MELISSA

The Melittologist's Newsletter

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GENERAL NEWS

Information Concerning Unpublished Data of the Late George Eickwort

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Readers of MELISSA are hereby informed that Alex Mary Eickwort asked me to insure the safe-keeping of several boxes of her father's unpublished notes and data relating to his studies of bees and mites. Voucher specimens from these studies are in the Cornell University Insect Collection (Ithaca, NY 14853, USA). The written material fills about three and one-half "banker's boxes" (39 X 31 X 27cm), and concerns the following, taken from the labels on the file folders. If anyone is interested in finding out more about these materials, then please contact me. These data are the property of the Eickwort children, who have authorization over their use.

FILE FOLDER LABELS: Records of *Dialictus* spp. examined; Records of West Indian spp. examined; "A comparison of numerical and classical estimates of relations between genera of new world halictine bees" [manuscript related to Master's thesis work, WTW]; West Indies, bee data; Summer 1974, 1975 *Halictus ligatus*; Species chart (*Chloralictus*); Arizona Research 1973; Beeroom studies 1974-1976; *Dialictus* nr. *abanci*; *Halictus ligatus*; *Evylaeus quebecensis*; RMBL 1984 (*Dialictus, Evylaeus, Panurginus*) [data from Colorado, WTW]; Notes from type comparisons; *Perdita maculigera*; *Centris* Costa Rica 1983; *Megachile coquilletti*; *Dialictus* nr. *perparvus*; *Halictus tripartitus*; West Indian talks; *Hoplitis* nests; *Paranthidium jugatorium*; Notes and keyes to N.A. *Dialictus* [in envelopes from P.H. Timberlake, and not in George's handwriting, WTW]; Cape Breton *Dialictus laevissimus*; Texas *Dialictus*; *Dialictus laevissimus* 1980; *D. pilosus*; *D. abnaci*; *D. tegularis*; *D. longicornus*; *D. zephyrus*; *D. rohweri*; *D. illinoensis*; *D. heterognathus*; New York field data, 1968-1978; *Lasioglossum leucozonium*; Nests 1979 California; *Evylaeus truncatus*; California Biological Data.

COLLECTING NEWS

Systematic Surveys of Local Bee Faunas

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The biodiversity crisis has brought a new emphasis on faunistic surveys as it highlights the urgent necessity of expanding our knowledge on the extant fauna. We need to know, for instance, how many species there are, where they are and what are their requirements for survival. Beyond this, faunistic surveys produce data needed for mapping the geographical distribution of species and other taxa, which are essential for biogeographic studies.

Many bee faunistic studies have been published (examples in Michener, 1979), but few researchers have devoted time to the collection of bees on a periodical, standardized basis in any given area. In one of the first attempts to summarize our knowledge of the distributional patterns of the bees, Michener (1979) called attention to the scarcity of data on bee faunas of several regions and to the difficulty of comparing the available data. Most of these data consisted of lists of species built upon specimens collected without any specified set of field procedures. Here we are proposing that more emphasis should be given to systematic collection in limited areas and that minimum standards for such surveys should be established so that results obtained by different researchers can be meaningfully compared. By systematic surveys we mean intensive periodic collections in a limited area through at least one whole year, and employing a given set of standard field procedures. Non-systematic surveys will be called "casual collecting." We will be emphasizing procedures that allow for comparison of species richness and relative abundance of bees in the different sites. These procedures, we believe, will also ensure better information on the geographic distribution of bee taxa and will support the advancement of other biogeographic fields, vicariance and phylogenetic biogeography, for example.

The comparison between conclusions drawn from casually collected material and those derived from systematic surveys demonstrate some of the advantages of the latter over the former. For example, Michener (1979:287) had the impression (based mostly on casual collecting) that the bee fauna in South American savannas ("cerrados") and fields becomes richer as one goes from north (in central Brazil) to south (southern Brazil, Uruguay and northern Argentina). Comparing the species richness of limited areas in southern Brazil with those of limited areas in central Brazil, by means of rarefaction curves (Silveira and Campos, in press) produced evidence to the contrary: local bee populations in southern Brazilian fields are larger than in the savannas of central Brazil. The species richness, however, is larger in the savannas than in the southern fields. It is obvious from the rarefaction curves that a collecting trip of, say 4 hours would on average yield many more species in southern than in central Brazil. A systematic survey covering all seasons, however, would generate more species (although fewer specimens) in the savanna.

The chances of collecting rare species (as well as undescribed ones) are also greater in a systematic survey than in casual collecting. For instance, Ayala et al. (1993) compiled a list of all bee species recorded for Mexico since the times of Linnaeus. They reported 204 species in 334 localities in the "Província del Altiplano Sur" of Mexico. Godínez (in preparation) collected 177 species in one and a half years of intensive collecting (94 days), in an area of 10 km^2 in the municipality of Guanajuato, in that "Provincia." Seventeen of those species were not previously recorded for the region and 13 were undescribed.

Another important aspect of systematic surveys is their potential for bringing to light other biological questions worth studying in separate projects. The intensive collecting of Cure et al. (1993) and Silveira et al. (1993) showed that *Melissodes sexcincta* was completely dependent on *Triumffeta* sp. as its pollen source. Although this bee is common and widespread in Brazil, this has never been reported before. This finding lead to a study of the relationship between *M. sexcincta* and *Triumffeta* (Collevatti, in preparation). Similarly, Godínez (in preparation) discovered that *Xenoglossa fulva*, thought to be dependent on pollen of *Cucurbita pepo*, is active well beyond this plant's flowering season and collects pollen on flowers of *Ipomoea* sp. when *C. pepo* is not blooming. This interesting finding is also under study.

One of the few and earliest research teams to devote time to systematic surveys of local bee faunas was the group lead by Sakagami in Japan (e.g., Sakagami and Matsumura, 1967). Their methods of data collecting and analysis were introduced to Brazil by Sakagami, Laroca and Moure (1967) and this paper stimulated many other faunistic surveys in that country, mostly in the form of theses and dissertations. Unfortunately only a very small portion of these have been published (e.g., Laroca et al., 1982; Camargo and Mazucato, 1984; Cure et al., 1993; Silveira et al., 1993). Moldenke and collaborators (e.g., Moldenke, 1975; Moldenke, 1979; Heithaus, 1979) have also developed a set of standardized procedures which enabled them to compare the results of their studies in several areas of North, Central and South America. Recently, a group of researchers lead by Godínez has initiated a series of systematic surveys of local bee faunas in different regions of Mexico, with the methodology proposed by Clench (1979), Raguso and Llorente (1991) and Luís and Llorente (1990). The first article resulting from those surveys was recently completed (Godínez, submitted).

It is obvious that systematic surveys would be most useful if they produce results that can be compared with the work of other researchers in different areas. Thus, it is imperative that some standardization of methods be achieved so that the usefulness of such efforts is maximized. A very good discussion of the problems involved in the comparison of different surveys is presented by Sakagami et al. (1967). Some of these problems are difficult to solve, for instance: different collectors have different abilities in finding and capturing different bees. This is probably more serious with inexperienced collectors and one should do some training before real data collection starts. We are not going to discuss here all the problems presented by Sakagami et al. (1967), but we will emphasize some ways to minimize the influence of diverse methods on the comparison of results:

1. Area.--Many authors have called attention to the fact that the size of the surveyed area has great influence on the outcome of the sampling, especially when the landscape is heterogeneous (e.g., Moldenke, 1975; Heithaus, 1979). The magnitude of this influence can be seen by the comparison of the results obtained by Silveira (in Silveira and Campos, in press) after sampling (1) an area of 140 ha for 106 hours and (2) 6 transects (total area = 0.4 ha, inside the first area) for 118 hours. In the former he collected 790 specimens and 151 species; compared with 188 and 66, respectively, in the transects. From this it is clear that comparisons should be made between areas of sizes in the same order of magnitude. If areas are

small (1-10 ha), more than one area should be sampled and pooled together to represent a region. It is easier to encompass the heterogeneity of a region's landscape in areas larger than 100 ha. Such areas are, however, more difficult to sample in a rigorous systematic way and should be divided into sub-areas. A number of these should then be randomly chosen to be surveyed on successive days.

2. Sampling.--The aim of systematic surveys should be to collect as many of the species as possible of a given area in a sample that represents their local relative abundances. The sampling should also provide accurate data on relative frequencies of each bee species associated with the flowers of each plant species. The sample areas (or sub-areas) should be surveyed by traversing them at a slow pace, in non-overlapping "strips" of land about 2 m wide. In these strips, the collector should look for bees on every flowering plant. An attempt should be made to collect **all** bees found, but one should not stay at any given plant "waiting" for more bees to arrive. In this way, plant species will be surveyed in proportion to their abundances and bees are more likely to be collected in numbers also proportional to their relative frequencies in the area. All individuals of all species (even the most common species) should be collected. This raises the question as to whether removal of those specimens will influence both the local population of bees and/or subsequent samples. No one has made a study (with marking and recapturing bees, for example) to address this problem, but is our opinion that one would need to sweep a large area with many collectors for many consecutive days to significantly reduce the local bee population. Most people involved in systematic surveys do not collect *Apis* in regions where it is not native. There are positive and negative aspects to this procedure.

Additional casual collecting in the perimeters of the sampling area, with effort concentrated on plants that are especially crowded with bees and/or plants absent in the sampling area, should complement the sample with rare species not captured during the systematic survey. The time consumed on this task can also be computed so that the additional species obtained can be employed in the construction of curves of time x species used in the prediction of species richness (Soberón and Llorente, 1993; Godinez, submitted).

3. Periodicity.--Part of any local bee fauna is composed of seasonal species, even in the tropics. In addition, the total bee population also fluctuates seasonally. For these reasons, it is important that collecting is conducted throughout the year so that different components of the local fauna and the fluctuation of populations can be represented in the sample. Intervals between sampling should be short enough to reduce the influence of delays in the start of wet or dry seasons or short periods of rain or drought. Of course different conditions will impose different constraints on sampling efficiency. From our experience, we suggest that sampling should be done at weekly or biweekly intervals. If these intervals are to be longer (monthly, for example), then one should collect for more than one consecutive day (3 to 5 days, according to our experience).

4. Daily time of sampling.--It is well known that total bee activity varies through the day, and that different species may concentrate their activities at different hours. For this reason, it would be ideal if bees were sought all day long. Of course, this is very tiring and tired collectors are not very effective, especially in systematic surveys. To deal with this, one can divide the day in periods of activity, separated by resting intervals. Godínez, for example, normally collects for 4 hours in the early morning, 4 hours around mid-day and for 3 hours at late afternoon. Silveira (in Silveira and Campos, in press) collected from noon to sunset one day and from sunrise to noon the following morning. It is important, however, that the hours of peak activity for most of the bees (mid-morning to mid-afternoon) are included in the sample.

