REPARTS FROM ECN MEETING, RENO - 1992

Insect Collection Conservation

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Catharine Hawks, National Institute for the Conservation of Cultural Property (NIC, 3299 K Street NW, Suite 403, Washington, DC 20007, tel: 202-625-1945, FAX: 202-625-1485) made a presentation to attendees in the Entomological Collections Network meeting in December 1991 and subsequently met with several ECN participants over dinner. She is Project Coordinator for The Conservation and Preservation of Natural Sciences Collections Project. The following is a summary of notes taken by Jon Gelhaus (The Academy of Natural Sciences, Philadelphia), Winnie Hallwachs (Area de Conservacion Guanacaste, Costa Rica), John Morse (Clemson University Arthropod Collection, South Carolina), and Kris Simpson (Wilbur R. Enns Entomological Museum, University of Missouri - Columbia) during the sessions with Cathy. We especially appreciate her help in editing and contributing significantly to this summary.

Collections conservation research:

Very little research has been conducted on preservation of entomological and other biological materials. Information on specimen treatments can help researchers evaluate the scientific research potential of specimens, and allow staff to monitor the impact of the treatments on specimen preservation over time. Curators, therefore, should keep accurate records of chemicals and handling techniques for specimens to facilitate research, including addition of lines for this purpose on specimen data labels and extra fields in the database associated with the collection in order to document killing agents, temporary and permanent preserving agents, rehydrating agents, fumigants, and other treatments. Special histories of particular specimens, experiments with expendable specimens, and other investigations should be recorded.

Labels:

Paper.—100% cotton rag or linen rag paper is excellent (paper of this kind has lasted for centuries). The pH should be in the 6.5-7.5 range (certainly no more than 8.5, because at this point cellulose can begin to degrade via alkaline hydrolysis, and alkaline materials in contact with specimens will degrade many pigments and proteins, and could degrade DNA). Beware of paper that is buffered (high pH) or "acidfree" (the term is inconsistently used). Resist all paper is an example of a "wet-strong" paper. These usually are treated with melain, urea-formaldehyde, or other resins in processing. The treatment lowers the pH to about 5.5, a level at which cellulose materials begin to undergo acid hydrolysis.

Silicon "papers" are chromatography sheets made of fine silica gel on a plastic substrate; they become brittle when frozen. Inks, especially aniline dye inks, will separate and "feather" on this surface (a simple way to test the composition of an ink, actually).
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Red pigments in papers (e.g., in holographic labels) are notoriously degradable and light sensitive; Rotring® red drafting ink may be best for this purpose (Gibson and Garcia-Pereza 1990). A useful review of label paper choice and management was provided by Hawkins and Williams (1986). University Products, Inc. (address below) has information on paper products.

Ink—Black drafting inks designed for writing on drafting film and designed for use in technical pens (e.g., Rapidograph® pens) are quite good; Rotring® and Pelican FT Black® were among the best (Williams and Hawks 1986, 1988).

Laser printed labels—The print may rub or flake off the label, especially in fluids. Toners should be carbon black pigment in a stable resin binder (polyester, silicone, epoxy, or possibly an acrylic). They will work well if heat and pressure fused to the paper in the photocopier/printer process (ASTM D-4598, D-3458 [regarding image quality]; Preservation Photocopying in Libraries and Archives 1987). Gordon Nishida (Bishop Museum) suggested baking the labels at 300 F for 5 min, but this also accelerates aging of the paper. The finished print can be tested either by tape (tape and peel) or by pressure (sliding sheet of white paper over label under 200 g between glass plates or microscope slides) or by soap and water (but washing with a load of clothes in a washing machine may put the failed toner on your clothes).

Felt-tip pens—Pigment-based, disposable, felt-tip pens are currently being tested by Steve Williams at Texas Tech University. Some of these are indeed carbon black pigments, which should be stable over time. The nature of the various carriers remains unknown (manufacturer secrets). Steve's results should be published soon, perhaps in Collection Forum.

Pinned specimens:
Pins—Copper and nickel coatings on pins react with specimen fatty acids to cause greenish blue corrosion (stearic compounds). There are many formulations for stainless steel which may affect specimen longevity; stainless steel pins need 12-18% chromium. The fact that there is only one international supplier suggests the possibility for negotiating an optimum standard stainless steel formulation for pins. (One of the recommendations coming out of the NIC Conservation and Preservation of Natural Sciences Collections Project is that an ASTM committee of entomologists, collection managers, conservators, materials scientists, metallurgists, etc. should be formed to develop specifications for a good insect pin.)

Print glue—Good alternatives include B-72 (transparent, used on paintings) or polyvinyl acetate (PVA) resins (AYAF or AYAA, control consistency and elasticity by dilution with acetone or ethanol). PVA resins are available from Conservation Materials Ltd. (1165 Marietta Way, Sparks, NV 89502, tel: 702-331-0582 or 702-359-0582). Do not use PVA emulsions (the common white glues), which form crosslinks and acidify over time. Fingernail polish also is not recommended (it cross-links, shrinks, and becomes increasingly insoluble over time).

Unit trays—Adhesives for the paper covers can be very alkaline (pH 11). One manufacturer of chipboard trays was citing his products as "acid-free" on the assumption (not founded in fact) that this alkaline adhesive would buffer the acids in the wood-pulp chipboard. Many paper-covered chipboard trays have very acidic adhesives, as well as acidic board. The paper covers may start out either buffered or neutral, but in close proximity to the very acidic chipboard, will not remain that way. Polyethylene, polypropylene and mylar pinning bottoms are relatively inert and very stable, therefore recommended; avoid polystyrene. Although the glues commonly used to hold these bottoms in the box perhaps are not a problem,
one could use 3M 415 double-sticky tape to be sure.

**Drawers:** Organic acids from wood and wood products migrate either directly (through contact between materials) or through air in a gas phase. Alkalis migrate only through contact, they do not normally evolve as volatiles from solids. These can affect specimens and promote metal pin corrosion (although stainless steel pins are somewhat resistant). Glass and wood respond differently to changes in temperature and RH; consequently, their bond is destroyed over time and they cease to seal well. No wood-finish coating will stop the migration of acids and peroxides from wood products. Water-cure polyurethane coatings are likely to be non-reactive towards specimens (produce no harmful volatiles). Shellac in an alcohol base is likely to be equally safe for use on wood and wood products (never use on specimens), as it cross-links and becomes insoluble over time.

