MELISSA

The Melittologist's Newsletter

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EDITORIAL COMMENTS

"*Melissa* is Back"

The editors of *Melissa* apologize for the lengthy delay in the publication of *Melissa* 4. Thanks to the help of Maureen Mello and Bryan Danforth, Melissa is back on track, and will continue as a regular newsletter for the dissemination of information on the study of solitary and social bees world-wide. Please send us articles on collecting trips, museum resources, past, present and future research, and anything which would be of general interest to bee researchers. We plan to have the 1992 issue out by the beginning of that year. We would like to thank George L. Venable for his expert assistance in the preparation of this newsletter.

In this issue we are pleased to announce that the United States National Science Foundation has funded a two year cooperative study of the bees of Mexico. The Principal Investigators on the grant are Wallace LaBerge and Ronald McGinley (see article below).

La Programa Cooperativo sobre la Apifauna Mexicana, or PCAM, traces its beginning to a meeting held in Chamela, Jalisco in 1985. At that meeting PCAM was formed as an informal organization to discuss and organize long term cooperative studies of the Mexican bee fauna. Because of the devastating earthquake which occurred a few weeks prior to the meeting, many interested Mexican scientists were unable to attend. A second workshop was held in Quintana Roo in October, 1986. A third meeting was held at Chamela in July 1989 and a fourth meeting at Hermosillo, Sonora, in July, 1990. The objectives of PCAM, established at the first two meetings, are described in the accompanying article. Requests for information regarding PCAM should be sent to George Eickwort (Cornell University) or Jerome Rozen, Jr. (American Museum of Natural History).

* * *

THE BEES OF MEXICO

Cooperative Survey of the Bees of Mexico Funded

By
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In the fall of 1986, during the second PCAM meeting in the state of Quintana Roo, Mexico, it was decided that W.E. LaBerge and R.J. McGinley would prepare a proposal requesting funds from the National Science Foundation to support a survey for the native bees of Mexico. This proposal was submitted in 1987 and was not funded. A revised proposal was submitted in 1988 and was again turned down. A third proposal was prepared and submitted in 1990 and has been funded starting in the summer of 1991 for two years. The proposal was submitted through the University of Illinois in Urbana and will be administered at the Natural History Survey located on the University campus by W.E. LaBerge. This grant will provide funds to do several things listed and briefly discussed below.

1. First, travel money will be available to collect bees and associated data. This, of course, is the heart of the proposal. We hope to be able to strengthen several of the North American collections in their holding of native Mexican bees. Approximately half of all collections will eventually be returned to Mexico (to the Universidad Nacional Autonoma de Mexico or to other national insect collections). Scientists leading the native bee surveys need to agree to this stipulation, in order to receive funds from the grant. In addition, the proposal specifies that holotypes of species described from material resulting from this survey should be deposited in the collection of the Insituto de Biologia, UNAM, in Mexico City.

2. Computer data management of all collections will be centered at the Natural History Survey. Data (on discs, on paper, etc.) from all collections will be sent to LaBerge to be entered into the PCAM data bank on Mexican bees. These data will be available to all PCAM members, and other scientists interested in bee research.

3. The grant has some funds for purchase of a vehicle that will be used for field trips to collect bees. This vehicle, after the two year grant or any renewals has expired, will belong to UNAM and remain in Mexico.

4. Funds are available to support a graduate student from Mexico at the University of Illinois for two years. We hope that a suitable student will apply soon.

5. Some funds will be used to support hourly workers and a data entry person at the Natural History Survey. These workers will process bees (pin, label, etc.) for collections from trips led by investigators who do not have facilities or the resources to do this work, or who want help in this regard.

6. The grant states that all faunal studies, species lists,or keys to Mexican bees resulting from this study will be published in Spanish with English summary and that other papers in which species or nesting biologies are described will be published in either Spanish of English, depending upon nationality of the author, and summaries provided in the alternate language.

Four objectives of PCAM were agreed to by participants of the first two PCAM meetings. These are: (1) investigation of the taxonomic diversity and distribution of the bees of Mexico, (2) establishment and enhancement of permanent collections of bees in Mexico, (3) investigation of the biology and ecology of Mexican bees, and (4) establishment of a training program designed to strengthen the Mexican base of expertise on bees.

The last objective has been supported by the Smithsonian International Exchanges Program (grants to Ronald McGinley) which provided support to teach and train Mexican students in bee systematics and in field techniques at meetings held in Chamela and Hermosillo. It is hoped that the present NSF grant will advance this objective by providing the possibility for a Mexican student to earn an advanced degree. Also, Mexican students will be supported by funds from the grant to participate in the field trips. They are encouraged to take part and will be welcome participants.