5. Where to collect bees.--The obvious place to collect bees is at flowers, but they can be found in other situations such as at nests, sleeping-aggregations or while collecting water, sand, mud or leaves. Traps of different types may also be employed. All situations, other than flowers, will be deeply influenced by the availability of nest sites, and sources of material for nest construction in the sampling area. The number of bees one is able to collect at social nests or nest aggregations will depend on the amount of time and the population size at those nests. None of those factors can be standardized and many of them cannot even be evaluated. For this reason, we suggest that only bees collected at flowers should be included in the samples used for comparison. Bees not collected on flowers might be used to complete the list of local species. In this way, we reduce the "external" factors influencing the presence of bees in the samples. It would be good to keep records of the number of flowering species for each sampling day. This can help in the evaluation of the influence of local floras in the differences observed among bee faunas. An evaluation of the relative amount of food available for the bees on each sampling day would be helpful, when possible.

The procedures described above are well suited to surveys in areas covered by short and open vegetation, but not as good for forested regions, where most bees forage in the canopy. They have been employed, however by Cure et al. (1992) in a forested area. There, collecting was done in the understory and at the borders of the forest along a trail. The results showed that this sampled fraction of the fauna alone was comparable in population density and species richness with the fauna in the surrounding secondary fields, contradicting previous expectations. It is, nevertheless, impossible to survey whole forested faunas in a systematic way.

It is not enough to standardize collections to make data comparable. Some important information needs to be published. The total amount of time (in hours) spent in collecting is required for comparison of relative abundances of bees (number of specimens divided by the total number of hours) and a list of the species, with the respective number of specimens collected, makes it possible not only to compare relative abundance of specific taxa, but also to make more objective comparisons of relative and expected species richness (Hurlbert, 1971; Silveira and Campos, in press; Soberón and Llorente, 1993; Godinez, in preparation).

Another important factor, frequently overlooked by those publishing on faunistic surveys is that voucher specimens should always be deposited in the public collections of museums or universities. In this way the specimens (which frequently come from poorly collected areas) will be useful for other biogeographic and taxonomic studies and, most important, will provide a way for future workers to check species identifications. This is especially important when we consider that typically many (sometimes most) species acquired in faunistic surveys are identifiable only to genus.

We understand that not every one is interested in the same kinds of information when collecting bees. We feel, however, that the procedures we discuss above are compatible with many research projects that involve the collection of bees and will increase the value and usefulness of the bees gathered with such efforts. Moreover, we do not see these procedures as a recipe that should be accepted by every one, but as starting points for discussion that would lead to more faunistic surveys of bees and to more coordination in the collecting and use of faunistic data. **We would greatly appreciate any comments, suggestions and/or criticisms by mail or, even better, through additional contributions in the pages of MELISSA.**

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Hunting in the Desert for a Glacial Relict Bee - Part II

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Readers of MELISSA may have read my account of a trip to Arizona and Utah in issue number 8. This is a sequel to that account and deals with a trip I made to the arid southwest in July and August 1993. The main purpose of the trip was to obtain specimens of the glacial relict bee *Lasioglossum boreale* to add to the samples obtained previously. **John Taylor**, whose Masters thesis research project these collections would contribute to, was simultaneously travelling in northern Sweden to collect some old world samples of the same species. As the "boss" I got to go to the warm climate, but he likes the arctic anyway and I prefer very hot weather - so it was an admirably amicable division of labour.

In the spring of 1993 I received a letter from a moderately distant (he lives in my country of birth - England), distant relative. Tim is one of my cousin's three sons and although I deal with coefficients of relatedness and the biology of social insects I am too tired to work out the math for this in an unfamiliar diplo-diploid system and I am rather ignorant of familial terminologies for human genealogy - once cousins thrice removed perhaps? Tim enquired as to whether he could visit me in Canada towards the end of the summer. I replied that yes, I did have vague memories of losing a game of tennis against him many years ago and yes, he could visit me but that my

plans were rather complex - early summer in Cape Breton, late summer in the southwest with a few days in Toronto in between, but perhaps he would like to accompany me on one or both of these trips. To be honest I was rather hoping that he would opt for one rather than both but he replied that he would love to come out to Canada's East coast and see the opposite corner of the continent as well. I tactfully mentioned that as I would be travelling a lot in a very small rented car there would not be much room for luggage - for some reason I had premonitions that he wanted to be a rock star. In mid-July I met him at a bus stop in Cape Breton Island, it was raining and he carried, among other things, a guitar! We went straight to a party (actually it was a farewell party for me thrown by some friends out there) and Tim got right in there and sang some songs accompanying himself on the guitar - to much applause (I suspect he will end up a successful rock star).

One week later, on the 28th of July we drove to Toronto and then took a plane to Albuquerque where our desert journey was initiated. Our plan was to fly to Albuquerque, rent a car and drive to as many 9,000ft + peaks as we could manage between there and Los Angeles (where I was to attend a conference) and then back again attempting to sample some of the mountains we had missed on the way West. Armed with a copy of "Arizona's Mountains, a Hiking Guide to the Grand Canyon State", we could obtain precise information on the height and difficulty of attaining all mountain peaks in that state. For New Mexico, Nevada and California we only had generally available maps to guide us.

We arrived in Albuquerque late in the afternoon, by the time we had sorted out our rental car it was time to head off into the hills to find a camp site. That night was the first of many when we would sleep in National Forest campsites for a comparatively few dollars but without washroom facilities. We got used to washing and brushing our teeth using water from 4 litre plastic milk jugs. We also got used to a diet consisting mostly of nachos and dip. But the first morning was different. On the way to the nearest gas station in search of coffee we rescued a damsel in distress who had run out of gas on a nearby sideroad. In response she provided a bathroom where we could wash and shave.

Collecting high-altitude-loving bees in the southwest is quite enjoyable. Most of the habitats that seem appropriate can be reached by car or by chair-lift and the enthusiastic entomologist can relax before a hard days drive travelling to the next site by casually walking among the flowers, net in hand. But, I don't like heights much. So, with Tim as a trusty assistant, I sent him up the chair-lifts to the peaks of the Santa Fe snowbowl, Humphrey's Peak near Flagstaff etc., etc. Meanwhile I hunted lower down. On most of these ski slopes Tim was both unsuccessful at collecting bees and extremely cold but he usually caught some interesting specimens in the warmer, lower slopes. In fact, he rather rapidly became very good at collecting bees and, embarrassingly, at a couple of sites collected more *boreale* than I did. I put this down to failing eyesight as I approach middle age.

On the evening of the last day of July we headed towards the northwestern corner of New Mexico, to a comparatively isolated high mountain - Mount Taylor (appropriately named given the person for whom these bees were being collected). The road that leads to the top of this 11,300 ft. mountain is rough to say the least. The rubble on the road often came in large enough pieces to leave us with at most only two wheels on the ground with the car rocking like a boat in high seas. After some struggle, we left the car by the side of the road (the exhaust made rather rude noises from this moment on) and collected a good number of *boreale*.

Next day we headed southwards to the eastern edge of the White Mountains. Always with locality labels in mind, I wanted to collect at a place called "Profanity Ridge". Appropriately, we went on a long hike and caught very little. We drove on to the Arizona side of the mountain range and eventually found our way to the top of a small volcanic mountain called Greens Peak, 10,133ft. Again, Arizona's 14th highest mountain, could be reached without stepping out of a vehicle. Immediately atop the highest spot on the mountain there is a fire observation tower. It was directly underneath this, literally at the highest point of the mountain, that we successfully obtained a small sample of our glacial relict species. The views from the tower were quite spectacular as was the thunderstorm that rather rapidly approached us. As the tower itself was rather frequently struck by lightning, the friendly staff there encouraged us to beat a hasty retreat.

We then headed towards Flagstaff, taking a bit of a detour to see a petrified forest national monument. This was amazing. A desert environment with piles of logs strewn hither and thither but with their cross-sections as colourful as the sands of the painted desert. If I had a few thousand dollars to spare I would have purchased a cross section or two of these spectacular fossils, in the hope that they would make excellent coffee tables.

In the San Francisco Mountains, I sent Tim up the chair-lift to Humphrey's Peak, the highest mountain in Arizona at 12,633ft and damn cold too, while I collected around the ski area's cafe. The following day we drove to the top of Elden Mountain, a smaller peak in the same large volcanic cone, 9,299ft in altitude. After quite some time in this rather despoiled habitat (there were indications of much tree felling) I was about to call it a day when Tim caught one *boreale*. Another hour or so of searching failed to reveal any more and we then gave up and drove to the northwestern most state park in Arizona - Hualapai. We had arranged, via complex telephone linkages including a message from a place called "Nowhere, Arizona", to meet up with **Mike Sharkey**, a well known braconologist from The Canadian National Collection in Ottawa.

Mike is a serious kind of guy and we had planned to go on this collecting trip together en route to the Hennig Society meetings in Fullerton, California, where he would deliver a paper on cladistic methodology (I did say he was serious). So, the next day we drove to Las Vegas and spent an enjoyable afternoon wandering around the "Excalibur Casino". Not wanting to miss the opportunity I gambled, and subsequently lost, one nickel. The speed limits around Las Vegas are truly annoying, and as everyone seemed to be following them - presumably they are enforced. Two mountains in Nevada yielded a total of one *boreale*.

En route to the Hennig Society meetings we stopped for an afternoon at Death Valley. This was marvelous. At Zabriski Point it was 51°C with gale force winds that sucked every molecule of sweat out from inside ones pores before it even had the chance to be detected as moisture. It was like being in a whole body-sized hair dryer, invigourating and with spectacular views too.

We drove on and spent the next two nights on alternative sides of Yosemite. Attempts to collect *boreale* at the peaks here resulted in a single specimen. Again, spectacular views and quite good collecting on the west side not far from one of the marvelous giant sequoia groves - each one of which could provide the equivalent of one acre's worth of firewood from Canadian forests.

We had decided that as Los Angeles has a bad reputation for camping, that Tim would be deposited in the San Bernardino Mountains and look for bees (by now he was getting very good at it). It took us hours to find a campsite that was not so obviously and fundamentally religious in clientele that a young, guitar playing, potential rock star and protest singer wouldn't be thrown to the bears, or worse, be continuously preached to.

In the midst of the conference Mike, **John Wenzel** and I drove back out to the San Bernardino's to find Tim and to look at the Pleiades shooting star shower. Tim was relieved to get some irreligious (well, for cladists at least) conversation but had not found many bees. It was at the campsite here that I caught a blue-tailed skink which seemed quite unconcerned sitting on my shoulder. For reasons that remain obscure, Mike decided that he wanted a picture of this animal with its tail sticking out between his lips! Perhaps it was a comment that the government does not fund his research sufficiently and so he was reduced to autotomized lizards for lunch. Anyone wanting a copy of this slide for blackmail purposes or just to slip into Mike's slide tray at International Conferences should contact the author and send a small contribution to my travel/research grant.

On the way back to Albuquerque we stopped off at a variety of mountains for collecting and various sites to observe spectacular scenery. At Bill Williams Mountain, 9,250ft, a small sample of *boreale* was obtained, again right at the very top. We collected again at both Humphrey's Peak and Green's Peak to increase sample sizes although by now (the 3rd week in August) our quarry was clearly declining in activity. We visited Monument Valley, the Grand Canyon (where one specimen of *boreale* was collected on the Kaibab Plateau at barely over 9,000ft the lowest altitude I have seen this species in the Southwest), and then down to the Chiricahua Mountains.