**Cabinets:** Cabinet seals should be checked; cabinets need to be level to seal tightly. They should be 4 - 6 in above the floor for ventilation, leveling, cleaning, and minimizing harbors for dermestids, roaches, etc.

**Compactors:** Recommended in earthquake-prone areas. They seem to perform well.

**Relative humidity:** Usually dry is better than humid; 40-50% RH is excellent for most natural history materials. Even lower, say 30-40%, might do for most entomology collections. The most important thing is that the RH should not fluctuate rapidly. A stable RH matters more than any particular setting, as long as it remains low enough to prohibit mold growth. Above 65% can be dangerous. Silica gel may be useful in drawers or cabinets.

**Pest control for dried specimens:**

DDVP ("No-pest strip"). Produces liquid phosphoric acid, gaseous acid esters, and volatile peroxides which promote oxidation (aging) of organic materials (Williams et al. 1986).

**Naphthalene and paradichlorobenzene (PDB).** Recrystallize in saturated environments in the presence of oils and fats, may affect cabinet paint and cause peeling. Naphthalene mobilizes fats. PDB promotes pin corrosion. As for most chemicals with an aromatic ring, both of these can attack polystyrene.

Some alternatives to chemical fumigation - low temperature heat (60°C, may affect specimen pigments), carbon dioxide gassing, contact insecticides (to prevent entry into the collection), oxygen deprivation (either with oxygen scavengers or nitrogen gas), and freezing.

**Freezing:** Freezers may be chest or upright, but should be good quality, well-insulated, and equipped with a temperature probe to permit the internal temperature to be monitored without opening the freezer. Good quality frost-free freezers are effective if kept closed throughout the freezing cycle. Freezer must be able to drop the temperature rapidly to -20°C (~25°C best) and hold it at that level for 7-10 days (one cycle should suffice). Each specimen or small drawer of specimens must be sealed in a heavy-duty polyethylene bag to help prevent moisture changes during the freeze/thaw cycles. Use of dehydrated silica gel as a desiccant inside the bag should mitigate the problem of moisture condensation on the pins. Freezing specimens with a high moisture content (e.g., freshly collected and not yet fully dry or exposed to high RH prior to freezing) will cause damage through ice crystal formation in tissues. (Above based on recent experiments at Canadian Conservation Institute).

**Health effects:** Very little quantitative information is available about health effects of chemical fumigants on curatorial staff. Information is available from the following:

Center for Safety in the Arts (Arts Hazards News), 5 Beckman Street, New York, NY 10038
212-227-6220

Arts, Crafts, and Theatre Safety
181 Thompson Street
New York, NY 10012
212-777-0082

**Fluid preservation:**

**Ethanol.** Preferred over isopropanol because ethanol's molecule has no side chain and is therefore less likely to be reactive. Denatured ethanol also has some damaging additives. The proper concentration has not been determined by any scientific research. Apparently, a solution of 60-80% works reasonably well; higher concentration causes brittleness, lower allows biodeterioration (rot). Changing specimens from ethanol into isopropanol is not advised, although changing from isopropanol to ethanol is alright. The pH of alcohol cannot be measured with strips or standard electrodes. To take a reliable pH of an alcohol-based solution requires a liquid junction electrode (c. $200). Hymenoptera reportedly deteriorate in alcohol at room temperature.

**Glycerine.** Hygroscopic and thus absorbs water from the air. If not well sealed, it scavenges sulfur and acids from the air; it leaches these from other materials with which it is in contact. It may clear proteins, not digesting them but changing their refractive index.

**Stoppers and seals:** Natural rubber and neoprene deteriorate with time and their additives and dyes leach into the alcohol; the quality control in their manufacturing is uneven, resulting in poor dependability. The white neoprene stoppers of genitalia vials dissolve readily. A plastic screw cap with a conical polyethylene seal or a polyethylene snap cap works best for individual vials; polyethylene foam (Ethafom) also works well inside screw caps as a seal. For multiple vials in a collection jar, vials each should have a plastic cap with a hole and should be inverted with the cap down (in case the jar seal fails, thereby allowing more time to catch
the problem before the alcohol drains from the vials). For gaskets on ball tops, teflon may be less reactive than most of the other ring gaskets available, but this style will never seal well without constant replacement of gaskets (before they wear out!).

Glass.—Chemically resistant borosilicate glass is recommended for fluid-preserved specimen containers because it does not leach silica or alkalis into the fluids as cheap, commercial-grade glassware will do.

Microscope slides:

Mounting medium.—Hoyers’ and other media usually must be sealed (“ringed”). Most known media and rinsing materials have unsatisfactory characteristics. Degraded slides with water-soluble media may be rehydrated over room-temperature, distilled water and reringed. Rehydration with preconditioned silica gel in a closed container works best (Weintraub 1991). At the high RH generated in a rehydration chamber, mold will grow unless 1-2 drops of 95% ethanol are added to the silica gel. The ethanol vapor prevents microorganism growth, but avoid using too much ethanol, as it may affect the slide-mounted specimens (similar care must be taken for rehydrating dried specimens, e.g., for pinning or repinning). Some studies by Charles Messenger (Univ. of Nebraska) suggest that B-72 (cited above as a glue for point-mounted specimens) may be a useful mounting medium. Cathy urged curators to meet with conservators concerning slide mounting and to document each step of the procedure chosen.

Photographic slides and prints:

Film.—Kodachrome ASA 25 is the best color film available at this time, but conservators of photographic materials do not regard any color process as “archival.” Only black-and-white photos and negatives are truly long-lived. Store slides and prints in cool, dry place, away from volatile acids. Inquiries can be addressed to the following:

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Douglas Nishimura
Image Permanence Institute
Frank Gannett Memorial Building
P.O. Box 9887
Rochester, NY 14603-0887
716-475-5199

Magnetically stored sounds:

Douglas Nishimura also is a good source of information about magnetic media as are the Orthoptera laboratory at the University of Michigan and the following:

Robert Grothe
Library of Natural Sounds
Cornell Laboratory of Ornithology
159 Sapsucker Woods Road
Ithaca, NY 14850
607-254-2409

Other information sources:

The National Institute for Collections Conservation (address above, ask for Martha Anderson) provides the following: (1) Conservation Assessment Program (CAP) assessments both for American Association of Museums (AAM) members and non-members. (2) The Collections Care Information Service (CCIS), which maintains a list (#3 below) of reprints of several "classic" conservation studies that are now out of print but which are available for $0.20/pg, minimum $2.00. (3) Collections Care: A Selected Bibliography (1990 - $15.00). (4) Training for Collections Care and Maintenance: A Suggested Curriculum, vol. III: Natural Sciences (1991 - $25.00). (5) Other publications and information on request.