The first two objectives will be directly supported by this NSF grant. Collections of Mexican bees will be enhanced, both in the United States and in Mexico. The third objective, although not directly addressed by our grant proposal, will also be advanced. In collecting native bees in Mexico, it is expected that floral data will be collected with all specimens. If the plants being used by the bees are unknown, specimens of the plants will be collected for identification later. It is hoped that a botanist may be induced to accompany the group for part or all of each trip. Also, any nesting bees will be noted, perhaps studied at the time (depending upon the discretion of the group leaders), and data entered into our data bank so that the site may be revisited.

A protocol has been designed to collect and record data from every major collecting site. This includes check-off items such as a list of plant communities, geographic location of the site, date, etc. There is space on the protocol for recording specific locations of such items as nesting sites, specific plant dominants at the site, and other pertinent information. This protocol is essential, we believe, for data management, labelling of specimens and relocation of sites.

W.E. LaBerge, R.J. McGinley (Smithsonian Institution), J.G. Rozen (American Museum of Natural History) and George Eickwort (Cornell University) will serve as an informal committee to advise on all policy matters involving this grant, and additional Mexican committee members will be added after consultation with our Mexican counterparts. Dr. Rozen will lead the first survey trip under the auspices of this grant in August of this year to the arid northern regions of Mexico.

* * *

COLLECTION AND COLLECTING NEWS

Catalog of Type Depositories of Bees in America North of Mexico

by
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The updating of the Catalog of Type Depositories of Bees in America North of Mexico is essentially complete. Ron McGinley is assisting with arrangements for the Smithsonian to publish the catalog. To make sure that types of your newly described species or lectotype designations published since 1982 are included, please send a reprint or reference as soon as possible.

My sincere thanks go to all who responded to my letter of last summer by sending reprints and information to me. Library facilities here at "Pseudo-U" are woefully lacking, and time to visit other libraries is virtually non-existent. Your help made the updating considerably easier for me.

The Brethes Types of Apoidea in the MACN Collection

by
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Between 1901 and 1927, Juan Brethes published 77 papers in which he described 893 new species of Hymenoptera. Most of the types were deposited in the Museo Argentino de Ciencias Naturales (MACN) where he worked, building up one of the most important collections of Hymenoptera from South America.

When Brethes died, nobody paid attention to his collection for about fifty years, until M.A. Fritz began to arrange it and made the first alphabetical files.

Brethes used to put a small label with a number on each insect in his collection. He registered each number in a notebook with a determination and a copy of this notebook is kept at MACN. The number label is critical for determining the "type" status of Brethes material because he rarely identifies specimens with name labels, and his locality labels were less complete than information in the original descriptions. Definitive decisions on all "types" will have to be made by specialists after comparisons with the original descriptions.

In the following list species names are given in their original combination without considering subsequent nomenclatorial changes and synonyms. A plus sign (+) at the end of an entry indicates that there is typical material in the MACN collection. The absence of a sign means that the type material has not been found. In some cases such material may simply repose in our collection undetected, or it may have been borrowed without a record.

A corresponding list of Brethes aculeate wasp types and a complete list of Brethes papers on Hymenoptera are given in SPHECOS 20 (September, 1990), available on request from Arnold Menke (SEL/USDA, c/o National Museum of Natural History, Smithsonian Institution, Washington, DC, 20560, USA).

