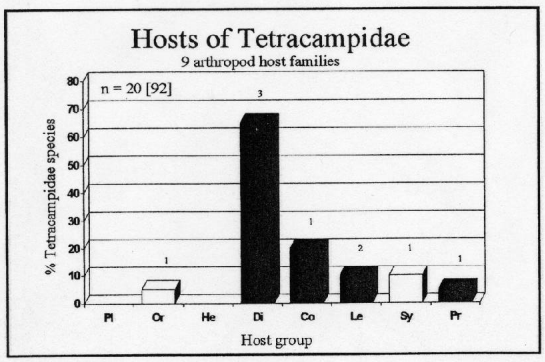

Hosts of Pteromalidae
175 arthropod host families
n = 1136 [3373]
% Pteromalidae species
Host group
Pl Ar Is Dc Or De Ca Ho Ht Ne Di Si Co St Le Sy At Pr
8 3 1 2 3 2 10 5 6 4 34 1 30 1 40 8 6 18

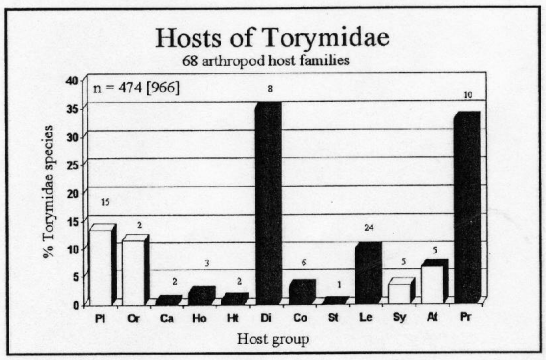

Hosts of Aphelinidae
68 arthropod host families
n = 784 [1121]
% Aphelinidae species
Pl Dc Or Pd Cd Ds Ca Al Hm Ht Th Di Co Le Sy At Pr
Host group

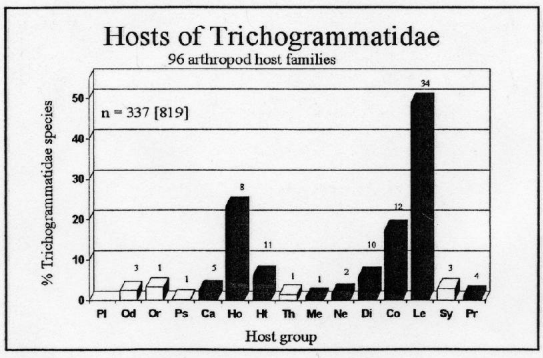

Hosts of Eulophidae
189 arthropod host families
n = 1692 [3979]
% Eulophidae species
Pl Nt Ar Ac Od Dc Or Ca Ho Ht Th Ne Di Co Le Sy At Pr
Host group


Hosts of Elasmidae
46 arthropod host families
n = 66 [212]
% Elasmidae species
Pl Dc Or Ca Ne Di Co Le Sy At Pr
Host group


Hosts of Chalcididae
82 arthropod host families
n = 383 [1456]
% Chalcididae species
Pl Or Ca Ne Di Co St Le Sy At Pr
Host group


Hosts of Tetracampidae
9 arthropod host families
n = 20 [92]
% Tetracampidae species
Pl Or He Di Co Le Sy Pr
Host group


Hosts of Torymidae
68 arthropod host families
n = 474 [966]
% Torymidae species
Pl Or Ca Ho Ht Di Co St Le Sy At Pr
Host group


Hosts of Trichogrammatidae
96 arthropod host families
n = 337 [819]
% Trichogrammatidae species
Pl Od Or Ps Ca Ho Ht Th Me Ne Di Co Le Sy Pr
Host group

of the total, e.g. 40% of the species of Pteromalidae with known hosts recorded are parasitoids of Diptera and about 19.5% are parasitoids of Lepidoptera.
4) The number at the top of each bar gives the number of host families attacked in each taxonomic group, e.g. for the Pteromalidae, 34 families of Diptera have been recorded as hosts.
5) The two letter abbreviations along the lower (x) axis denote the following taxonomic groups:

Ac – Acari; Al – Aleyrodidae; Ar – Arachnida; At - Hymenoptera (Aculeata); Ca – Hemiptera (Coccoidea, excluding Coccidae and Pseudococcidae if treated separately); Cd – Hemiptera (Coccidae); Co – Coleoptera; Dc – Dictyoptera; De – Dermaptera; Di – Diptera; Ds – Diaspididae; Ho – Hemiptera (Homoptera, excluding Coccoidea if treated separately); Hm – Hemiptera (Homoptera, excluding Coccoidea and Aleyrodidae); Ht - Hemiptera (Heteroptera); Hy – Hymenoptera; Is – Isoptera; Le – Lepidoptera; Me – Megaloptera; Ne – Neuroptera; Nt – Nematoda; Od – Odonata; Or – Orthoptera; Pa – Pseudoscorpionida; Pd - Hemiptera (Pseudococcidae); Pl – Plants; Pr – Hymenoptera (Parasitica); Ps – Psocoptera; Ra – Raphidioptera; Si – Siphonaptera; St – Strepsiptera; Sy - Hymenoptera (Symphyta); Th – Thysanoptera