"Natural History Conservation." This is a free newsletter from the ICOM Conservation Committee Natural History Working Group available via:

Robert Waller
Head Conservator
Canadian Museum of Nature
P.O. Box 3443, Station D
Ottawa, ON K1P 6P4
CANADA
613-952-3518

Art and Archaeology Technical Abstracts. Also, there is an AATA Conservation Information Network on-line database available concerning collections care. For AATA’s and in-
formation about CIN’s on-line database, contact:

Getty Conservation Institute
4503 Glencoe Avenue
Marina del Rey, CA 90292
213-822-2299

Canadian Conservation Institute (CCI) serves museums in Canada and publishes reports of conservation research. Their Analytical Research Service will test materials free for staff of Canadian museums and publish the results. The index for their Commercial Product Analytical Reports is free; they will distribute a few reports at no charge, but there is a charge for the entire series. They have other information available at no charge and provide some excellent tools (such as the slide rules for estimating light damage or for choosing appropriate shipping materials) at very low cost. Cathy spoke highly of this organization for which there is no equivalent centralized conservation service facility for museums in the United States.

Canadian Conservation Institute
1030 Innes Road
Ottawa, ON K1A 0C8
CANADA, 613-998-3721

The Smithsonian Institution’s Conservation Analytical Laboratory is active in archeometry and art/paper/objects conservation research, but is not a service organization for US museums as CCI is for Canadian Institutions. The CAL will handle information requests for sources on a particular topic, however (call Marge Cleveland at 301-238-3712).

American Association for Testing Materials (AATM) produces reports that occasionally are relevant to natural materials preservation.

Society for Preservation of Natural History Collection (SPNHC) membership is $15.00/yr, includes journal Collection Forum. SPNHC is also currently developing a conservation resource directory.

Natural History Newsletter, Ottawa.
American National Standards Institute.
Several conservation suppliers provide information on their products. Two useful catalogs are those from the following:
University Products, Inc.
ATTN: Christine Allen
South Canal Street
P.O. Box 101
Holyoke, MA 01041
800-628-1912
Conservation Resources International
8000-H Forbes Place
Springfield, VA 22151
800-634-6932

References:

Taxonomic Cataloging Relational Database
Written by Gary Shapiro in cooperation with Randall T. Schuh
This relational database developed in RBase for DOS is designed to facilitate the preparation, query, and output of systematic catalogs. It has the flexibility to accommodate and document the provisions of the Code of Zoological Nomenclature as well as to maintain a bibliography, list of available names, classification, the catalog entries themselves, and information on geographical distributions and biotic associations.

The structure of the database is relational, consisting of the following tables: bibliographic, available higher category names, available genus/species names, higher category catalog entries, genus/species catalog entries, and biotic associations. Additional tables maintain the current classification, establish the relationship between available and valid names, and perform other necessary database functions.

The database is designed to function as an expert system so the relations among tables are transparent to the user and no particular knowledge of the database structures is necessary for successful use of the program. Access is gained through a series of menus, each of which describes the functions that can be performed. Separate modules allow the user to catalog the primary literature, previously prepared catalogs, query the database for information on the taxonomic hierarchy, synonyms, available names, catalog entries, distributional data, and biotic associations, and backup and otherwise maintain the database.

The current version is designed to treat individual families as separate databases, and will document the following levels in the hierarchy: subfamily, tribe, subtribe, genus, subgenus, species and subspecies. Logic built into the database performs data entry checks at many levels, and allows for flexible search strategies.

Compiled and executable module versions will be available for a modest fee. A 386-based IBM compatible machine with 640K of RAM is recommended for databases of any size. For additional information, contact:
Dr. Randall T. Schuh
Department of Entomology
American Museum of Natural History
Central Park West at 79th Street
New York, New York 10024

From Checklists and Catalogues to Taxonomic Databases and Biological Information Systems
Larry Speers
Biological Resources Division
Centre for Land and Biological Resources Research
Agriculture Canada

Everyone recognizes that biological nomenclature is the "information carrier" of biological knowledge and that the products of systematic research are critical for accurate transfer of information within the scientific community. Unfortunately the historical products of systematic research (group-oriented revisions, checklists and catalogues) often do not supply the end users who are not trained in taxonomy with the information they require in an easily accessible form. While it is recognized that the only efficient approach to conducting systematic research is the study of monophyletic groups, most end users of taxonomic information are interested in answering questions that require information that crosses phylogenetic lines. Questions such as: 1) What are the pests of a particular crop? 2) What are the potential biocontrol agents for a particular pest? 3) What are the best bioindicators to monitor pollution? These questions can only be answered if one has access to information on many different...
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phylogenetic groups. If the systematic community is to meet the needs of these users of taxonomic information, it is essential that methods be developed that allow the information being produced by individual researchers to be incorporated into larger information systems that can be searched across phylogenetic groups.

Systematists have had to deal with large quantities of information associated with specimens ever since it was realized that where specimens were from (both geographically and ecologically) might be important and that examining more specimens is more informative than examining fewer. For these reasons, systematists have been handling the field data associated with specimens by various means and in many ways; these activities can be grouped under the general headings of information transfer and information analysis. Some types of information transfer are: putting collecting data on specimen labels, combining label data from multiple specimens into lists of collecting records or onto dot distribution maps (for individual taxa), and producing lists of taxa based on collections in a given area or by a particular expedition (or based on any other grouping criteria). Information analysis includes (but is not limited to) searching for patterns of geographical, ecological (habitat, microhabitat, or host), elevational, and temporal (seasonal or long-term) distributions within or among taxa.

Reflex® is a program we have used heavily in the last few years for data storage, transfer, and analysis. It is a flat-file (i.e., non-relational) database management and analysis program that is powerful but relatively easy to use for many kinds of graphical analyses as well as for cross-tabulations, storage, and very flexible information transfer, e.g., to manuscripts and labels. It shares many features with spreadsheet programs, such as allowing complex formulas in fields, graphs, and reports and having several built-in statistical functions. The flexible graphical capabilities of Reflex® allow easy searching for geographical, elevational, ecological, and temporal patterns within a whole database or any specifiable part of one; several examples were presented. Beyond merely summarizing the available data, this sort of analysis can highlight the possible presence of such phenomena as geographical or elevational species replacement, niche partitioning, or population expansion or contraction over time.