APOIDEA

Ancyloscelis videlai Brethes, 1914 (+)
Ancyloscelis bonariensis Brethes, 1910
Anthidium caroliameghinoi Brethes, 1903
Anthophora escomeli Brethes, 1920 (+)
Anthophora arequipensis Brethes, 1920 (+)
Arhysosage johnsoni Brethes, 1922
Augochlora (Tetraechlora) porteri Brethes, 1914 (+)
Augochlora proserpina Brethes, 1909 (+)
Augochlora clonia Brethes, 1909 (+)
Augochlora phylacis Brethes, 1909 (+)
Augochlora videlai Brethes, 1914
Bombus peruvianus Brethes, 1920 (+)
Callonychium argentinum Brethes, 1922 (+)
Coelioxys fiebrigi Brethes, 1909
Epeolus arechavaletai Brethes, 1909 (+)
Epeolus merus Brethes, 1909 (+)
Eulonchopria psaenythiodes Brethes, 1909 (+)
Exomalopsis ascendens Brethes, 1910
Exomalopsis latifasciata Brethes, 1909 (+)
Exomalopsis latifasciata sororcula Brethes, 1909 (+)
Exomalopsis pampeana Brethes, 1910 (+)
Exomalopsis solitaria Brethes, 1910 (+)
Exomalopsis spedazzinii Brethes, 1910 (+)
Exomalopsis testaceinervis Brethes, 1910 (+)
Exomalopsis trifasciata Brethes, 1910 (+)
Leptergatis fiebrigi Brethes, 1909 (+)
Leptometria gigantea Brethes, 1920 (+)
Leptometria lynchii Brethes, 1910 (+)
Leptometria mendoza Brethes, 1910 (+)
Leptometria patagonica Brethes, 1910 (+)
Leptometria singularis Brethes, 1910 (+)
Leptometria tarijensis Brethes, 1910 (+)
Leptometria tucumana Brethes, 1910 (+)
Macroglossapis buccosa nigriventris Brethes, 1910 (+)
Megachile verrocosa Brethes, 1909 (+)
Melissodes gratiosus Brethes, 1910 (+)
Melissodes sobrinus Brethes, 1910 (+)
Melissodes sparsus Brethes, 1910 (+)
Melissodes rufithorax Brethes, 1910 (+)
Melissoptila argentina Brethes, 1910 (+)
Melissoptila fiebrigi Brethes, 1910 (+)
Melissoptila inducens Brethes,1910 (+)
Melissoptila inducens Brethes, 1910 (+)
Melissoptila malvacearum Brethes, 1910 (+)
Melitoma nigrotarsalis Brethes, 1910 (+)
Nomada costalis Brethes, 1909 (+)
Parapsaenythia paraguayae Brethes, 1909
Protodiscelis fiebrigi Brethes, 1909 (+)
Ptilothrix albidohirta Brethes, 1910 (+)
Ptilothrix chacoensis Brethes, 1910
Ptilothrix lynchii Brethes, 1910 (+)
Ptilothrix megasoma Brethes, 1910 (+)
Svastra ameghinoi Brethes, 1910 (+)
Svastra apicalis Brethes, 1909 (+)
Svastra basirufa Brethes, 1910 (+)
Svastra brachyura Brethes, 1910 (+)
Svastra corduvensis Brethes, 1910 (+)
Svastra mimetica Brethes, 1910 (+)
Svastra patagonica Brethes, 1910 (+)
Svastra segmentaria Brethes, 1910
Svastra subapicalis Brethes, 1910 (+)
Svastra tucumana Brethes, 1910 (+)
Tetralonia chubutina Brethes, 1910 (+)
Tetralonia fulva Brethes, 1910 (+)
Tetralonia saltensis Brethes, 1910 (+)
Tetralonia sobria Brethes, 1910 (+)
Tetralonia spegazzini Brethes, 1910 (+)
Tetralonia squalida Brethes, 1910 (+)
Tetralonia tornowii Brethes, 1910 (+)
Tetralonia vara Brethes, 1910 (+)
Tetrapedia tarijensis Brethes, 1910
Trigona bipunctata limae Brethes, 1910 (+)
Trigona martinezi Brethes, 1920 (+)
Tyreothremma paraguayensis Brethes,1909 (+)
Xylocopa paraguayensis Brethes, 1909 (+)
Xylocopa bellula Brethes, 1916 (+)
Xylocopa boliviana Brethes, 1916 (+)
Xylocopa guarantica Brethes, 1916 (+)
Xylocopa martinezi Brethes, 1916 (+)
Xylocopa rotundisouta Brethes, 1916 (+)

Field Trip to Argentina: The Pleasures of the Panurginae

by
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At the end of March 1990, I returned from a second field trip, of a month's duration, to the northwestern provinces of Argentina. this expedition followed a visit there in October–December 1989. On both trips I was accompanied by **Arturo Roig-Alsina** (Department of Entomology, Snow Entomological Museum, University of Kansas, Lawrence, KS, 66045), who is a specialist on

parasitic bees. The purpose of both trips was to carry out studies dealing with the comparative nesting biology, mating behavior, floral preferences and immature stages of panurgine bees. The investigations were sponsored by the National Geographic Society. **Luisa Ruz** (Laboratorio de Zoologia, Univeridad Catjlica de Valparaiso, Chile) joined the expedition for about a week, and we were briefly accompanied on a side trip to the high Andes by **Manfredo Fritz** (Ministerio de Educacion, Consejo Nacional de Investigaciones Cientificas y Tecnicas, Insituto de Investigaciones Entomologicas Salta).