For the biological summaries for each chalcidoid group the two letter abbreviations on the x-axis denote parasitism type:

Ec – Ectoparasitoid; En – Endoparasitoid; Ep – Egg parasitoid; Hy – Hyperaparasitoid; Np – Nymphal parasitoid; Lp – Larval Parasitoid; Ph – Phytophagous; Pp – Pupal parasitoid

For the summaries for each type of parasitoid type the two letter abbreviations along the lower (x) axis denote the chalcidoid families as follows:

Ag – Agaonidae; Ap – Aphelinidae; Ch – Chalcididae; Ec – Eucharitidae; El – Eulophidae; Em – Elasmidae; En – Encyrtidae; Ep – Eupelmidae; Er – Eurytomidae Le – Leucospidae; My – Mymaridae; Or – Ormyridae; Pe – Perilampidae; Pt – Pteromalidae; Si – Signiphoridae; Ta – Tanaostigmatidae; Te – Tetracampidae; To – Torymidae; Tr -

So you think you can card-mount?

by John Noyes

A few years ago I was visiting a well-known university collection of chalcidoids and was quite dismayed at the poor state of some of the material that had been mounted by students. Many of the specimens were mounted upside down and/or covered in glue and/or with the wings folded. In a way, this is quite understandable because many universities, particularly in the US, employ students to work in their insect collections. In some instances students get points towards course units for working in insect collections. One of the jobs they are frequently given is mounting material resulting from various projects or collecting trips. Many learn mounting techniques very quickly, but I think that the vast majority find it rather difficult. Another problem with temporary help is continuity, many helpers staying for only a short time with a resulting very high turn over. This gives them very little time to gain the necessary experience and thus ability to mount small insects properly. Ultimately, the rapid turn-over also generally means that collections managers spend less time than they should in ensuring that mounting is done properly.

Several years ago I published a note on collecting and preserving chalcidoids (Noyes, 1982). In that note I described in detail what I then thought was the best way to mount chalcidoids - on card-rectangles. Other methods have also been noted (see for instance Gibson, Huber & Woolley, 1997). Although I still mount specimens on rectangles, I now realize that point-mounting for some groups and under certain conditions (for instance when CPD'd) has some advantages. However, there is still the problem of encouraging helpers to learn how to mount best and how to know when they are doing a good job without excessive supervision by a collections manager, etc. I suppose the same may also apply to some experienced collectors of chalcidoids, a few of whom certainly cannot be considered as good technicians when it comes to mounting specimens dry on cards. We know who they are, but of course, they will be nameless here.

Anyway, whilst I was sitting in this (unnamed) collection getting more and more depressed at the state

of the recently mounted material I came up with the idea of a system for "self-help" for inexperienced "card-mounters". It allows individuals to score the attributes of card-mounted specimens thus allowing them to have an idea of how well they are mounting specimens. This system has been used in the university museum in question with some success. Therefore, I thought it might be of interest to others. Note that four scores are negative: mounting the specimen on its back, mounting the specimen with wings under its body, and covering the wings or antennae with glue. My feeling is that although a score of 5 or 6 may be acceptable for identification purposes, specimens mounted to this standard would often fall short of the requirements for research. I would therefore suggest that a score of 8 or better should be the target. Of course a perfect score of 10 is desirable, but it is certainly not possible to achieve this with every specimen.

References

Noyes, J.S. 1982. Collecting and preserving chalcid wasps (Hymenoptera: Chalcidoidea). Journal of Natural History 16:315-334.

Gibson, G.A.P.; Huber, J.T.; Woolley, J.B. (Editors) 1997. Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera), xi+794pp, NRC Research Press, Ottawa, Canada

Scoring for quality of card-mounted Chalcidoidea

State	Score
Specimen well attached by glue [at least by mesopleuron]	1
Rectangle mount	
Specimen axis 30-45 degrees to card [including head]	1
Specimen axis 0-29 degrees or 46-90 degrees to card	0.5
Point mount	
Specimen either with scutum or mesopleuron uppermost	1
Specimen on back	- 5
Pair of wings free of glue and saliva, flat, with venation and setation clearly visible (score for each side: max. 2 points if both pairs thus and propodeum clearly visible dorsally)	1
Pair of wings under body	- 1
Antennae free of glue, intact and well displayed and all segments clearly visible (score per antenna – maximum 2 points if both antennae thus)	1
Both pairs of wings glued or folded	- 5
Both pairs of antennae embedded in glue or otherwise obscured	- 5
Legs well displayed and not obscuring side of thorax	1
Hypopygium and ovipositor clearly visible	1
Mouth and face free of glue	1
Thoracic dorsum, dorsum of head, and setae free of glue and undamaged	1
Maximum score possible	10

Editor's Note: Although technically possible, we hope the undesirable score of -15 is rarely encountered.

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