We systematists are inundated with rapidly accumulating information of many kinds that must be transferred into various forms and from which we wish to extract patterns of different sorts. It is valuable to scrutinize what we do with information, how we do it, how different activities are (or could be) interconnected, and how we can redesign some procedures to re-
duce duplication of effort and maximize the usefulness of our efforts. The more we can harness technological advances toward this end, the more we can get done and the better job we can do of it.

**Software Development and Use**

*abstract*

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Gary Noonan demonstrated a program he has written in Foxpro version 2.0. The program handles the management of transactions involving exchanges, gifts, loans and other transactions involving specimens. It follows the data standards adopted by the Entomology Collections Network in its 1990 meeting. The program automates the task of handling data associated with transactions. It contains three main database files, a database about people, one about transactions, and one about taxa involved in transactions.

When a new transaction is started, the curator enters the name of the addressee involved with the transaction. If that person is in the people database, the database shows the name and address and asks the curator to confirm that the proper person has been found. Upon such confirmation, the program relates the new transaction to the proper person in the people database and supplies data such as the person's address. Once a person is in the people database, his/her address need never be entered again. The people database tracks people with "bad" loans and warns curators who are starting a new transaction with such persons. The database prints two transaction forms for the addressee and one for museum files.

The program can automatically generate loan inquiry forms. The curator specifies how long a grace period to allow, and the program then scans for all loans overdue by more than the grace period. It generates a loan inquiry form for each such overdue loan and records the date for that inquiry. The wording of the inquiry form changes according to how many unanswered loan inquiry forms have previously been sent regarding the loan.
During an overdue scan the program marks as bad all loans that have previously had three unanswered inquiries. It prints a report for each such marked transaction so that the curator can decide how to handle the situation. A related routine handles loan renewals.

Another feature of the program is automatic updating of loan totals as partial returns are recorded. The program keeps track of the total specimens on loan and also will, if desired, keep track of the number of each taxon on loan for a transaction. This updating feature will be combined with a forthcoming collection inventory module to allow for automatic updating of collection inventories when loans are marked as closed. This updating feature will be designed to handle situations such as where studies by the borrower result in the returned taxa having different taxa designations than when originally lent.

When curators close a loan, the program checks to be sure all specimens have been returned. If not, the program tells the curator of the discrepancy. If the curator elects to close the loan, the program opens a memo field for the curator to give the reason for closing a loan whose specimens have not all been returned. When the loan is closed, the program prints four forms recording the closure, one form for the addressee and one for museum files.

The program provides methods for finding particular transactions or for looking at groups of transactions (examples: transactions begun during a given time period; transactions closed during a given time period; transactions involving a certain taxon or curator; etc.).

Curators can have the program generate a variety of reports about transactions. General reports give all relevant data about transactions that meet criteria (such as transaction open or closed, begun during given time period, etc.) selected by the curator.

Summary reports five statistical data about numbers of transactions, specimens, etc. for transactions meeting criteria selected by the curator.

The program will be compiled to run independently of FoxPro and can be distributed to systematists as desired. It will be part of a projected series of programs that manage and analyze both collection and associated research data. Major program modules will be: (1) Transactions Module for handling all specimen transactions such as exchanges, gifts and loans (module written and in process of being debugged); (2) Accessions Module (for handling accessions not yet written); (3) Inventory Module (for maintaining inventories of collections, making reports about holdings, storing classification data - will use data from transactions program to update inventories as they change due to loans, exchanges and gifts; program not yet written); and (4) Ecological and Habitat Module (will handle research data about geographical and ecological information; writing in progress).

Noonan also briefly demonstrated the use of the text oriented database askSam for handling literature citations and showed how the graphics program Designer could be used for generating certain types of geographical maps or other necessary illustrations.

Regional Sorting Centers

Jim Woolley, presenting.
Texas A&M University, Insect Systematics Research Group:
Horace Burke, Ed Riley, Joe Schaffner, Bob Wharton, Jim Woolley
College Station, TX 77843

A sorting operation under development at Texas A&M University was presented as an example of how a regional sorting center might work. This group is attempting to put together a centralized structure for sorting bulk samples of insects (screen-sweeps, malaise trap, canopy fogging samples etc.) and for distributing target taxa to a network of collaborators. The program will be developed using material generated through TAMU field work in the southwestern U.S. and Mexico. Expansion to accept samples from other collaborators and institutions (e.g. ANTSE, INBIO) will depend upon the success and continued support of the sorting program. We believe it is critical to build upon existing relationships, therefore, to a large extent the network of collaborators presently includes specialists with which TAMU systematists have exchanged material on an ongoing basis. A team of five sorters will be trained with general expertise at the level of insect orders and major families and with particular expertise to sort target taxa, generally families or subfamilies. Sorting will proceed in two stages, the first roughly to ordinal level groups which will be distributed directly, queued for incorporation into TAMU, or sorted further to target taxa. At present, 20 specialists have agreed to accept material under long-term loan arrangements that, in most cases, will involve return of 50% of the specimens, mounted, labelled and determined, to TAMU. In most cases specialists should decide which specimens from bulk samples should be mounted and labelled. Feedback from collaborators will result in new arrangements with new specialists. Various issues relating to the requirements and design of databases for storage and retrieval of locality data, centralized labeling preparation, and management and tracking of the sorting operation were discussed. Networking of regional sorting centers with the Smithsonian sorting center, INBIO, and similar organizations worldwide will provide part of the infrastructure necessary for large-scale inventory of insect biodiversity. Development of such networks will require coordination of specialists willing and able to sort target taxa as these persons are the limiting resource upon which all such efforts depend.
ECN PROGRESS REPORT

Checklist of Insects of Canada, United States and Mexico

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Systematic Entomology Laboratory, USDA
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Washington, D.C. 20560

One of the major problems facing entomological activities, including databasing of collections, is the lack of basic taxonomic catalogs to standardize nomenclature. Insects have usually been ignored in biodiversity programs as there are no comprehensive catalogs. Some specimen databasing projects can be delayed until taxonomic databases are completed, but many specimen databasing projects are already underway and cannot wait. This is especially a problem for state surveys based at institutions that do not have comprehensive libraries. We will handicap entomology for years to come if we do not address this problem immediately. Clearly, we cannot revise all taxa within a reasonable period of years, but we can make the current status of knowledge readily available to all who need it now.