The bee fauna of northwestern Argentina is surprisingly rich in species and genera. As an example, only four species of *Callonychium* had been described from Argentina, one of which is assignable to the subgenus *Paranychium*. As the result of these trips we identified 8 or 9 new species of *Callonychium* and 6 of these belong to the subgenus *Paranychium*. Specimens of 3 undescribed panurgine genera were also collected. This wealth of new taxa indicates that previous researchers in Argentina concentrated on large bees and overlooked smaller species. The moral of the story: if we are going to understand the diversity of the bee fauna of the world, we must not overlook the smaller species.

Bees at Canberra

by
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In the spring of 1988, I visited Canberra to attend the general assembly of the International Union of Biological Sciences as the delegate of the International Commission of Bee Plant Relationships. On October 15–16, modest numbers of 2 medium-sized halictid species were collected from a range of flowers, but only mint bushes *Prosanthera* supported more than one species. No colletids or other native bees were active. One or two hover fly species visited the various flowering *Eucalyptus, Grevillea, Telopea, Indigofera, Phebelium*, and apple flowers. In October in New Zealand, *Lasioglossum* would have been foraging on at least some of these flowers.

At the Australian National Insect Collection, Entomology Division, CSIRO, Cardale is completing a catalogue of Australian Apoidea. Most of the 10 drawers of non–Australian bees are from Papua New Guinea, Indonesia, the Solomon Islands and Malaysia. There was one drawer of bumble bees, mainly with older exchange specimens. The drawer with carpenter bees *Xylocopa* had about 200 bee specimens. Any lack of bees from the Cocos, Christmas and Norfolk Islands should not be due to an insufficient collecting effort as there were extensive collections of robber flies from these islands, but no specimens of Asilidae from Lord Howe Island.

Bee Research in India

by
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I have been collecting and identifying non–apid bees, especially Megachilidae, from throughout India since 1980. Thanks to all apoid workers for their cooperation in this effort. I can now identify any megachilid collected in India, and shall be happy to do so. Recently, I received financial assistance for the continuation of this research. I would be grateful to anyone sending recent reprints on bee research, or apoid catalogues.

Perdita Nesting Sites

by
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Finding nests of solitary or communal ground nesting bees can be very frustrating business. This frustration can be greatly magnified when the bees are minute and the areas available for nesting are vast.

It is becoming increasingly evident that the nesting biology of bees in the genus *Perdita* shows great variability with some species exhibiting flightless, macrocephalic males which remain in the natal nest, and considerable interspecific variation in the numbers of females inhabiting nests. In order to find out more about the nesting biology of this genus of bees, I would like to know of localities where nests have been found, or sites which support large *Perdita* populations. Please send information to the above address.

I am particularly interested in the subgenus *Pseudomacrotera* (*Perdita turqiceps*) which occurs in Inyo, San Bernardino and Riverside counties, California. Any help would be gratefully received.

List of Endangered Species

by
Ronald J. McGinley

The Department of the Interior has published a list of endangered vertebrates and invertebrates which includes bees such as *Perdita hirticeps, P. scitula antiochensis, Bombus franklini* and fifty-seven species of *Nesoprospis* from Hawaii. For further information contact Mr. William Knapp, Chief, Division of Endangered Species and Habitat Conservation, U.S. Fish and Wildlife Service, Washington, D.C. 20240. 703–235–2771 or FTS 235–2771.

RESEARCH NEWS

Molecular Genetics of *Apis mellifera*: Genome Mapping

by
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My laboratory has become actively involved in research on the molecular genetics of the honey bee, *Apis mellifera* L., in recent years, and I am now planning a major program to physically map the genome of the honey bee. This will be in collaboration with Dr. Charles P. Milne, Jr., at Washington State University and with the cooperation of the Carl Hayden Bee Research Laboratory in Tucson, Arizona, and the nearby Center for Insect Science at the University of Arizona. We would like the cooperation and input of other honey bee researchers interested in bee genetics for this program to be a success. As a newcomer to bee genetics, I find it an exciting challenge and believe that the time is ripe to prepare molecular linkage maps for the 16 chromosomes that make up the honey bee genome. I have been developing strategies on the best way to do this and, with the help of Dr. Milne and others, I believe we can begin to make headway in honey bee genetics. Having spent a long career in the developmental and molecular genetics of *Drosophila melanogaster*, I believe that I shall be able to contribute significantly to the success of this project.

I would appreciate input and comment from anyone interested in bee genetics.