In the Chiricahua's we camped at Rustler's Peak. In many of the other high-altitude, forested sites where we had stayed there were warnings to keep car windows wound up and to keep food in the car or in boxes provided for it on the camp site. At Rustler's Peak the bears have been such a nuisance that the advice was to keep the car windows wound down. The reason, frustrated bears were in the habit of breaking windshields because they often found tasty morsels (pizza, Michelob, courting couples) on the inside!

The following day we exerted ourselves and clambered up towards Fly's Peak, 9,667ft, giving up after an honourable effort. There were few bees but to my surprise upon my return to the lab in Toronto I found that amongst those that I preserved and pinned there was one which was unmistakably *boreale*. The Chiricahua Mountains then are the most southerly location known for this arctic-alpine bee, only 60 kilometres from the Mexican border!

After swaggering around the town of Tombstone, proudly carrying our entomological paraphernalia, Tim and I said goodbye to Mike who was heading back to the frozen north and headed on to Millers Canyon to look for *Mexalictus* (see accompanying note on page 9).

In the next few days we collected in the Willcox Playa (a place that **Jerry Rozen** has made well known as a result of his energetic research there) and sat in steaming pools at the San Francisco Sulphur Springs in Western New Mexico. I also spent a night sleeping under the stars at White Sands National Monument. With lightning storms going on in hills in three of four compass directions and lighting up these eery white dune formations, this was a spectacular sight worth waking up for every hour or so during the night. However, as a result of the wind getting very strong around midnight, I was prying sand out of my eyeballs for a full two days after this and my cornea became somewhat etched.

Back to Albuqueque. Remarkably the car did not complain of its rough treatment and was at its quietest for the month as I handed it back to the rental agency at the airport. However, after having driven 7,000 miles in 25 days (subtracting the sojourn in Fullerton for the conference), I felt like I needed a holiday.

Certainly driving long distances has its enjoyable moments. I particularly liked the day when Tim accidentally sent us in the wrong direction for one hour, ten hours after the drive had started and insisted on playing his favourite U2 album on the car cassette player for the 16th time that week to drown out my hysterical screaming as we retraced our steps.

But all in all it was a very worthwhile trip, samples of *boreale* were obtained at most of the high altitude spots we attempted to find it, although sample sizes were vanishingly small at some localities, i.e., one individual - but in each case it was one female (if we had caught one male our sample size genetically would have been one half!). This bee certainly has a fascinating distribution and now that the electrophoretic data are almost complete, I'm expecting a research article out of all this strenuous driving sometime in the not-too-distant future.

Gone Bush for Bees in Southwestern Australia

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For three months this past fall, my wife and I had the pleasure of a sabbatic leave in the southwestern quarter of Western Australia, pursuing studies of pollen-foraging and pollination dynamics of native bees at native wildflowers. For a North American, Western Australia is a floristic and faunistic challenge (or delight or headache, depending on circumstances and attitude). The dominant native bee genera are largely unfamiliar, or not even yet monographed in the case of *Leioproctus* or *Trichocolletes*. Some 70% of the plant species are endemic, and belong to largely unfamiliar families like the Proteaceae, Goodeniaceae and Sterculiaceae. Our preparations were guided by a number of bee biologists and ecologists, including our host in Perth, **Terry Houston**, as well as **Steve Buchmann, John Mathiesson** at CSIRO, **Lynn Kimsey, Roy Snelling, Peter Bernhardt** and **John Alcock**. Below I wish to enumerate some of these preparations (or ones we wish we had made), as well as summarize some of what we learned while there.

First, well in advance of departure, we made arrangements for our permits. Contact the Australian Nature Conservation Agency (ANCA) in Canberra for forms to arrange export of the specimens that you collect. An exporter, such as the Western Australia Museum where Terry Houston is based, must specify the ANCA registration number of the overseas institution to which the specimens are shipped. As the registration form is some 8 pages of fine print with attendant signatures (and prone to misplacement, it seems), it behooves the traveler to process this early. As in many other countries, the states of Australia also require collecting permits for insects and plants. A simple permit may be obtained for so-called Crown Lands, but if you wish to collect in national parks, reserves or national or state forests (and you will), you will need a suitable permit from Conservation and Land Management. "CALM"... such an acronym for a controversial, all-encompassing land management agency! They are located just outside of Perth (50 Hayman Rd., PO Box 104, Como 6152). It is easier than in the U.S., as this single agency oversees nearly ALL rural public lands in WA. We found them easy to work with, and their local land stewards and rangers, if widely scattered, were nonetheless not only pleased that we contacted them in advance, but were very willing to share their knowledge of their local jurisdictions.

Western Australia is huge, 5 times the size of Texas, with a population smaller than that of Costa Rica (and over 80% of that in Perth and its suburbs). Few paved highways traverse this immense land: most are confined to the more densely populated, intensively managed farms and forests of the southwestern corner of the state. Nonetheless, many rural gravel roads are well-maintained, and at least one local rental car agency, Bayswater, was agreeable to us taking their year-old cars off the pavement (or bitumen) so long as one was careful. Four-wheel rentals are prohibitively expensive for long periods of time. John Alcock bought his wheels for a more prolonged sabbatic journey in Australia. Even though we confined our travels to perhaps 1/10 of the land area of WA, we drove nearly 6,000 miles in 3 months and saw everything from deserted beaches and massive granite headlands to sand plain heaths and dark eucalyptus forests.

The flora is daunting. At one location in the sand plain heaths north of Perth, botanists report 80 flowering plant species per square meter! A new revision of the only state-wide flora, Blackall and Grieve, is soon to be published. The first edition was printed in long-hand script! Earlier editions lacked some major families, such as the Fabaceae. So a plant press is imperative. For some species, we ultimately had to revert to flipping herbarium sheets at the reference collection at the State Herbarium (also run by CALM, coincidently) just outside of Perth. They are happy to voucher pressed specimens with lat/long coordinates (GPS works fine in WA, even a cheap Magellan instrument), and for one of our's, it was only the second specimen in their herbarium. Several books, such as one by C.A. Gardener, as well as some local floras for specific parks, can help with the more common plant taxa, and a visit to King's Park Botanical Garden in Perth is an invaluable (not to mention refreshing) experience.

We had chosen this part of WA to visit, as I was interested in furthering my studies of the relationships between pollen-foraging and pollination among bees. Some botanists claim that WA has more species of plants with poricidally-dehiscent anthers than any other place in the world, including members of the Dilleniaceae, Liliaceae, Solanaceae, Epacridaceae, Sterculiaceae, Myrtaceae, Tremandraceae, Fabaceae and more, all in the absence of that queen of sonication, the bumble bee. This conjured up visions populated by clouds of buzzing solitary bees, not to mention their responses to a diversity of *Solanum* look-alikes in the flora. You can then imagine my consternation at finding few if any bees visiting, let alone sonicating, the literally thousands of flowers that carpeted vast areas of WA in this, their spring (winter rains had made for a banner bloom). One grad student in plant systematics, who is revising the Sterculiaceae of WA, had yet to see a bee at any flower of her group despite 3 years of field work, although many of the species have poricidally dehiscent anthers. Out of frustration, perhaps, she was reconsidering the possible role of thrips in pollination on the flowers of her greenhouse plants. The experience has caused me to question the general assumption that poricidally-dehiscent anthers evolved to restrict pollen access to buzzing pollinators like bees. Maybe they facilitate precise placement of pollen on stigmas during self-pollination, at least for those species with pendant flowers and self-compatibility.

Having weathered this rude realization, we set about in search of any plant taxa that hosted enough bees (other than the ubiquitous and annoying honey bees) to warrant a foraging and pollination study. Several plant taxa rewarded us: *Keraudrenia* (Sterculiaceae), *Petrophile* (Proteaceae) and *Boronia* (Rutaceae). The first two genera offer only pollen rewards, which species of *Leioproctus* remove with gusto and ef-

ficiency (95% available pollen snagged from a *Petrophile* flower in less than a second). At one locality, species of nectariferous *Boronia* and nectarless *Petrophile* were serviced by the same *Leioproctus* pollinator. Females of *L. (L.) sexmaculata* went from one host to the other, alternately adding nectar or pollen to their loads on a given foraging trip, and meanwhile transferring pollen between neighboring conspecific flowers of both plants species in the patch. It was a marvelous example of facultative pollinator sharing. Another *Leioproctus, L. (L.) subminutus*, handily cleaned the pollen from the nectarless, solaniform flowers of *Keraudrenia* on the very first visit (again, % dregs remained after the first visit by these bees, whose foraging day ended by 0915). Females failed to alight on the once-visited flowers, perhaps seeing that the bright orange pollen was missing from the grey anthers. As these females also delivered ample stigmatic pollen loads on their visits to virgin flowers, one wonders about the necessity of pollen dispensing for successful sexual reproduction by nectarless flowers pollinated by bees. We have **Glynn Maynard** to thank for the IDs of these *Leioproctus*, a dominant but unworked group in Australia that Glynn is in the process of monographing.

In addition, as intimated by Michener in his Bees of Australia, the papilionaceous legumes are a great source of *Trichocolletes* (Colletidae). Many of these may be oligolectic for these shrubby peas like *Daviesia* or *Gompholobium*, if only we could figure out the species of bee and floral host! Caroline Gross (president of the Australasian Pollination Ecology Society, or A.P.E.S.) has some of the best recent work with pollination of some of these peas and their bees, although the association was recognized much earlier in the century by Rayment.

In all, we found Western Australia to live up to its reputation as Oz, well worth another visit. The citizenry was welcoming, and in the rural areas, often interested in natural history, botany and conservation. Kangaroos are enthralling, as were the various cockatoos. The Western Flora Caravan park north of Eneabba and its proprieters, Allan and Lorraine Tinker, is a "must" visit to begin your familiarization with the flora of WA (they hosted Sir David Attenborough during a shoot for "The Secret Lives of Plants"). Buy and study the "Lonely Planet Guide to Australia". You will wear it out during your travels. If you hold an American Express card, you can buy your travelers checks in Perth in Australian dollars using a local check from the U.S. Plan to tent during much of your travels, and if driving a 2-wheel-drive car, expect to stay in private caravan parks, as unrestricted camping is largely forbidden on public lands in WA. Given the paucity of bees that we encountered during the earlier periods of spring, and the denizens of pernicious bush flies that follow later in the season, we gained considerable respect for the few mellitologists and pollination ecologists like Terry Houston that have contributed to our knowledge of plant/pollinator relationships in WA.

Bees on Butterfly Food

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In early April 1989, I had a chance to visit Northwest Thailand for insect collecting. It was only for several days, but I had a very interesting experience which I would like to report.

I visited Chian Dao, Tagad Dam near Lampang, Doi Suthep near Chiang Mai and Mae Hong Son. I was with a group of Japanese insect collectors primarily interested in butterflies. The year was towards the end of the dry season when many trees had shed their leaves and the flowering plants were very, very scarce. Accordingly, I did not expect much for bee collecting.