Checklists of insects exist for various states, other countries, and checklists of other groups for the World exist. Clearly the task of assembling a checklist of insects is feasible. The only difference between this proposal and other checklists is magnitude. The knowledge needed to build the checklist is today scattered across numerous published works, most of which are outdated, and personal research files. Only specialists know where to find all (or at least most) of the names.

The purpose of the checklist project is three fold: 1) to get the specialists to automate, to store their knowledge in computerized databases where it may be easily updated; 2) to develop, test, and prove the process of consolidating the knowledge of the specialists easily and quickly to generate useful tools for the scientific and general community; and 3) to provide users with a checklist of insects. Given the success of this initial project, then we will continue to add more useful data to the database, periodically releasing more comprehensive and updated versions.

BACKGROUND:

Last year Scott Miller proposed a list of North American insects. His idea was discussed and endorsed by the Entomological Collections Network at their 1991 Reno meeting. After the Entomological Collections Network established the project, a working group met at the ESA meeting in Reno. The following work plan evolved from discussions at that meeting and was finalized through telephone conversations and correspondence. Solicitations have and are being made now to find funding to carry out the plan.

SCOPE:

All insects found to occur in Canada, Mexico and United States of America and their territories. After much discussion, the scope of checklist was defined as the political units as this will accommodate the widest set of views. Thus, the potential user base will be the broadest, which means the greater the potential funding base.

PLAN:

The tentative action plan envisions five levels of activity. 1. Entomological Collections Network: a. Official sponsor of the project; b. Selects working committee. 2. Coordinating Committee: a. Defines project (data contents and standards, scope, output, etc.); b. Seeks funding, prepares proposals, etc.; c. Provides overall coordination among group coordinators and merge group, sets time schedule; d. Selects Group Coordinators; e. Selects Merge Group; f. Acts as editorial board; and g. Interacts with outside users in regards to data. 3. Group Coordinators: a. First level of integration of data; b. Select contributors; and c. Insure data conforms to project standards, etc. Group coordinators are not expected to merge the data from the contributors/specialists, but, instead, to insure its conformity to project standards. 4. Contributors/Specialists will gather, enter and verify data. 5. Merge Group: a. Establishes prototype, tests, etc.; b. Merges data from group coordinators; and c. Generates and disseminates output, etc. The following tasks and preliminary times are envisioned: 1. Select Working Committee (Done, Reno 1991); 2. Prepare work plan, set preliminary data design, standards, etc. (Done); 3. Working Committee select Coordinating Committee and Group Coordinators (In progress); 4. Group Coordinators select contributors/specialists (In progress); 5. Survey contributors/specialists to assess status of data, problems, etc. (Fall 1992); 6. Conduct test of merge operation (Winter 1992); 7. Seek support (funding, approvals, etc.) for full project; report to ECN (November-December 1992); 8. Contributors/Specialists accumulate, verify, etc., data (In Progress); 9. Merge data, produce statistics summary, printed copy, CD-ROM, etc. (Summer 1993??) 10. Final output published, etc. (Fall 1993??).

Input: The available literature provides much of the data needed. That literature is summarized in Kosztarab and Schaefer (1990). A survey of the community will be developed to more precisely determine the status of current knowledge and the willingness of specialists to contribute. To ease the burden of data accumulation, the two levels of data management will be used (Figure 2). The data will be divided into blocks, with a group coordinator for each. The group coordinator will work with the specialists who will actually enter the data. The group coordinator will ensure that the data submitted conforms to standards, is machine readable, etc. The data blocks are defined taxonomically except that exotic distribution will be handled as a separate data block. The
Bishop Museum already has the entire Hawaiian arthropod fauna database. They will cover the other US Pacific territories. Specialists may use whatever database system that they want so long as they can provide Xbase (dBase) compatible files. The merge group will, however, provide PC (and Macintosh?) database programs to those who want them.

Output: The output of the process will be both traditional and modern: A printed version and a digital version as CD-ROM will be produced. A summary of the project including statistics will be generated and published in a widely-read source, such as American Entomologist.

Data Elements: The first version of the checklist will include data on classification (Order, Family, Genus and Species), on nomenclature (the author, year, and status of all genus and species group names), and distribution. Distribution data will be encoded as a series of logical flags for the following geographical units (Nearctic? Neotropical? Oceania? Alaska? Canada? Greenland? United States (lower 48)? Mexico? Hawaii? Puerto Rico (and Virgin Islands)? Samoa? Guam?). Special flags will be used to broaden the usefulness of the database to specialized users (Immigrant? Economic Importance? & Endangered Species?). Also, each record (name) will be identified as to who provided the data and when.

The future depends on users' demands and willingness to support further enhancements. The checklist represents a framework to which more information can be attached. The distribution data could be expanded to small political (states, provinces, etc.) or biogeographical (life zones, etc.) units. More information on economic importance and hosts (associates) of species could be added. A regular schedule of updates and enhancements could be established (once a year?) or the consolidated data could be maintained.
permanent online where users could access it via INTERNET.

A detailed proposal will be distributed at the 1992 ECN meeting to be held in Beltsville, Maryland. Copies can be obtained by me directly.

COLLECTION NEWS

Specimen Management: Prep Time - Prep Costs

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In an earlier issue of ICN Newsletter (ICN, 1989 2(1):8), one of us (TLE) reported on extraction time for specimens from bulk alcoholic samples. Steinle in the same issue (ICN, 1989 2(1):8) also reported on this aspect, but using different types of samples. Since the time of those reports, we have been keeping track of an array of information pertaining to the gathering and preparation of bulk alcoholic collections for the simple reason that this type of sample will be more and more commonly found on the doorsteps of entomological museums as biodiversity inventories increase. How to handle these and how much it costs will be the first thing museum and departmental administrators will ask. It will also be the grist of higher level decisions (Foundation, Institution, Congress) when general allocations are made.