Research at the USDA Bee Lab, Weslaco, TX

by
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Currently I am a Research Associate at USDA-ARS Honey Bee Lab, Weslaco, TX. My responsibilities include maintenance of the Africanized honey bee trap line along the Texas-Mexico border, feral honey bee studies, and contributing to the African Honey Bee selective abatement Pilot Project. My other interests include feral honey bee ecology, theoretical and applied pollination, non-*Apis mellifera* bee biology, especially allodapine species (in particular the Australian genus *Exoneura* and allies) and Megachilidae. My previous appointments include Exotic Pest Analysis Staff, California Department of Food and Agriculture 1987-88, post-doctoral studies (honey bee-native and bee competition), Australian Museum, Sydney, New South Wales, 1985-87, and private apicultural development, Dubai, United Arab Emirates 1984-85.

Sizing It Up: Recent Perspectives on Colony Growth and Reproduction in Bumble Bees

by
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We welcome this opportunity to inform *Melissa* readers of collaborative work we have conducted recently in our ongoing bumble bee domestication research. While we appear to have solved many of the intransigent problems which have previously limited attempts to mass-rear bumble bees for applied pollination purposes, there is one particular aspect of *Bombus* biology to which we keep returning: that of worker numbers. Like colonies of other annual social insects, those of *Bombus* vary tremendously in terms of the number of workers each produces, and our domesticated species, *B. terrestris*, is no exception. While we are now quite proficient at starting and maintaining colonies on a large scale, we still lack control over how large a given colony will become (i.e., how many workers it will have produced before the onset of male and queen production). We believe the following influences are important and need further investigation:

1) The role of competition in limiting colony productivity. Here we define productivity as the total biomass of workers and reproductives produced in a given nest. While much of our research has been directed towards greenhouse pollination, we have placed bumble bee colonies in the field for kiwifruit pollination trials, and to minimize labour costs have allowed the bees to maintain themselves outdoors during the long New Zealand spring. These colonies show considerable variance in colony productivity even though they have all been treated the same way prior to placement outside. We consider the role of intra- and interspecific competition to be very important in mediating these size differences and at the same time acknowledge competition as perhaps the thorniest influence to examine experimentally in the field. Bumble bees do not appear to be very bold practitioners of interference competition, although references to interference effects on their foraging behaviour appear from time to time in the literature (e.g. Thomson 1989). Thus, competition effects on colony size are likely to be subtle and hard to prove. Observations of differences in colony productivity (Fisher & Pomeroy 1989) or foraging efficiency (Plowright *et al.* 1978) between areas of apparently different colony densities suggest a food supply limitation effect on colony size, although we arestill unable to demonstrate that competition is the underlying process which limits food supply. David Woodward, a PhD student at Massey, has recently studied the possible displacement of *Bombus terrestris* from *Borago officinalis* flowers by honey bees as the temperature increases during the day.

2) The timing of reproduction in limiting worker numbers. A large problem that we and others working in this area have faced is that bumble bee colonies in many cases do not follow the 'bang–bang' strategy of optimal reproduction, first espoused by Oster and Wilson (1978). In contrast to their view that it is in the colony's best interest to rear the worker 'factory' before using it to rear reproductives, we find that reproductives, particularly males, often trickle out of a colony's reproductive assembly line at irregular intervals. Some species seem to be more prone to doing this than others. Tantalizingly, other *Bombus* spp. (and *Vespula* spp.; Albert Greene, personal communication) DO seem to follow the Oster and Wilson, 'workers–first' reproductive strategy.

What influences this early pattern of reproduction, and is there anything we can do to control it, in order to produce colonies which are rich in workers? Early, or staggered reproduction may be a consequence of the battle between the queen and her workers for the control of reproductive investment in a bumble bee colony. If larval ejection, oophagy and out–and–out fisticuffs among the bees are any indication of this battle, it must surely be a ferocious and potentially debilitating one in many *Bombus* species (and again, tantalizingly, not such a source of contention in others). In one approach, cuckoo bumble bees (*Psithyrus* spp.) were used to assay possible limits on worker numbers, based on the supposition that these parasites, which live in prolonged intimacy with their hosts, would likely reflect the ways in which reproductive conflict limits colony size and reproduction. The results indicate that it is difficult for social parasites to effectively police a large colony of host bees, and that the smaller size of bumble bee colonies parasitized by *Psithyrus*, which has often been reported in the literature, may be a compromise between decreased reproductive output and better overall control of host bees by parasites.