In Chian Dao and Mae Hong Son, we collected along small riverbeds where local butterfly catchers set up their butterfly collecting spots, burying "butterfly foods" in the sand to attract butterflies. The butterfly foods apparently have various special formulas but mainly consist of crushed and fermented fruits, fish and in particular, crustraceous waste. Some of them seem to contain animal droppings. It attracted a fair number of butterflies but to my surprise it also attracted a good number of Hymenoptera, mainly bees and eumenids. Among bee species, *Apis dorsata* was abundant with fewer numbers of *A. florea, A. andreniformis* and *A. cerana*, as well as some *Trigona*. There were also a fair number of *Hylaeus* spp. and halictines, including *Nomioides*. Megachilids were particularly abundant. Some of the megachilids were sent to and identified by Dr. D.B. Baker of England - they included, *Megachile conjuncta* Sm., *M. siamensis* Ckll., *M.* spp., *Chalicodoma dimidiatum* (Sm.), *C. stultum* (Bingh.), *C. florale* (F.), *C. nanum* (Bingh.), *C.* spp., *Chelostoma aureocinctum* (Bingh.), *C.* sp., *Heriades* spp., *Pachyanthidium lacrymosum* (Sm.), *Anthidiellum* spp., *Protanthidium* sp., *Batanthidium* sp., etc. All of these were caught at riverbeds and very few bees were caught on flowers (*Xylocopa*, etc.). If I had not been along with the butterfly collectors who sample wet places during the dry season, I would have never have been able to collect so many bee species.

Other groups were not very common, e.g., ceratinids, etc. I do not know whether or not this reflects the faunistic composition at that time of the year or food preferences.

I did try "butterfly food" setting in Japan a long time ago. It attracted a small number of butterflies, a good number of Diptera and NO Hymenoptera. Apparently, it all depends on when and where you are. I do not know if this phenomenon is limited to dry seasons when flowers are so scarce, but I can say that when and if you have a chance to visit S.E. Asia during the dry season, it would be a good idea to get in touch with a local butterfly collector who might take you to riverbed sites with food settings. Without such local assistance you might set up your own "bee spot" along a riverbed. It's probably worth trying.

RESEARCH NEWS

Observations of *Mexalictus arizonensis* in Millers Canyon

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A second objective to the major escapade outlined above (page 4) was to try and collect (for molecular studies) and observe (and hopefully find nests of) *Mexalictus arizonensis*. The previous year I had caught two males of this species at Millers Canyon, Huachuca Mountains, on August 2nd and another at Bog Springs, Madera Canyon, Santa Rita Mountains, on August 5th. It was clear that the very beginning of the month was the very beginning of this species' flight activity. Consequently, in 1994 I planned to visit Millers Canyon a little later in the season.

Tim (see my previous article in this issue) and I drove to the car park at the top of the road leading to the Millers Canyon site on the 23rd of August, having driven across from the Chiricahua's, via the Dragoon Mountains and Tombstone on the way. We arrived late and set up our tents on the edge of the car park. We woke early, packed up and headed upwards on foot. It is quite a hike before reaching the canyon proper but it was fairly cool and there were few insects flying. Seeing that it was cool and early we were in no great hurry as we walked up the footpath along the side of the canyon.

We were approximately half way up the path before we saw the first *Mexalictus*, foraging from a small yellow composite (this and all my other botanical collections were lost before returning to Canada so no more detailed plant identification is possible). Along a length of 100 metres or so of the path we saw a couple of dozen females, collected 10 of them and observed the remainder to see if we could detect where they nested. Sunlight reached ground level in this area only in isolated patches and the bees seemed to show no preference for shade or sun.

These bees flew and foraged rather slowly and after over one hour of observation it became clear that we were not going to find a nest. Further, as it approached 11am, the activity levels had clearly decreased markedly suggesting that this is rather an early flying bee.

The one firm conclusion I can make concerning this species' behavioural ecology is that it has an annual phenology with males and females emerging in August. Thus, unlike many other halictines, there is no overwintering only of mated females. Although I have only been in *Mexalictus* habitat in August, the late George Eickwort, who described the genus, made repeated trips to *Mexalictus* habitat in 1992 and failed to find any. Thus, this species remains unusual but not unique among halictines in its phenology as there are comparatively few other species where males and females emerge, mate and females forage without entering a hibernal or aestival period. *Lasioglossum pallens, Lasioglossum xanthopum* (sometimes) and some *Andrena*-attacking *Sphecodes* are some examples of species with a similar lack of an inactive period between mating and egg laying, although all are spring fliers.

The genus *Mexalictus* remains poorly understood and infrequently collected. I have seen a specimen from northern Panama which indicates that the genus is far more widespread than has been hitherto recognised (until now it has been recorded only from Mexico and Arizona). Given its apparent early morning flight period and preference for cool, damp and shady places, perhaps these bees have been overlooked by bee collectors who prefer warm, sunny locations. Additional species of *Mexalictus* should be looked for, especially between northern Guatemala (from where I have seen one specimen) and northern Panama, in less bee-friendly habitats.

Foresis de *Caenocara* sp. (Coleoptera: Anobiidae) en *Anthophora atrata* (Hymenoptera: Anthophoridae).

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Una hembra de la abeja *Anthophora (Mystacanthophora) atrata* Cresson, capturada en la zona de nidificación, en Bacunayagua, Matanzas (24. v. 93) , tuvo adherido a los pelos de la superficie posterior del propodeo, un ejemplar del coleóptero *Caenocara* sp.

Existen ejemplos de escarabajos foréticos en abejas (Roubik y Wheeler, 1982; Roubik, 1989; Chavarría, 1994), sin embargo no conozco ninguna cita que relacione a los géneros mencionados en este trabajo. La foresis le permite al organismo forético la dispersión hacia otros nidos donde encuentra refugio y alimentos. Es necesario un mayor número de observaciones para dilucidar la relación entre ambas especies. El material de referencia esta depositado en la colección del autor.

Agradecimientos.- Agradezco a Rare Center for Tropical Conservation, Philadelphia, el financiamiento de mi visita al Instituto Smitsonian, lo que permitío la identificación del escarabajo y obtención de literatura. **Richard E. White** (SEL/USDA) amablemente identificó el anóbido.

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New Records of *Holcopasites* from California

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Holcopasites is not a commonplace part of the California bee fauna, as pointed out by Cooper (1993). Only three species have been recorded from the state (Cooper 1993), *H. stevensi* Crawford, *H. bohartorum* Hurd and Linsley, and *H. ruthae* Cooper, all in the subgenus *Holcopasites* and all from single localities. I was, therefore, surprised to collect specimens of *Holcopasites* during a fall collecting trip to the deserts of southeastern California in 1993. These proved to be *H. arizonicus* (Linsley) and *H. insoletus* (Linsley), representatives of the subgenus *Trichopasites*. Subsequent perusal of the Logan collection plus specimens sent for identification provided additional localities for these species. A fall trip to the same area in 1994 yielded yet another species, *H. (H.) illinoiensis minimus* Linsley. Because the genus has been rarely collected in California, the records follow.

Holcopasites arizonicus: Riverside County, Hopkins Well, 18 miles W Blythe, 4 Oct 1984, N.J. Smith; San Bernardino County, Amboy, 12 Sep 1983, P.F. and D.M. Torchio; Cove Spring, Granite Mountains, T8N R13E Sec. 8, 1250m, 22 Sep 1993, *Pectis papposa*, T. Griswold; 1 km N Mountain Springs Pass, 34° 50.63'N 115° 03.24'W, 19 sep 1994, T. Griswold.

Holcopasites insoletus: Riverside County, Hopkins Well, 18 miles W Blythe, 4 Oct 1984, N.J. Smith; San Bernardino County, NE of Granite Mountains, T9N R13E Sec. 33, 1160m, 21 Sep 1993, *Gutierrezia microcephala*, T. Griswold.

Holcopasites illinoiensis minimus: San Bernardino County, 1 km N Mountain Springs Pass, 34° 50.63'N 115° 03.24'W, 19 Sep 1994, T. Griswold.

Literature Cited:

Cooper, K.W. 1993. The first *Holcopasites* from western California, *H. ruthae* n. sp., and *H. linsleyi*, a new species from southwestern Arizona. *Proc. Entomol. Soc. Wash.*, 95:113-125.

Bumble Bee Rearing

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[from the Bombus List, 4/1/95]

[The following communications on bumblebee were originally distributed on the Bombus List and are reproduced here with the permission of Chris Plowright, who also provided additional editorial corrections. As a general bee worker, I often get asked about how to rear bumblebees, either for research or simply for the fun of it. I thought this should be shared with other bee workers who do not subscribe to Chris' discussion group.--RMcG]

This is intended to be the first of three messages on the subject of bumblebee rearing which I am posting to the Bombus List.

Putting together a useful bibliography about bumblebee rearing has not turned out to be as easy as I had thought it would be. As I wrote to one of our Bombus List members recently, "it is proving to be very difficult, because I have to tread a fine line between, on the one hand, revealing privileged information (the intellectual property of the bumblebee rearing companies), and on the other, giving out quite useless information of the sort which I was given when I first began to attempt to rear *Bombus* as a graduate student". Yes indeed -- and if you were hoping to gain access to commercial *Bombus* rearing techniques from this list (as many of our would-be subscribers have candidly stated), then I had better say right at the beginning that, unless I am very much mistaken, you aren't going to get it, either from me, or from anybody else around here. That sort of information, being based on some quite sophisticated biotechnology, is (as I believe it should be) worth a great deal of money. In fact, if you are simply bound and determined to enter the field of commercial bumblebee rearing, then the simplest advice that I can give you is: (1) mortgage your house (your car, your collection of seventeenth century Portuguese paintings, or whatever), (2) go to Europe (using some of the funds generated by (1)), and (3) see if any of the commercial enterprises will sell you a license (or something similar). But don't be surprised if you find that the doors are rather firmly closed . . it might turn out to require a larger investment than the combined mortgages on house, car, and paintings can realize.

While on the subject of commercial bumblebee rearing, let me correct a common misconception about the profitability of the business. When we first started "Bees-under-Glass", we were amazed that we could sell our *Bombus impatiens* colonies to greenhouse tomato growers for $600 each. What a gold mine, you might have said (and many did say just that), and you would have been right -- except that the inefficient, fumbling, bumbling, methods that we used to rear our colonies made sure that most of the gold was washed away before it could be put in the bank. If (1) we could have kept our monopoly, and (2) improved the efficiency of our production methods, then you probably wouldn't be reading this because I would be long gone and would now be busy learning how to spend lots of money in some tropical paradise. But what actually happened here in North America (as had already happened in Europe), was that experienced competitors (with industrial and efficient production techniques) entered the market, prices went tumbling down, and the gold mine evaporated within less than four years. This is something which honeybee people (who are better shielded from intense competition) find hard to understand -- but like it or not, the commercial rearing of bumblebee colonies is not a type of farming; it is, as many people have pointed out, an industrial activity. To put it another way, bumblebee colonies are produced not on farms, but in factories.

Anyway, my only interest is in helping people rear bumblebee colonies for research, or just because it is a fun thing to do (and it certainly is that), so the criterion of industrial efficiency is not really relevant in this forum. In my second message, I will provide what I hope will be some useful

comments, and then in the last message I shall go on to make a suggestion which should (again, I hope) bring others into the discussion.

More to come . . .