Our model is based on field work carried out by us in Peru using the fogging method (Erwin, 1989) for collecting bulk samples of mixed arthropods in 70% ethanol. These samples (referred to as lots and each assigned a Lot#) are gathered from tree canopies and from the undercanopy in microhabitats of various kinds. Beetles and spiders are extracted at the field site, labelled and stored in 2 dram shell vials for transport to the NMNH (beetles) or turned over to a Peruvian co-investigator, Diana Silva (spiders). In Washington, D.C., each beetle sample is sorted to morphospecies, one specimen of each is pinned/pointed and labelled temporarily with an alphanumeric identifying name in the form ‘CARA 000’ ‘LOT 0000.’ A partially preprinted label [CARA and LOT#] speeds the process, so that only the actual numbers are hand written at the time of identification and preparation of the synoptic specimen. On the bottom of the name-lot label is written the total number of representatives of that species in the sample. A growing synoptic collection is maintained at hand for checking the identity of species from each subsequent lot. Data about these species is entered onto an EXCEL 4.0 spreadsheet which gathers data at the beetle family level and at the Lot level. Sheets are linked and embedded with formulas which keep track of numbers of specimens and species. At appropriate intervals, specimens are prepared for the general collections at NMNH. Approximately 95% of the specimens in these canopy samples need mounting on points and virtually all receive 3 labels. At this point, the specimens are collection-ready at a Level 3 (McGinley, ICN, 1989 2(2):19-24).

A typical undercanopy sample (n=350) will contain 514 beetle specimens (.07-35 mm) of 415 species, weigh 19.8 grams (dry weight), and represent 50 families. Extraction, sorting and preparing, and data entry of a synoptic set requires 10 hours per sample. An additional 2.2 minutes (n=2,127 specimens) is required for making each additional specimen in the sample collection-ready. In the meantime, these additional specimens are stored in a freezer at 1-3°C; extraction only takes place when an investigator finds important material in the synoptic collection and needs additional study specimens.

A breakdown of costs beginning with the trip, salaries, field stay, prep time, and all materials comes to $1.28 per specimen. This figure is based on the situation at the NMNH and our salaries. Variation will occur at other institutions. This figure does not include overhead and cabinetry needed for storing the specimens at the museum.

Literature cited:


Communal Sorting of Insects from Bulk Samples

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One of the problems facing insect taxonomists is a backlog of field collected material that has to be processed before relevant specimens can be studied. These backlogs often develop because mass collecting techniques such as yellow pan traps, Malaise traps, or flight intercept traps are now being routinely used in field studies. The backlog of material can occur at several stages depending on the available manpower and particular preparation needs for the taxonomic groups involved. For example, large numbers of Hymenoptera can be collected in a few days of trapping or active collecting; a season of collecting results in huge numbers indeed. Most of the Hymenoptera will be micro-hymenoptera (less than 5 mm long) but all specimens are inaccessible, and therefore useless, for taxonomic study until they are extracted, critical point or chemically dried where necessary, individually mounted, labelled and sorted to some functionally useful category.
After initial mass collection of insects into liquid preservative in the field, the steps taken from extracting the insects from the sample to final preparation for taxonomic study may be summarized as follows: 1) in the laboratory, Hymenoptera are separated from non-Hymenoptera and stored in alcohol or other preservative in a coldroom or freezer; 2) further sorting to superfamilies or family can be done at the same time as 1) or later to facilitate retrieval of particular groups; 3) selected specimens or all the material is mounted (after critical point drying, if necessary) - specimens that are not mounted are returned to a cold room or freezer for long term preservation; 4) mounted specimens are labelled; 5) if not sorted to family (step 2) the specimens are sorted to a functionally useful category; 6) specimens are arranged by geographical region in museum drawers under the appropriate family or other category so that loans can be made quickly and easily to specialists. Each of these stages presents a potential bottleneck in processing museum specimens. The method described below is efficient for dealing with the bottlenecks of steps 1 and 2.

How does one process the biomass collected to retrieve useful specimens prior to mounting and labelling? The most common solution, and apparently the simplest, has been to let the individual worker who had the drive and interest sort out his/her particular group from whatever samples he/she could acquire and nothing more. If the rest of the sample was lost, so what. But today there is increasing concern about loss of biodiversity. Responsible taxonomists, and large taxonomic institutions in particular, cannot afford to collect massive amounts of material just so that one or very few groups of interest are retrieved and the rest of the sample is thrown out or allowed to deteriorate. All specimens that are not damaged or inadequately preserved by the collecting method used should be extracted so that they can be sent to other specialists, or preserved adequately for future generations of specialists to study. This is particularly important for samples taken in areas whose biota is endangered.

For several years it has been the policy of the Hymenoptera unit at the Canadian National Collection of Insects (CNC), Ottawa, that the maximum number of useable Hymenoptera specimens in a sample be extracted. During the past 5 years most CNC hymenopterists have conducted weekly communal sorting sessions to extract all Hymenoptera from bulk collections of insects. Samples are initially preserved in 70% ethanol after having been collected into alcohol, concentrated salt solution or glycol using various mass collecting techniques. As soon after collection as possible the samples are washed gently in fresh water and placed in clean 70% ethanol in air tight jars. Because the samples may only be processed several years after collection due to an accumulated backlog, they are kept in a coldroom (+2°C) which greatly retards deterioration (color loss, etc.) of the specimens.

Communal sorting has four advantages over individual sorting: 1) it eliminates or reduces boredom and lack of drive to get the samples sorted; 2) it permits sharing of information and learning from one another; 3) it eliminates repeated handling of the material which therefore reduces or prevents breakage of specimens and 4) it ensures that all Hymenoptera are extracted, not just the groups of immediate interest to a particular specialist. Anywhere from 3-6 hymenopterists take part in a sorting session. Usually one person prepares the samples to be sorted that day, ensures that proper labels are prepared and checks that samples do not get mixed up. A time is set for sorting, e.g., every Wednesday afternoon for 3 hours, and everyone is encouraged to attend though in practice the sorting pool is often disbanded in summer because of field trips and vacations. Each sample is first screened into coarse, medium and fine fractions using ¼" and ½" hardware screen cages. The coarse fraction is sorted without a microscope by spreading it out in shallow water in a white enamel pan with black transverse lines every 5 cm. Medium and fine fractions are sorted under stereomicroscopes at low power using sorting dishes with raised lines every 10-12 mm. At the CNC we immediately separate all the Hymenoptera extracted into 8 main groups - Ichneumonidae, Braconidae, Chalcidoidea, Cynipoidea, Proctotrupidae s.l. (including Ceraphronoidea and Scelionoidea), Symphyta, Aculeata (except bees) and bees. These groupings were selected simply to reflect the taxonomic expertise at the CNC. Because we do not have an aculeate specialist, aculeates are not further subdivided, other than to remove the bees. Small or rare groups such as Trigonidae, Ebenioidea, etc. are also sorted separately. A single bulk sample may yield several hundred to thousands of specimens sorted. Anywhere from 1 to 12 samples might be sorted at a given session, depending on their richness. For maximum efficiency at a sorting session some preliminary work is necessary. Proper labelling of jars with standardized labels both inside and on the lid is needed, and the jars are grouped by date of collection for a given locality. Preprinted (hand written or, nowadays, computer generated) labels for placement in each vial are also prepared ahead of time.