Large colonies are unwieldy replicator vehicles for any individual, particularly the queen, which would attempt to monopolize brood rearing for its own reproductive interests in the face of large numbers of discriminating and often insubordinate nestmates. Although in New Zealand the very largest *terrestris* colonies usually produce many hundreds of queens, and the smallest produce none, there is great variation in sex ratio in the intermediate sizes. Unlike honeybees, which use worker police to maintain a type of 'community conscience' about male production (Ratnieks and Visscher 1989), anarchy appears to be the name of the game in *Bombus* societies once the queen has lost her ability to dominate workers. What promotes long–term dominance by the queen and relative stability in bumble bee social structure? We are very keen to obtain an answer to this question.

The ability to discriminate the sex and parentage of eggs and larvae, representing the offspring of many possible reproductive rivals within the nest, is an expected consequence of conflict and has been our second approach in exploring colony size. We have tried to meddle with colony ontogeny by adding male and female larvae to pre–worker colonies and observing the effects of our 'insubordination'on queen behaviour and reproduction. Our results (Fisher & Pomeroy 1990) indicate that *B. terrestris* queens are capable of sexing larvae, and that the presence of reproductive brood at times when it doesn't normally occur produces anomalies in brood rearing. While experiments like these don't tell us how to stop colonies from reproducing early, they do provide information about some of the underlying proximate mechanisms which may influence the cessation of worker production in favour of males and queens. Larval cuticular hydrocarbon profiles may provide the basis on which discrimination by adult bees is made; profiles differ significantly in terms of the types of compounds produced by each sex. Dr. David Greenwood (Department of Scientific and Industrial Research, Biotech Division, Palmerston North, New Zealand) is currently assisting us with chemical analyses.

Another approach we are employing to study temporal trends in bumble bee reproduction is a consideration of heritable factors. Such factors are often overlooked in short–term studies, but are more accessible to us now that better methodologies for long–term Bombus culture are available. We hope that selective mating experiments will demonstrate to what extent colony size is controlled by these factors, and whether artificial selection among queens is a viable and desired option.

3) Environmental influences. It is in this area that we feel the greatest immediate gains in knowledge regarding variable colony size can be made. Proximate external factors affecting colony growth are rather malleable experimentally. Bumble bees, for example, harbour a veritable witch's brew of internal and external parasites which may act alone or in concert to debilitate the health of bees and hence their brood–rearing capabilities. We have concentrated on studies of *Nosema bombi*, a cosmopolitan microsporidian which is of special interest because it appears to weaken bumble bees but not necessarily to kill them outright. Further, its effects can be controlled through antibiotic treatment, allowing us to manipulate its epidemiology to some extent. Bumble bee tracheal mite (*Bombacarus buchneri*) is another parasite which we view with suspicion in terms of possible effects on colony size. External agents which affect 'vigour' have long been thought to influence colony growth, but to our knowledge remain unquantified parameters in social insect population biology. The parasites we have mentioned appear to rely on transmission via fall queens, and as such are ideal candidates for a sublethal infection which may affect colony strength without killing all the nest members.

So far, our attempts to inoculate bees with *Nosema* spores have met with mixed results. Like other intimate host–parasite relationships, heritable resistance may complicate inoculation procedures and success. Is the disease absent in many springqueens, for instance, because they have not had contact with it, or because they

are resistant to it? As a consequence, much of our *Nosema* research has involved post hoc analysis to compare observed incidences of infection with colony performance in the field (Fisher & Pomeroy 1989). Catherine McIvor is continuing this work as an MSc thesis at Massey University.

Our results so far suggest that it may be difficult to tease apart the various, possibly interactive factors affecting bumble bee colony size. Nonetheless, investigations in this area must continue if we are to succeed in controlling bumble bee colony growth in the following important areas: reliability and predictability.

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Future Directions of Bee Research

by
The Editors

In the previous section we presented short accounts of research in progress. In the spirit of R.P. Macfarlane's article on imporant and unsolved problems in bee research (*Melissa* 3), we again encourage people to send us their opinions on the future directions of bee research. What are the most important, and critical areas of bee research? Given finite resources, what questions demand the attention of researchers, and what areas of research are the most likely to yield significant advances in our understanding of bee biology and evolution? Is the ultimate question in bee biology, "why do some bees collect a small subsample of all available pollens available (i.e., oligolectic species) while others collect a wide variety (polylectic species)?" Or are the phylogenetic placement of the family Colletidae, or the shortage of parasitic species in Australia, the crucial, unanswered questions. We hope this section of the newsletter will provide a forum for people to discuss future research projects and potential areas of collaboration.