I hope that, in my first message, I gave the impression that rearing bumblebee colonies is difficult. It is. I have worked away at it for over forty years, and I still don't count myself as being very good -- although that may be more a result of my limited talent than because of the difficulties intrinsic to the task. (In support of this, I might modestly point out that since I first became interested, a whole new generation of bright young scientists has come along -- they have made my clumsy procedures look slightly less elegant than the first attempts of my three-year old twins to make ice-cream on the kitchen floor). Nevertheless, I have learned a few things, of which the first, and by far the most important, is that if you are going to rear bumblebees successfully, you must acquire a detailed knowledge of the reproductive biology of bumblebees. So start hitting the books: read Plath (1934), Free & Butler (1959), and Alford (1975) . . . but above all, read the absolute masterpiece (more valuable than all the others, IMHO, rolled up together) written by F.W.L. Sladen in 1912: "The Humble Bee, its Life History, and how to Domesticate it", recently republished by Logaston Press, and available from IBRA (details later, if required). Sladen's book, if you read it carefully, will not only give you a thorough introduction to *Bombus* biology (reproductive and otherwise), but will also, hopefully, give you thoughts and ideas about rearing colonies in captivity. Not that Sladen was very good at rearing captive bumble bee colonies -- he was much better at getting them to occupy the "domiciles" that he set out in his garden (in Kent, U.K.).

The next thing that you should do is to make a decision as to what general class of methods you are going to use to obtain your bumblebee colonies. Other than actually buying the hives from a commercial supplier, there are four major classes of rearing methods: A) Setting out artificial nest boxes (domiciles) in the spring in the hope that overwintered queens who are searching for nest sites will have the good sense to use the palaces that you have provided for them; B) Rearing colonies in complete captivity using the sort of procedures devised by Free & Butler, P-F Roeseler, Plowright & Jay, and others; or C) Using methods that are intermediate between "A" and "B": these involve keeping the queens confined, but in large enclosures so that they have the liberty of choosing between various types of domiciles that are placed inside the enclosures, together with an abundance of blooming "bee flowers" to provide food; D) The high-intensity "BioTech" methods used by the major commercial suppliers.

Of these, the first (or "domicile") method is certainly the most "natural", and really quite easy. Its disadvantage, of course, is that it allows you to obtain hives only in the spring -- and also that one has only limited control over the choice of species that occupy the domiciles. As mentioned above, the first really successful domicile experiments were done by Sladen, but the best known large-scale domicile work was done in Canada by Gordon Hobbs, and then by his protegee and successor, Ken Richards, at the Lethbridge research station of Agriculture Canada (Ken is a subscriber on the Bombus List). Domicile methods have been criticized because of their supposedly low success rates, but if a good design is used, and one chooses the placement carefully (underground domiciles sunk in the sides of banks in "old- field" habitat that is surrounded by forest have always worked well for me), then one can end up with either a 100% success rate or something very close to that.

Dear Bombologists: In this, the third of my trio of messages dealing with bumblebee rearing, I shall make some comments on the other classes of rearing methods that I referred to in my last message. First, though, I would like to present to you a suggestion, which follows directly from the fact that I have not been nearly as successful in compiling a helpful review of useful articles on bumblebee rearing as I had hoped . . . either I can't get (or translate) the more obscure papers (I no longer have any research grant to help me), or I have not found the articles to be useful enough to be worth recommending (with only one exception -- the paper by P-F Roeseler). Our own first attempt to describe a practical method for rearing bumblebee colonies in captivity (Plowright & Jay 1966) has been repeatedly, and probably justly, criticized because many people have been unable to use it as an effective starting point -- but I have not been greatly convinced that other more recent publications have done much better. So what I suggest is that because several of us are, or have been, active in bumblebee rearing, we should ask people to make their own contributions: let us know which papers you have found to be useful, and if so why and in what way(s). This should broaden the discussion and, I hope, provide a more balanced perspective.

Anyway, before we begin this process (assuming that any of our members can be stimulated into applying digit to plastic), here to conclude my introductory review, are some comments on the other classes of rearing methods.

Rearing methods which depend upon confining queens in small chambers can be subdivided into A) those that allow the queen access to insulating nest material (usually raw cotton or an old mouse nest), and B) those in which no nest material is provided but, instead, the chamber is held at a high temperature (usually around +30C). Versions of both these approaches were described in Plowright & Jay (1966), whereas the well-known work of P-F Roeseler has chiefly concentrated on "B". On the whole, I would say that "A", being more "natural", is in some ways easier than "B" for a beginner, but the average success rate is likely to be lower. (However, using the "cotton", or "Series III", method in Plowright and Jay 1966, one can reliably get success rates over 80% with the most cooperative species, such as *B. bimaculatus* and -- whereas other species, e.g., *B. ternarius*, generally refuse to have anything at all to do with it!). Both "A" and "B" require the experimenter to provide, and renew fairly frequently, fresh (or fresh-frozen) pollen for the queens.

Methods involving the use of larger cages and provision of flowers (or artificial flowers).--I have always had great admiration for those who have successfully used techniques of this sort -- there is an "environmental friendliness" about letting the queens make their own decisions (within limits) as to

where they would like to start their nests. My only problem is that I personally have had no experience with such methods . . but fortunately, we have among us Dr. **Vladimir Ptacek**, from the Czech Republic, who is an authority on the subject, so I will ask him to make some comments about this class of methods.

Vladimir Ptacek (ptacek@sci.muni.cz) contributes:

Dear Bombologists: In his last message, Dr. Plowright asked me to contribute with some of my own experiences on starting bumble bee colonies in captivity. In all modesty, I must explain that I am not myself the author of any special method in this area. But about ten years ago, we did test and compare some techniques, all of which had previously been published:

1. The so-called "Zapletal" method, where queens searching in nature for suitable nesting sites were caught and put in prepared hives left outside.

2. The "Polish" method, worked out by one of the most skilled specialists in this area - Dr. Mieczyslaw Bilinski from the Institute of Pomology and Floriculture, Pulawy, Poland. He published the principles of the method in 1973 and later Dr. Bornus (1975) did the same. Here, sections (1-sq. metre in area) of stands of *Lamium album* L. ("White Deadnettle") are covered with cages at the beginning of flowering time. In each cage one hive with one bumblebee queen is placed. Queens may originate either from nature or from artificial overwintering. Dr. Bilinsky found that the food source allows the queen to raise the first generation of workers. After that, the hives should be situated outside (and equipped, for a while, with narrowed entrances to prevent the queen's escape and attacks by *Psithyrus* females). Supplemental feeding supports the development of colonies.

3. Laboratory methods, based on the results published by Plowright and Jay (1966) and other researchers. Here we found it possible to stimulate egg laying in *B. terrestris* by putting some very young honey bee workers together with the *Bombus* queen in the laboratory rearing cage.

We concluded that the Polish method is the simplest for obtaining small numbers of colonies. Colonies that we considered to be of satisfactory quality were obtained from about 70% of the queens that we installed. This method enables one to rear nearly all *Bombus* species (which hardly can be said about the laboratory procedures). On the other hand it needs comparatively large amounts of equipment, work and space. But this also may be the case in the laboratory rearing techniques, where due to the high investment costs, a profit can be made only on an "industrial" scale (see Bombus List, Message No. 250).

Having mentioned the last three messages from Dr. Plowright - I agree that it is very difficult to make a coherent bibliography from the large amount of published papers related to the problem. But on the other hand, to discuss only the main points of some method also may not be enough for unexperienced people, since there are many details which can be found only in the publications. So I would suggest that it would be useful if members of the Bombus List could obtain a package of publications, which was put together by some contributors, that would allow them to start just at their individual level. Where some articles are written in foreign languages without English summaries I could translate them into English and for those who would feel that they need translation of the complete text I could arrange that also.

References:

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Roeseler P. F., 1985: A technique for year-round rearing of Bombus terrestris (Apidae, Bombini) colonies in captivity. Apidology, 16(2):165-170.

[The new e-mail address for the Bombus List can be found on page 17 of this issue of MELISSA.--RMcG]

CURRENT PROJECTS

Tad Bartareau, Department of Zoology, James Cook University of North Queensland, 4811, C/-P.O Box 317, Herberton, Queensland, AUSTRALIA.--CURRENT PROJECTS: I am doing a study on comparative foraging strategies and competition between *Trigona* bees and honeybees in open and closed forests of tropical Australia. I am also working on the pollination of plants visited by native bees and honeybees. Also, I'm collecting information about habitat requirements, nest sites, parasites and predators of native bees. **HELP**: Any reprints of papers relevant to my current projects would be greatly appreciated.

George E. Bohart, USDA Bee & Systematic Laboratory, Department of Entomology, Utah State University, Logan, UT 84322-5310, USA.--CURRENT PROJECTS: Completion of a revision of Western Hemisphere *Dufourea*. **HELP:** Additional material of this genus, determined or undetermined.

Amots Dafni, Institutue of Evolution, University of Haifa, Haifa 31999, ISRAEL [Sent via Bombus List from **Chris Plowright**]. "Prof. Amots Dafni has asked for information on the relationship between the pollination activity of various bee species (*Bombus*, honeybees, solitary bees) and temperature and humidity under field conditions. He writes: 'We have a project on the invasion of *Bombus terrestris* in Mt. Carmel in relation to pollination and bee preservation and I need comparative data. *Bombus* is invading NOW and chases honeybees as well as solitary bees in the wild wider weather range of *Bombus* in relation to the others.' I asked Prof. Dafni why he was working on *Bombus* (he describes himself as 'an innocent botanist') and he replied: 'While working on the influences of fire on pollinators I was 'forced' to be familiar with the habits of *Bombus terrestris* which invaded our region (Mt. Carmel) about 20 years ago.' You may wish to reply directly to Prof. Dafni in Israel. If so, here is the e-mail address that I use for him:

RABI306%UVM.HAIFA.AC.IL@taunivm.tau.ac.il. If you find this address a bit too long, then you might try using: RABI306@HAIFAUVM.BITNET. Alternatively, please feel free to post your response on the Bombus List (in which case I will forward it on to him)."

Bryan Danforth, Department of Entomology, Comstock Hall, Cornell University, Ithaca, NY 14853, USA; bnd1@cornell.edu.--CURRENT PROJECTS: This past October I began my new job as assistant professor. I have recently finished setting up the lab for both morphological and molecular systematics. I plan to work on the relationships among the subgenera of *Lasioglossum* using both morphology, mitochondrial sequences and nuclear sequences. I hope to continue working on the evolution of big-headed males in *Perdita* using DNA fingerprinting to assess intra-nest relatedness and paternity, and will continue investigating the evolution of head allometry in the species closely related to *Perdita portalis*. My teaching responsibilities include Insect Morphology and an undergraduate course on insect evolution.

Patricia Maria Drumond, Faculdade de Filosofia, Ciencias e Letras, Departamento de Biologia, setor Ecologia, Universidade de Sao Paulo, USP, Avenida Bandeirantes, 3900, 14040-901 Ribeirao Preto, SP, BRASIL; pdrummon@cat.cce.usp.br.--CURRENT PROJECTS: I'm a Brazilian entomologist interested in oviposition behaviour of stingless bees. My doctoral project involves the ethological variation within the genus *Plebeia*. I would greatly appreciate being contacted by researchers interested in behavioral phylogeny.