For the period 9.1 to 19.xii.1991, 45 sorting sessions were held and 327 bulk or partly sorted (i.e. pure Hymenoptera) samples were sorted. This yielded 99 vials of ichneumonoids, 95 of braconids, 204 of chalcids, 179 of proctotrupoids, 154 of cynipoids, 180 of aculeates, 114 of bees, and 71 of sawflies. The average sorting session lasted for 3 hours (not including time for a coffee break and screening of samples) and included 4 people. Although no counts were made of the numbers of specimens obtained there were undoubtedly many
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thousands. When deemed appropriate, samples from the same locality but consecutive dates, were combined, e.g., four consecutive weekly samples combined. Thus, although almost every sample would contain at least a few chalcidoids the total number of chalcid vials could be reduced by 20% without undue loss of information.

The CNC now has hundreds of vials of pure Hymenoptera sorted to major groups waiting to be processed, either at the CNC or available to specialists in other institutions for extraction of their own group. This separate collection of ethanol preserved specimens by taxonomic group has encouraged several specialists to visit the CNC purposely to retrieve the particular taxa they want to study. If the Hymenoptera had never been extracted and partially sorted few specialists would have visited the CNC other than to study the pinned collection. Our main problem is no longer one of unsorted Hymenoptera in bulk samples but rather one of having the sorted Hymenoptera mounted and labelled in a reasonable time. Alternatively, one could invite specialists to the CNC to extract particular taxa for study from the pure accumulated Chalcidoidea, etc. Although the bottleneck has just been displaced further towards the final goal of mounted and labelled specimens, at least it is at a point where specialists are encouraged to examine the unprepared material.

One may ask what is the point of extracting so many specimens from such a large number and diversity of bulk samples. The goal is to obtain the best possible representation of a taxonomic group for research purposes. Good series of specimens in excellent condition are needed for proper assessment of variability within a species, for preparing good descriptions, and for dissection, scanning electron microscopy, or other techniques that require specimens to be destroyed. Good taxonomic revisions with workable keys to a given fauna depend ultimately on good representative collections. Without the latter the former is not possible and a taxonomist cannot obtain the species concepts and an accurate idea of the diversity of a taxon that is needed to provide accurate identifications. Mass collecting and communal sorting is thus driven by the need for better taxonomic research on often poorly known groups of organisms.

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The insect collection housed in the Entomological Division of the Finnish Museum of Natural History numbers about six million specimens. The pinned collection (dry collection) is by far the most extensive, but in certain groups a considerable number of specimens are preserved in alcohol.

Practically all insect groups are represented in the collections. Particularly rich in specimens are the collections of Coleoptera, Lepidoptera, Diptera, Hymenoptera and Hemiptera. Regarding different zoogeographical regions, the Palearctic and the Nearctic regions are well represented, but there is also much material from the Ethiopian region.

Besides material from Finland, recent additions include large quantities of Lepidoptera, Coleoptera and Diptera from Siberia, Coleoptera from Uganda and Hemiptera and Coleoptera from the Near East.

Numerous type specimens from different insect groups are deposited in the collections. Especially important in this respect are the Coleoptera collection of Mannerheim, the Hemiptera collections of Bergroth and Reuter, and the Diptera collection of Frey.

Staff:
Prof. Olof Biström
Head of the Division. Coleoptera: Dytiscidae: Hydrophorinae of the subtropics and tropics; faunistcs of the Finnish Coleoptera.

Dr. Antti Jansson
Head curator (Hemiptera). Heteroptera: Corixidae, world revision.

Dr. Kari Mikkola
Head curator (Lepidoptera). Taxonomy of Noctuidae and Geometridae; zoogeography of the Holarctic Region; industrial melanism.

Dr. Hans Silfverberg
Curator (Coleoptera). Chrysomelidae: Galerucinae and Criocerinae of the Old World; faunistcs of northern European Coleoptera.

Dr. Jyrki Muona
Curator (Coleoptera). Taxonomy and systematics of Eucnemididae and Staphylinidae; faunistcs of Finnish Coleoptera.

Dr. Anders Albrecht
Curator (Diptera, Hymenoptera). Diptera: Pipunculidae: systematics, taxonomy; Heteroptera, Homoptera Auchenorrhyncha and Aphididae faunistcs; Lepidoptera: larval taxonomy.

Dr. Larry Hulden
Curator (Hemiptera, minor orders). Heteroptera and Homoptera faunistcs; insect-mapping.

Mr. Pekka Villamoa
Collection assistant (Diptera, Colembola). Diptera: Sciaridae, taxonomy; Colembola faunistcs.

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INSECT COLLECTION NEWS

Workshop on Canadian Systematics

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On June 16 and 17, 1992 many systematists from across Canada met at the University of Ottawa to discuss the nature of potential collaboration between government departments and agencies, universities, industries and professional societies regarding the future role and responsibilities of the Canadian federal government with regard to research, collections, training and services in systematics.

This workshop was convened primarily on the initiative of Agriculture Canada and primarily as a means of seeking solutions to issues raised in a late 1990 review of the Biological Resources Division (BRD), formerly Biostatistics Research Center; home of the Canadian National Collection of Insects, CNIC (see Dang 1992). This review recommended that the BRD "should ... ensure its work is more closely directed to the needs of and benefit to the agri-food sector" and particularly that "... collections of insects that are not significant to Canadian agriculture should only be maintained if external sponsors to whom the insects are significant, provide resources for its maintenance or maintain it themselves." Aside from directly addressing specific issues such as these, it also was realized that future challenges facing systematics research in Canada could not be met by one organization or even several organizations working separately. There was an urgent requirement to define the respective roles and responsibilities of BRD and other organizations and to work towards establishing linkages in order to address future needs.