ADVANCES IN ELECTRONIC COMMUNICATION

Rapid Social Communication among bee researchers via worldwide computerized networking

by
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State University of New York
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There is now the availability of an electronic communication network to help bee researchers to keep abreast of developing events in research and to keep in better contact with each other. This electronic network allows for very rapid spread of information and access to electronic file transfer among professional electronic mail addresses. This system is now up and running... worldwide. I am writing to encourage all researchers to "subscribe" to the network (which means get yourself into the system). A brief description follows along with the directions on how to get on (for BITNET users, or EARN users in European countries). If you are unsure of your electronic mail status (most university campuses in the United States are on BITNET), check with your campus computer people and show them this publication. You must have access to a terminal or a modem on a micro–PC. We might be able to give access in the future to other systems including public or commercial bulletin boards.

The communication System: BEE–L is a network file list dedicated to research and information concerning the biology of BEES! This includes solitary and even social bees (and maybe even wasps). We communicate about sociobiology, behavior, ecology, adaptation/evolution, genetics, taxonomy, physiology, pollination and nectar/pollen biology. Also, it is a great way to announce meetings and professional opportunities, seek help in research work or research funding, and discuss ideas.

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* * *

MEETING ANNOUNCEMENTS

Ecology of Non-Social Bees Reno, Nevada in December, 1991 (Symposium for Section C, 1991 ESA meetings)

Organizers:
Jim Cane, Dept. Entomol.
Auburn Univ. Auburn, AL 36849-5413
Tele: 205 844-2559

Rich Rust, Dept. Biol.
Univ. of Nevada, Reno, NV 89557-0015
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Pollen-foraging of specialist and generalist bees at *Solanum*. **S.L. Buchmann**, USDA ARS, Carl Hayden Bee Research Labs, 2000 E. Allen Rd., Tucson, AZ 85719 & J. H. Cane., Dept. Entomol., Auburn Univ, Auburn, Al 36849-5413.

Bees as herbivores: reproductive consequences of pollen specialization. **J.H. Cane**, Dept. Entomol., Auburn Univ., Auburn, AL 36849-5413 & J. A. Payne, S' east Fruit & Tree Nut Research Labs, P.O. Box 87 Byron, GA 31008.

Native bees as pollinators of endangered plants. **V.J. Tepedino**, USDA Wild Bee Labs, UMC 53, Utah State Univ., Logan, UT 84322.

Evolution and behavior of macrocephalic males in *Perdita*. **B.N. Danforth**, Dept. Entomol., Smithsonian Inst., NHB-105, Washington, DC 20560

Multimodal size distributions of bee faunas of North America and elsewhere. **J. Seger**, & J. Burner, Dept. Biol., Univ. Utah, Salt Lake City, UT 84112, J. W. Stubblefield, CERA, Charles Square, 20 Univ. Dr., Cambridge, MA 02138 & V. J. Tepedino, USDA Wild Bee Labs, UMC 53, Utah State Univ., Logan, UT 84322.

Modelling parental investment: cell construction and sex ratios. **R.W. Rust**, Dept. Biol. Univ. Nevada, Reno, NV 89557-0015.

Trap-nesting bees: when are the ecological interpretations qualitative, quantitative or artificial? **P.F. Torchio**, USDA Wild Bee Labs, UMC 53, Utah State Univ., Logan, UT 84322.

Ecology and origins of mites in solitary bee nests. **G.C. Eickwort**, Dept. Entomol., Cornell Univ., Ithaca, New York 14853.

Evolution of cleptoparsitism in bees. **B.A. Alexander**, Dept. Entomol., Univ. Kansas, Lawrence, KS 66045.

Non-*Apis* Bees and Their Role as Crop Pollinators Logan, Utah in August, 1992

by
John D. Vandenberg
Bee Biology and Systematics Lab,
Utah State University, Logan, Utah, 84322-5310

An International Workshop on Non-*Apis* Bees and Their role as Crop Pollinators will be held in Logan, Utah, USA in August, 1992. Its purpose will be to facilitate exchange of current information on all aspects of bee biology and to improve prospects for establishing non-*Apis* bees as crop pollinators. The four-day workshop will include both invited symposia and contributed papers. Informal meetings and small workshops are encouraged and will be facilitated. English will be the language of the workshop.

The meeting will be hosted by the Bee Biology and Systematics Laboratory (USDA Agricultural Research Service) and by Utah State University, Logan, Utah. The conference will take place on the University campus where food services and living accommodations will be available. Off campus housing can also be obtained.