Michael Scott Engel, Department of Entomology, 3126 Comstock Hall, Cornell University, Ithaca, New York 14853, USA; me18@cornell.edu.--CURRENT PROJECTS: 1) Finishing up my morphological analyses of augochlorine phylogeny. 2) Continuing work on the fossil bees - right now I am primarily studying specimens in Dominican amber and the type of *Cyrtapis anomalus* from Florissant. 3) Molecular and behavioral data for augochlorine phylogeny getting underway. 4) Describing a number of new genera and subgenera of Augochlorini in collaboration with **D.A. Yanega** and **R.W. Brooks**. 5) Revising *Pereirapis*, still in progress so nothing more to say about that at the moment. **HELP:** I need additional specimens of Nomioidini in 95-100% ethanol for sequence analysis. I have already kindly received 5 *Ceylalictus variegatus* from **Y.A. Pesenko**, but need additional species. [P.S.: The **Eickwort** Festschrift will be coming out soon in a special publication of the Journal of the Kansas Entomological Society (sometime in late Spring/early Summer of 1996).

Pedro G. Fernandes-da-Silva, Fac. Fil. Cienc. Let., Ribeirao Preto, USP, Av. Bandeirantes, 3900 Ribeirao Preto, Sao Paulo, BRAZIL 14040-901; pgfdsilv@fox.cce.usp.br.--CURRENT PROJECTS: I am now investigating the influence of quality of food collected by one species of meliponinae (*Scaptotrigona depilis*), and its effect on the behaviour of the colony. The feeding dynamics is under investigation, by means of quality of larval food, produced by hypopharingeal glands, and also the development of the colony, by analysis of food volume deposited in each brood cell, density of larval food, size of the workers, length of ontogenetic phase of workers, development of hypopharingeal glands and ovaries. These parameters can indicate some evolutionary strategies utilized by different groups of bees, i.e., during evolution, did different species of bees developed different forms of food utilization? If so, what is the relation between feeding dynamics of the colony and food availability and quality in the environment?

Tony Genaro, Museo Nacional de Historia Natural, Obispo #61, esq. a Oficios, Habana Vieja 10100, CUBA.--CURRENT PROJECTS: With financial support from the RARE Center for Tropical Conservation, the American Museum of Natural History and the Smithsonian Institution I was able to conduct research at both museums. I studied wasps and bees of the Antilles, especially those from Cuba. I have finished revisions of Cuban *Coelioxys* and *Triepeolus*, and have now started work on the Epeolini from the Dominican Republic (I have a paper in press describing a new *Triepeolus* from there which is closely related to *T. wilsoni*). A paper on a new species of *Melissoptila* from Cuba is in preparation. I am also interested in resolving the confusion associated with *Megachile* species names from the Antilles. I am currently finishing an annotated checklist of the Cuban species, which includes some new synonymies.

Jorge F. Genise, Division Entomologia, Museo Argentino de Ciencias Naturales, Av. Angel Gallardo 470, (1405) Buenos Aires, ARGENTINA; genise@muanbe.gov.ar.--CURRENT PROJECTS: My current project on bees is the study of trace fossils of bee origin and architecture of extant bee nests related to trace fossils.

Terry L. Griswold, USDA Bee & Systematic Laboratory, Department of Entomology, Utah State University, Logan, UT 84322-5310, USA; tgris@cc.usu.edu.--CURRENT PROJECTS: Generic and subgeneric revision of Eastern Hemisphere Osmiini with **Charles Michener**. Aculeate fauna of Mojave National Preserve, San Bernardino County, California. **HELP:** Most of the problems with the osmiines relate to the poorly known eastern Palearctic including Central Asia. Additional material from this region would be most helpful (hopefully).

Penelope F. Kukuk, Division of Biological Sciences, The University of Montana, Missoula, MT 59012, USA; bi_pk@selway.umt.edu.--CURRENT PROJECTS: 1) An ongoing study of the evolution of communal sociality in bees using *Lasioglossum (Chilalictus) hemichalceum* as a model species, 2) ongoing studies of the evolution of dimorphic males in bees, 3) a new project in ecological aspects of bumble bee respiratory physiology, 4) a continued interest in the systematics of the Australian *Lasioglossum*. **HELP:** I would like to know the locations of nest aggregations for any communal bee species.

Kenna E. MacKenzie, Agriculture and Agri-Food Canada, Research Station, 32 Main Street, Kentville, NS, B4N 1J5 CANADA; mackenziek@em.agr.ca.--CURRENT PROJECTS: 1) Alfalfa leafcutting bees have been found to be excellent pollinators of lowbush blueberry. Currently adapting management techniques to the Canadian Maritimes. Studying the effectiveness of ALB as pollinators of other *Vaccinium*

crops. 2) Examining the relative value of managed pollinators (ALB, bumble bees and honey bees) on lowbush blueberry. 3) Surveys of native bee species of lowbush blueberry and tree fruits and determining the value of these bees in crop pollination. **HELP**: Any suggestions on methods of evaluating the usefulness of native bee populations as crop pollinators would be appreciated.

Glynn Maynard, AQIS, GPO Box 858, Canberra, ACT 2601, AUSTRALIA; gmaynard@mailhost.dpie.gov.au.--Yes Ron, gotta get out there and do nasty things to bees. I'm still fooling about with the biology of that *Leioproctus*, lots more could be done but with greater facilities. What I wish to wrap up is the egg to mature larvae stage, at least get some specimens, hopefully some other life history data and a person at CSIRO wants to look at the fungi associated with the pollen balls and larval guts. Apart from that I hope to look further at the *Trichocolletes* nest we found about 6 weeks ago, single female nesting by herself, no-one else in the vicinity nor food plants. Males and females still on food plants. As well to try to keep a monitor, rough survey (or what ever you feel like calling collecting in the one area over a time) on the other bees and their flowers. This year I'm attempting to photograph foraging flowers and associate them with bee data.

[Glynn, continues on 05/04/95] Just touching base to let you know that I am still on earth. I have just returned from two and a half wonderful weeks in far north west Queensland, about 400 km north of Mt. Isa. The area is normally extremely dry, but we went in just after a very good wet season. It was hot (days all higher than 35 degrees) and extremely dry. Many of the waterholes were drying rapidly. This was the first part of the Queensland Royal Geographic Societies expedition into Musselbrook Reserve. Collecting was hard work with a lot of the flowers finished or rapidly chewed up by spur-throated locusts soon after they opened. I am still labeling specimens so I haven't looked closely at what I got.

Margrit McIntosh, Department of Ecology & Evolutionary Biology, University of Arizona, Tucson, AZ 85721, USA; MCINTOSH@ccit.arizona.edu.--CURRENT PROJECTS: I'm a new grad student studying pollination mutualisms and how they affect the evolutionary history of both plants and pollinators ... especially bees! I've been doing a project on the pollination biology of the local barrel cactus with an eye toward discovering if there is a link between specialist pollinator behavior and plant hybridization. I was interested to learn that the *Idiomelissodes* bees I collected this summer and fall are specialists on barrel cacti, and would like to know if anyone knows of other cactus bees which specialize on a particular genus or species of cactus.

Luciano Moffatt, Departamento de Ciencias Biologicas, Facultad de Ciencias Exactas y Naturales UBA, Pb II, Ciudad Universitaria (1428) Capital Federal, ARGENTINA; luciano@bibiol.uba.ar.--CURRENT PROJECTS: I have changed from working on the systematics of Neotropical bees under the direction of Dr. **Arturo Roig** to work on the behavioral physiology of the honeybee, directed by Dr. **Josue Nunez**.

Christopher M. O'Neal, 300 Nob Hill Pl. #2, Ann Arbor, MI 48103, USA; coneal@biology.lsa.umich.edu.--CURRENT PROJECTS: I am a first year grad student at the University of Michigan working towards my Ph.D. My advisor is **Beverly Rathcke**, and my interest in bees comes from a fascination with the effects of fragmentation on pollination systems (invasive species, cascade extinction, edge effects, the usual). The thing is, you'd be surprised with how little decent stuff has approached this problem from the pollinators' point of view. So I am starting down that road, and though much of the really neat stuff in this area is done in the tropics, by necessity I am confined to the temperate zone for a while. This summer [1995] I am going to lay some ground work for future research, and plan to work here in Michigan. The current plan is to investigate the effects of fragment size and insularization on bee demographics in woodlots surrounded by farmland here in southern Michigan. Previous work by **Paul Marino** in the same area has led me to believe it is an ideal area, and I'm hoping to have good luck getting twig-nesting species to bless me with their presences. Eventually, I would like to move this study to the southwest, and of course the tropics.

Laurence Packer, Department of Biology and Faculty of Environmental Studies, York University, 4700 Keele St., N. York, Ontario, CANADA; bugsrus@YorkU.CA.--CURRENT PROJECTS: In between teaching, reading NSERC grant applications and doing various other administrative functions, I occasionally wish I could be getting on with the following research projects. **1)** Phylogeography of *Halictus ligatus*. Eighteen months ago we discovered that what was previously thought to be one widespread species is actually two genetically differentiated forms - one in the southeastern USA, the other elsewhere. The two are sympatric at the southern end of the Appalachians. It remains unknown where the border between these two species is to the west but we do know that bees from the southwestern USA are of the northern species. The species-level differentiation is easy - there are something like 7 fixed electrophoretic differences at allozyme loci, not one individual has been found to be heterozygous even in the areas of sympatry. However, the preliminary mitochodrial DNA sequences we have obtained (and thanks are due to **Bryan Danforth** for his invaluable and generous help with this) suggest a more clinal variation from north to south. So, we have discovered an example of cytonuclear disequilibrium (and I have to hope that it isn't catching). **2)** A morphology-based phylogeny of the Halictini at the generic level. This is a project in collaboration with **Yuriy Pesenko** of the Zoological Institute of St. Petersburg where I spent a fascinating two weeks last May. Unfortunately, since then, the above mentioned administrative and teaching tasks have meant that I have not been able to look through my microscope at bees even once. **3)** With **Cecile Plateaux-Quenu** a study of intraspecific (?) variation in behaviour of *Lasioglossum albipes* is underway. I hope to be able to pick up some specimens of this species from her when I go to France for a conference in May and perform genetic studies to see if the behavioural differences are mirrored by genetic ones in more than the three samples already analysed. **4)** With **Shoichi Sakagami** a study of the sociality of *Lasioglossum (Dialictus) problematicum*.

Shoichi began this study when I was 2 years old so it is a bit of a long term one. He sent me all the data from this some years ago and after an initial bout of activity, again, the above job description has precluded much further progress (my teaching load quadrupled in 1994 and will stay at around this level until I go on sabbatical - currently slated for 1997). **HELP:** I would be most grateful for frozen and/or alcohol preserved (80% or higher) samples of *Halictus ligatus* from anywhere between Florida and New Mexico and south through Mexico and Central America and back up towards Florida in the Caribean.