DAY 1 will be devoted to the biology, nest associates and management of leafcutting bees (*Megachile*). DAY 2 will be set aside for similar discussions of other pollinators, including *Bombus* and *Osmia*. DAYS 3 and 4 will be reserved for bee ecology, behavior, evolution, biosystematics and other basic research topics.

Logan is situated in a beautiful valley in the Wasatch Mountains of northern Utah. Typical August weather is dry with warm days and cool nights. Commercial alfalfa seed fields pollinated by the alfalfa leafcutting bee (*M. rotundata*) can be visited within a half-day drive of Logan. Many outdoor activities are available, and seven U.S. National Parks are within a one-day drive.

To be put on the mailing list for future announcements and for further information, please contact: Dr. John D. Vandenberg, USDA-ARS Bee Biology and Systematics Laboratory, Utah State University, Logan, Utah, USA, 84322-5310.

Social Insect Studies in the Soviet Union Rybnoe (Ryazan District) in September, 1992

by
Vladilen E. Kipyatkov
Department of Entomology, Faculty of Biology, Leningrad State University, Universitetskaya nab., 7/9, Leningrad, 199034, U.S.S.R.

The All-Union Entomological Society Section for the Study of Social Insects was organized in 1989. The First Colloquium of the Section was held in Leningrad 2-8 October, 1990. The participants of the Colloquium have elected the Coordination Council of the Section (9 members; chairman – Dr. Vladilen E. Kipyatkov, secretary – Elena B. Lopatina) and discussed the main directions of further work. 31 papers on ants, bumble-bees, honey-bees, termites and wasps presented to Colloquium are printed now in the **Proceedings of the First Colloquium** (Leningrad, 1991, 212 pp., in Russian with English summaries for the most papers; available from V. E. Kipyatkov). We plan to establish a newsletter of the Section (two issues in a year, in two languages), to organize the Colloquia of the Section every two years and to publish their Proceedings in Russian and in English. The Second Colloquium of the Section will be organized in September, 1992 in Rybnoe (Ryazan District, about 160 km from Moscow). We would be happy to see our colleagues from other countries among the participants of the Second Colloquium. Interested persons and institutions may contact with Dr. Vladilen E. Kipyatkov at the address given above.

* * *

BOOK REVIEWS

New From Cambridge Press
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Published June 1987:

BUMBLEBEES

Oliver Prys-Jones and Sarah A. Corbet.
Department of Applied Biology, University of Cambridge

Bumblebees are attractive and conspicuous insects and can often be identified without being caught. Their behaviour is readily observed and they form ideal subjects for field studies. This book introduces bumblebee natural history, emphasizing topics that offer scope for further research. The keys, supported by illustrations in colour and black and white, are designed to enable the reader to name the British species easily and reliably. By including keys, techniques and references as well as ideas, the book aims to encourage and facilitate individual studies of bumblebee biology by students at schools and universities and others interested in natural history.

READERSHIP: school biologists, entomologists, beekeepers, amateur and professional ecologists, university students for projects, general readers.

NATURALISTS' HANDBOOK 6
210 x 148mm c. 96 pp. c. 80 line diagrams 4 colour plates

CONTENTS:

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Recent Apoid Literature: 1987–1990

by The Editors

The following list of references has been compiled primarily from the National Agricultural Library's computer-based bibliographic retrieval system, as well as from reprints or lists of papers kindly sent to us by subscribers. Papers dealing specifically with the commercial aspects of *Apis mellifera* or *Megachile rotundata* have not been included, but papers of general biological interest have been included. Key words included most bee genera, familial and subfamilial names as well as pollination biology and bee/plant interactions. We admit in advance that these citations have not been checked for accuracy.

At present the roughly 800 references shown below are included in a single file created by v. 1.4 of the bibliographic software package Pro-Cite (Address: P.O. Box 4250, Ann Arbor, Michigan, 48106; 313-996-1580). We would like to make this and expanded lists available to other Pro-Cite users, or users of other, compatible, bibliographic programs. We hope in the future to send out this list on disk to readers who agree to add references or check those already input. Additionally, it is planned to supplement this list with references gathered from Biological Abstracts or Zoological Record, which should extend the list back to the late 1970's.

As a preliminary step towards making this reference list available to *Melissa* readers on disk, we would be willing to send copies in the form of a WordPerfect 5.0 text file to anyone who sends us a request and a blank 3.5 or 5.25 inch diskette.

Please send us comments on the utility of the reference list and how we might make it more generally available to researchers. And please continue to send reprints and reference lists to Ronald McGinley for inclusion in upcoming lists.

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