David W. Roubik, Smithsonian Tropical Research Institute, Unit 0948, APO AA 34002-0948, USA; roubik@joline.umsl.edu.--CURRENT PROJECTS: I finished a 17-year study on the impact of exotic *Apis mellifera* in French Guiana. They are successful in invading all habitats present, but least successful in pristine forest. They have not caused the local extinction of any bee species, however, they radically alter the reproductive success of flowering plants. In the species that I studied most extensively, seed production was diminished by 40% where the African honeybee totally dominated flowers. I was able to make direct comparisons to other areas where the 10 native *Melipona* species and other native bees (mostly halictids and other Meliponini) were almost the only pollinators. This is the first study to my knowledge that described what happens as the result of feral honeybees, naturalized in undisturbed tropical forest regions. It's about time some data were given.

Diana Sammataro, Department of Entomology, Ohio State University, 1735 Neil Ave., Columbus, OH 43210-1220, USA; dsammata@magnus.acs.ohio-state.edu.--CURRENT PROJECTS: I am still studying bee mites and control, specifically tracheal mites.

Fernando Silveira, Laboratório de Ecologia e Comportamento de Insetos, Departamento de Biologia Geral, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, Caixa Postal 2486, 30161 Belo Horizonte, MG. BRAZIL; fernando@oraculo.lcc.ufmg.br.--CURRENT PROJECTS: For my dissertation, I did a phylogenetic study of the Exomalopsini and the revision of a small species group inside the subgenus *Phanomalopsis*. I am submitting a paper to the Kansas Science Bulletin on the phylogeny and classification of the Exomalopsini (this includes the proposition of a new tribe, Teratognathini) but I am planning to complete the revision of the species of *Phanomalopsis* before I submit the second portion of my dissertation to any journal. Following this, I'll work on the revision of the species of *Exomalopsis* s.s. I have done a great deal of work already on both subgenera, but I do not want to send anything to print before I can see the collections at the Museu Nacional (in Rio de Janeiro) and at Curitiba (with **Moure**). I believe both hold very important material of species groups which still confuse me.

Felix Torres, Departamento de Biologia Animal, Unidad de Zoologia, Facultad de Biologia, Universidad de Salamanca, E-37071 Salamanca, SPAIN; torres@gugu.usal.es.--CURRENT PROJECTS: Study and identification of bee larvae, now concentrating on the Megachilidae, from wood stems and artificial nests. **HELP**: I need to know the holdings/lists of bee larvae in museums and other institutions.

Maria Fernanda Trucco Aleman.--NEW ADDRESS: Universidad Nacional de Salta, Fac.de Ciencias Naturales, Buenos Aires 177, 4400 Salta, ARGENTINA; proto@ciunsa.edu.ar (via Dr. **Jorge Protomastro**).--CURRENT PROJECTS: Pollination ecology of *Crotalaria anagyroides* in Vaqueros (Salta, Argentina), involving the megachilid bee genus *Pseudocentron*. **HELP**: need any studies, or thesis on the relationships between plants and the megachilid bees. I would like to be in touch with others who are studying this.

Robert Tuckerman, 82 Dublin St., Peterborough, Ontario, CANADA K9H 3A9.--CURRENT PROJECTS: After a hiatus away from my studies I'm getting caught up to date on the literature so I can write up my thesis - three field seasons of data on the nesting behaviour of *Seladonia confusus*. I'm also working as an illustrator and trying to convince people there is merit in "insect art."

Ken Walker, Museum of Victoria, AUSTRALIA, kwalker@mov.vic.gov.au.--CURRENT PROJECTS: I am working on the systematics and biogeography of the Australian halictid fauna, and at present am concentrating on the tribe Halictini. To date, I have revised members of the genus *Homalictus* and have just submitted a supplement to that revision with several new species and descriptions of male or female sexes not previously known. In 1993 I updated the known information on the single Australian species of *Pachyhalictus*. A recent intensive field work program, "Heathlands", in Cape York Peninsula collected seven specimens of a new Australian species of *Pachyhalictus* and I have submitted a paper on this new species. However, much of my time has been spent conducting a revision of the eight Australian subgenera of *Lasioglossum*. I have recently completed the subgenus *Chilalictus*, which resulted in the discovery of 73 new species giving a total of 134 valid species. My successful ABRS grant application will give me a part-time assistant for three years to continue work on the remaining taxa. One of the greatest problems I face is the lack of non-Australian *Lasioglossum* specimens in Australian collections. Fortunately, Profs **Michener** and **Sakagami** as well as Drs **McGinley** and **Packer** have made donations from their collections. **HELP:** I would greatly appreciate if readers would loan me any Australian halictini specimens held in their collections and I would also be keen to exchange Australian *Lasioglossum (Chilalictus)* specimens for non-Australian *Lasioglossum* specimens. Thank you.

Bill Wcislo, Smithsonian Tropical Research Institute; strem123@sivm.si.edu.--CURRENT PROJECTS: Most of my time is spent on behavioral studies of a social sweat bee, *Lasioglossum (Dialictus) umbripenne*, in eastern Panama. Social behavior varies among several populations along a transect crossing the continental divide, which is also a rainfall gradient. The aim is to discern the environmental and genetic factors influencing the variation in social organization. Other projects are a study of time and place learning in an ant (*Ectatomma*) that sits at the *L. umbripenne* nest entrances and hunts the incoming bees; a study of learning with respect to mating

and nesting behavior of *Calliopsis hondurasicus*; and, lastly, I am coming to terms with my non-essential nature of being, the latter by decree of the U.S. government.

Neal Williams, Department of Ecology and Evolution, State University of New York at Stony, Stony Brook, NY 11794, USA; nwilliam@life.bio.sunysb.edu.–CURRENT PROJECTS: I am a student with **James Thomson** at SUNY Stony Brook. I currently am working on certain aspects of diet specialization in solitary bees, though my interests are broad in the area of bees in general.

*ELF news from The Flinders University of South Australia

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The **EXONEURA LIBERATION FRONT (ELF)**, a bee group at Flinders University, Adelaide, has grown rapidly during 1995. **PAM HURST** has continued Ph.D work on *Exoneurella tridentata*, an allodapine bee showing morphological caste differentiation as well as a number of other traits that indicate highly eusocial behaviour. **LAURENCE PACKER** visited in January through April and the lab is still reeling from shell-shock. Laurence brought phylogenetic aspects to the fore: the arguments are still going on, but the lab is now moving towards the end of trauma therapy sessions. It was gratifying to see that Laurence mastered the art of driving on the left hand side of the road (a skill that is best mastered while passengers are asleep in the car and unaware of impending bridges or other obstacles). **NICK BULL** commenced a Ph.D. on conflict and cooperation in *Exoneura bicolor* and, having discovered the joys of large-scale dissection, is now eager to follow up with large-scale allozyme electrophoresis of brood and sex allocation studies. **ADAM CRONIN** also started a Ph.D. and is looking at latitudinal variation of social behaviour of allodapine bees along the Australian coast. **NI LUH WATINIASIH** is a mid-year arrival from Bali working on *Exoneurella eremophila* which is the only truly arid-zone allodapine to inhabit the central heart of Australia. Among other locations, *E. eremophila* lives in the gibber-plain deserts around Oodnadatta and the stony desert. These areas are very barren - often it can be dozens of kilometres (this is a gross understatement-SR) between trees - quite a contrast from Bali! **TANIA NEVILLE**, our technical assistant who sees to the needs of the lab, is spreading her wings and looking at sociality in *Exoneurella setosa*, a close relative of *E. eremophila*. **STEPHEN REYES** arrived in July to take up an ARC research associateship. Stephen has almost adjusted to life in the sticks after the civilization of Lawrence, Kansas. A bigger shock than moving to Adelaide was moving into a lab of systematic babes-in-the-wood. Re-education has been the order of the day, and the lab is slowly recognizing that *Exoneura* is a minuscule part in the order of things in the universe. Recently, he has just finished the analysis of the species phylogeny of *Exoneurella* based on the combined morphological and cyt b sequenced data. In the meantime, Stephen draws strength from email contact with the real world and Coopers sparkling ale - a saving grace of Adelaide. **RICHARD EVANS** started honours mid year 1995 and is studying fluctuating asymmetry (FA) in *Exoneura*. 1996 will see the lab grow further - **ZETA STEEN** begins her PhD on *Lestis* - an endemic group of Australian carpenter bees, **REMKO LEIJS** will begin his Ph.D on the phylogeny of social behaviour of carpenter bees using sequence data, and **KATJA HOGENDOORN** begins an ARC postdoctoral position coordinating research on *Xylocopa* social evolution. On a sobering note, the lab is being infiltrated by people working on gall-forming thrips (**BRENDA KRANTZ** and **DAVID MORRIS** with visits from **BERNIE CRESPI** and **LAURENCE MOUND**) and fig wasps (Honours student **JOHN ZAMMIT**). In the meantime **MIKE SCHWARZ**, is trying to pretend that he knows what all these people are up to. Sex ratio still remains as his primary interest and presently extending it to thrips and fig wasps. Mike also unashamedly flirts with FA, even in front of the young and impressionable grad students. He is even thinking of enlisting **MARK BLOWS** (James Cook University) on such an endeavor.--M.P. Schwarz and S.G. Reyes (Stephen.Reyes@flinders.edu.au) are entirely responsible for any errors or omissions in this article. Please address enquiries or lawsuits to either individuals. (*Note - ELF is a registered trademark of P. Hurst Foundation, Millswood, Adelaide, Australia).

Activities in the Laboratory of Laurence Packer at York University

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Things have been somewhat disorganised this past year, largely due to the length of time it took me to recover from the alcohol poisoning I was subjected to while visiting **Mike Schwarz**'s laboratory/tavern early in the year. Nonetheless, there are three graduate students currently enjoying (sic.) my supervision. **JEREMY KERR** is working on large scale biodiversity patterns in North American organisms of various descriptions and also testing edge/area effects in oak savannah habitats. **NOEL PABALAN** is working on the effect of behavioural interactions on ovarian development in *Halictus ligatus* and *Lasioglossum zephyrum* and also assessing the influence of sociality on spermathecal morphology in bees. **SHANNON BROME** is looking for phenological and sociobiological differences between the two cryptic species of *Halictus ligatus* in areas where the two are sympatric. Some additional students have expressed interest in coming to work in my lab - the topics of interest are i) molecular phylogeny and social evolution and ii) local scale biodiversity patterns.

PASSINGS

Klaus Warncke (1937-1993)

Stephan M. Blank
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Dr. Klaus Warncke, teacher and well known bee researcher, died on 2 January 1993 due to a car crash near Kairo in Egypt. He was borne on 14 May 1937 in Neustrelitz / Mecklenburg. At the end of World War II his family fled to western Germany. After finishing school in Braunschweig he studied teachership at the Universities of Mainz, Freiburg and Munich (biology, geography and chemistry) and graduated upon a systematic subject in botany in Munich. A few years after marrying his first wife Ulrike in 1964 he was employed as a teacher at a secondary school in Dachau. In 1991 he married his second wife Christa, who also died at the accident near Kairo. During numerous travels to the mediterranean countries he became an expert of ornithology and entomology within this region.

Between 1957 and 1973 Warncke published several investigations on birds. During the last three decades Klaus Warncke was very productive in investigating bees. Since 1963 he worked on faunistic, taxonomic and phylogenetic aspects of bees. During this time he described 57 genera and 887 species.

His entomological work concentrated on the westpalaearctic and central asian fauna. The new taxa described by Warncke originate from these regions. His sudden death interrupted his work on a comprehensive monograph on westpalaearctic bees, which certainly would have clarified many open questions. A detailed obituary, a biography and a complete list of ornithological and entomological publications have been published elsewhere (Ortal, R. - 1993. Nachr.bl. bayer. Ent., München 42(3): 94-95; Kraus, M. and S. M. Blank - 1994. Linzer biol. Beitr. 26(2): 649-663).

The nominal taxa described by Warncke and their types were listed by Blank and Kraus (1994. Linzer biol. Beitr. 26(2): 665-761). The purpose of this paper is to summarize the taxa newly described by Warncke and to give easy access to his contribution to the knowledge of bees. The taxa are listed according to the first description. Later revisions of names and resulting synonymies, homonymies or new combinations are not considered. This presentation does not address later decisions on the status of the taxa. Conformity of the type series with the original description was verified, the orthography of few taxa was corrected according to the ICZN (1985).

Today the Warncke bee collection of Warncke is deposited at the Oberösterreichisches Landesmuseum in Linz (Austria), and his collection of reprints was given to the Zoologische Staatssammlung in Munich.

ANNOUNCEMENTS

New WWW Server about Bees!!

Stephen L. Buchmann
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The USDA-ARS Carl Hayden Bee Research Center proudly presents . . . The Global Entomology Agricultural Research Server (GEARS). Our domain name address (url) is as follows: http://gears.tucson.ars.ag.gov/. We can also be reached by IP address at http://198.22.133.109/.

If you have a direct internet connection through a university or third party provider, please make a cybervisit to the newest World Wide Web site on the internet just devoted to bees and pollination. Think that you'll enjoy the images, movies, publications and insect sounds, etc.

Happy Net-Surfing!

New Address for Bombus List

Chris Plowright
cplowrit@aix1.uottawa.ca
[from Bombus List, 12/12/95]

Dear Colleagues: This will be the last message that is sent from the "old" Bombus List. At the end of this week, our connection to the "csi2" computer will (because of budget cuts at the University of Ottawa) be severed. So the old address for the Bombus List (bombus@csi.uottawa.ca) will no longer be functional. So please don't send any more messages to that old address. Instead, the Bombus List is being transferred to the University of Ottawa's LISTSERV machine. So the new address will be: BOMBUS-L@LISTSERV.UOTTAWA.CA, or, if that machine is smart enough not to be case-sensitive: Bombus-L@Listserv.Uottawa.CA

You shouldn't have to re-subscribe (I have requested that this be done from the old table of e-mail addresses), and please don't try to do so -- otherwise you run the risk of receiving duplicate copies of all messages -- until you are sure that you are not a member of the "new" list.

How will you know that you are not a member of the "new" Bombus-L? Well, as soon as the Listserve is up and running, I will write a welcoming message to everybody. When you have received that, you will know that you are still subscribed. If you have heard nothing by the middle of next week (December 20th, for example), then please send a message to the list to re-subscribe yourself. Or, if you wish, please feel free to write to me directly -- but if you do, please note that my address is also about to be changed. It will become: cplowrit@aix1.uottawa.ca, and that will be the only address that I shall have after the end of this week.

The best news about all of this is that, once the BOMBUS-L listserve has been activated, we will suddenly acquire over 100 new members. This is made possible by the greater speed

and power that results from using a mainframe machine. So I hope that we will see a great increase in activity.

NMNH Entomology Gopher

Jerry Louton
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The Department of Entomology, National Museum of Natural History, Smithsonian Institution Gopher Server is on line. It contains information about the staff, resources available to visitors, newsletters maintained by staff members, information about the collections and a growing International Directory of Entomologists. The information has been compiled by NMNH staff as well as staff of various associated organizations located at the National Museum of Natural History, including the USDA Systematic Entomology Laboratory, the Walter Reed Biosystematic Unit and the Maryland Center for Systematic Entomology at the University of Maryland. The information contained in these files should be viewed with caution - this is an evolving product that will be edited, upgraded and expanded over time.

The NMNH Entomology Gopher is located at nmnhgoph.si.edu and is reached through Gopher client software. World-Wide Web users with MOSAIC or other WWW client software can access this information at URL http://nmnhwww.si.edu/nmnhweb.html via the National Museum of Natural History home page. Contact your Internet provider for detailed information about access to these services.

For general information about the NMNH Department of Entomology Gopher, contact Jerry Louton, at the address listed above.

[MELISSA readers should know that through this Gopher they can electronically access the MELISSA newsletter, the MELISSA directory, and obtain information on the Smithsonian bee collection. This and subsequent issues of MELISSA will be available on the NMNH Gopher system (the newsletter will continue to be available in hardcopy). Through the Gopher you can access the Directory and select the "search command." Once there you can call up records for individual bee workers (other entomologists) by name, or do a search for individuals by city, country, university, etc. If you want to access the entire MELISSA Directory, just type in "Mel" [no quotes] at the search prompt.--RMcG]

New Book: Biology of Bees (Hymenoptera, Apoidea)

Biology of Bees, by Vladimir G. Radchenko and Yuriy A. Pesenko; Publisher: Zoological Institute, St.Petersburg. 1994. 350 pp.; 144 figs, 6 tables, 1810 references. In Russian with large summary in English. Price: USD 25 (including postal expenses). Hardcover. Size 248 x 173 mm. Date of publication: October 28, 1994.

The book represents an analytical review of data on the nesting biology of bees and is based on all known data of bee biology of the world. It is the first edition on this subject in Russian, and since 1936 it is only one in the world literature. The book consists of 13 chapters, organized in 3 parts: I) Introduction: Diversity, Distribution, Life Cycles, and Trophical Links of Bees, Methods for Study of Their Biology; II) Nesting of Bees and its Evolution; III) Social Life: The Main Forms, Origin and Evolution.

Numerous new data on the biology of separate species are given, and new interpretations of many data are provided. Directions of the evolution of the main biological characteristics of bees, and morphological structures that are integrated with them are established. Based on this the authors propose a new hypothesis of the origin of bees and the reconstruction of the main morphological and biological features of the "proto-bee" (the nearest common ancestor of the superfamily Apoidea), in essence differing from previous hypotheses. The main directions of the evolution of the nesting of bees are shown, including new hypotheses of the pathways of the evolution of the families Megachilidae and Apidae.

This book pays special attention to the classification of all known forms of sociality, and detailed characterizations of eusocial colonies of Halictinae, Xylocopinae, Euglossinae, Bombinae, Meliponinae, and Apinae are given. All hypotheses about the origin of eusociality are discussed in detail. Resolution of the problem of the polygynous foundation of eusocial colonies in the framework of Hamilton's "hypothesis of haplodiploidy" is given. Eight stages of eusocial development are distinguished and characterized.

Orders for the book should be sent to the authors: Dr. Vladimir G. Radchenko, Artema street, 102-A, apt. 10, Donetsk, 340048, Ukraine (E-mail: RVG@ipii.donetsk.ua); Dr. Yurij A. Pesenko, Zoological Institute Russian Academy of Sciences, St.Petersburg, 199034, Russia (E-mail: PYA@zisp.spb.su). You can pay for the book (including the postal expenses) by banking cheque (banker's check) for the sum of USD 25, addressed to one of the authors simultaneously with the order or after reception of the book. Sincerely, Vladimir G. Radchenko, Yuriy A. Pesenko

Beekeeper's Yellow Pages

Geary Wong
gewong@netcom.com

We would like to request your assistance in helping us compile a "beekeeper's yellow pages or reference list". Hopefully, this would be a useful reference tool for communicating with colleagues, research, and beekeeping communities. We anticipate having this list published in a major trade journal. If you would like to be listed, please send the following via e-mail.

Name (first, middle, last, & degree):
Title:
E-mail address(s):
Snail-mail address:
Phone & FAX numbers:

Please state your teaching and/or research interests. Please e-mail above information to either: Stan Kain: stankain@delphi.com; OR Geary Wong: gewong@netcom.com

IVth International Colloquium on Social Insects - St. Petersburg, Russia 18 - 24 August, 1996

This Colloquium is organized by the Russian Language Section of the International Union for the Study of Social Insects. It will be held at St. Petersburg State University - the oldest Russian university, in the historical centre of St. Petersburg. The Colloquium will cover all aspects of behaviour, ecology and physiology of social and presocial arthropods. The official languages of the Colloquium will be Russian and English.

For more information, contact Dr. Vladilen E. Kipyatkov, President of IUSSI Russian Language Section, Department of Entomology, Faculty of Biology, St. Petersburg State University, 7/9 Universitetskaya naberezhnaya, St. Petersburg 199034, RUSSIA. Tel.: (+7) 812 218-96-79; Fax: (+7) 812 218-08-52, 218-13-46. PLEASE, USE ELECTRONIC MAIL FOR FAST COMMUNICATION! E-mail address: vk@socium.usr.pu.ru

XIII International Congress of IUSSI Adelaide, 1998/99

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The XIII International Congress of IUSSI will be held in Adelaide, Australia, between 29 December 1998 and 4 January 1999. Organization is still at an early stage, but preliminary suggestions for some symposia topics are arriving, and requests for symposia suggestions will be disseminated in the first half of 1996. The venue will be University of Adelaide in the state of South Australia. Adelaide is a coastal city of about 1 million people. The congress date falls in the Australian midsummer, giving delegates an opportunity to see the Australian insect and vertebrate fauna at its peak as well as enjoy the sun and beaches. The venue is close to the city centre, with easy access to air and land transport. Although airfares will be higher for many delegates than if the congress were held in the northern hemisphere, accommodation, food and local transport costs should compensate. A wide variety of pre and post congress tours will be offered, including trips to areas of interest to insect sociobiologists. The latter will include camping trips and trips based around field stations. Australia has an intriguing bee fauna (as well as ants, termites, etc.) and the congress organizers will endeavour to facilitate any collecting and research activities that delegates may want to undertake. The first congress announcement will appear early in the second half of 1996. E-mail queries can be directed to Mike Schwarz at Michael.Schwarz@cc.flinders.edu.au

COCUYO - Carta Informativa de los Investigadores de Invertebrados de Cuba

COCUYO is a newsletter dealing with the activites of people who study the invertebrates of Cuba. It is published irregularly and is sent free to interested parties. The editors are **Julio A. Genaro and Jorge L. Fontenla**, from the Museo Nacional de Historia Natural - Obispo #61, esquina a Oficios, Habana Vieja 10100, Cuba. The RARE Center for Tropical Conservation (Philadelphia) supports production and mailing costs. COCUYO is structured into different sections such as Current Projects, Field Work, Announcements, Scientific Notes and Recent Literature. The editors encourage those with much needed information concerning the Cuban invertebrate fauna to submit checklists and other contributions relating to the the groups they study. This will be of great help in updating knowledge of Cuban biodiversity.

RECENT LITERATURE

The following literature is recent, but not all THAT recent. We have several months of searches on disk that were not included. MELISSA-9 was simply getting too large. Sorry if we didn't include your most recent publications! We will try to catch up next time out.--RMcG.

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