The workshop had its beginnings in 1991 when scientists and management at BRD met to discuss a means of responding to the review in a manner suited to the short and long term interests of both parties. It was agreed that a plan promoting collaboration among a number of agencies with similar interests would be a good route to follow. Various federal agencies including Forestry Canada and Environment Canada were approached by BRD and a number of meetings arranged. One other agency approached by the BRD was the Canadian Museum of Nature (CMN), now a crown corporation, but with strong ties to federal government. Through CMN and its mandate as a natural history museum, it was hoped that BRD could develop an appropriate partnership capable of resolving issues raised in the BRD review and of concern to Agriculture Canada management.

Meetings with the CMN, BRD and Forestry Canada (FC, already a stakeholder in BRD through secondment of research scientists and technical staff) eventually resulted in a draft Memorandum of Understanding early in 1992 expressing the desires of these three agencies "to cooperate along with other potential partners in sustaining, and enhancing where possible, key systematics functions by entering into a mutually recognized agreement relating to selected areas of activity in Canada." Such an MOU was a timely venture with respect to the current political and scientific climate in Canada and was based on the views that:

1) "The maintenance and wise use of biodiversity is essential to the proper functioning of Canadian and world ecosystems and the sectors and people they encompass and sustain;"

2) "Systematics provides an essential framework for understanding biodiversity that is necessary for its optimum maintenance and understanding;"

3) "Effective and efficient overall operation and management of systematics activities in Canada is necessary to ensure that results are meeting the needs in all sectors in an optimum fashion;"

4) "Reorientation of the nature and focus of research and budget limitations requires a more coordinated approach to the Canadian systematics effort in government agencies and universities."

Combination of the broad-based mandate of the CMN with the special expertise and resources of BRD/FC could ensure a brighter future for Canadian systematics.

Approximately 80 individuals representing the CMN, various federal agencies, universities, provincial museums and other agencies, private industries and environmental groups met for two days to address systematics issues with respect to three main subjects: collections, research and services. The workshop focussed on the scope and form of the Agriculture Canada/Forestry Canada/Canadian Museum of Nature Memorandum of Understanding with the hope that such a partnership would be approved in principle by the Canadian systematics community. It was further hoped that the MOU could act as a starting point for the development of a national "network" of agencies with systematics interests and programs.

On the morning of June 16, the workshop was introduced by Dr. Paul Marriage and Dr. Richard Asselin (BRD) and Dr. Bernard Philogène (University of Ottawa) and overviews were given by Dr. J.-C. St-Pierre (Agriculture Canada), Dr. Alan Emery (Canadian Museum of Nature) and Dr. Ben Moody (Forestry Canada). Dr. Ian Smith (BRD) addressed present and future systematics research needs and priorities in Canada and the opportunities that exist for collaborative ventures; Dr. Paul Callling (BRD) discussed collections issues in a similar context and pointed out the special problems facing the collections of BRD; Dr. Valerie Behan-Pelletier (BRD) discussed services, primarily the needs and future of identification services; and representatives of Carleton University, University of Ottawa and McGill University (Macdonald College) discussed the future of sys-
INSECT COLLECTION NEWS

Arthropod Collecting and Forest Conservation in Guatemala

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Guatemala is a small country with high biodiversity. How high? Hard to say because so little work has been done here compared with countries such as Costa Rica and Peru. Nevertheless, because of the presence of many isolated mountain ranges, I think its diversity is comparable to that of Costa Rica, but with a quite different species composition, especially at higher elevations. My own expertise, passalid beetles, indicates 48 species for Costa Rica, 58 for Guatemala (and only one species in the U.S.A.). These two countries have the highest passalid species diversity in Central America; yet, of 106 total species, only 20 (19%) are found in both countries.

Guatemala, like most tropical countries, faces the same problems concerning habitat destruction. A basic conservation strategy for saving tropical forests is to increase their monetary value in the natural state. INBIO, in Costa Rica, is attempting to do just that, an arthropod systematic collection being an integral part of their project.

For 16 years I have been working to develop an arthropod collection at the Universidad del Valle de Guatemala. This collection, including contributions from other staff and students, totals nearly 20,000 labelled specimens - a small drop in the bucket considering what needs to be done.

The last two years I have been enlisting my students in the biodiversity inventory process. I teach a two semester general biology course sequence to approximately 200 students each year, from which 4-10 students major in Biology, with similar numbers in the biology related fields of...
Agronomy, Ecotourism and Forestry. Most students, however, major in engineering fields or computer science. For many years I have required that all students do an original research project, in groups of five students, which is presented as a paper styled for journal publication and in Science Fair format for "La Bioferia."

Recently, I have encouraged projects that involve arthropod biodiversity studies. For example, this term I have some 80 students working on biodiversity projects. They will spend one or two weekends in 16 different areas of the country. Some will emphasize leaf litter fauna, others canopy fauna, etc. The students, all novices, will be advised by advanced students in my Entomology course. These senior students will be coordinating and analyzing the collection data for their entomology course, as well as helping in identification and experimental design. Approximately 20 second year students (from various majors) who worked on similar projects last year, have volunteered to help as well.

In fact, concerning these volunteers, I have discovered that non-biologists have much interest in helping with species conservation and biological inventory. Our university administration recognizes the importance of our systematic arthropod collection and has appointed a full time curator starting June 1, 1992, who will help coordinate volunteer efforts.

Major problems I foresee concern, of course, funding. So far, we have been able to keep up with equipment (cabinets, drawers, pins, pinning trays) through our normal budget, some grant money and donations (especially pins) from visiting scientists. Our building facilities are fine; I have a large room with space for 60-80 Cornell cabinets. At present, we have nine cabinets.

Aside from our building facilities, we are working on a shoestring budget. We plan to apply for grant money from various institutions; however, that takes time and, meanwhile, the forests are being destroyed rapidly. My objective in writing this article is to obtain feedback from our readers concerning other sources of support. We encourage visiting scientists (we had over 12 last year) and will do all we can to facilitate their stay. How else might we rapidly augment our efforts? For example, we urgently need one or more foggers for canopy work. Any ideas? Could we develop exchange programs with foreign institutions: specimens for equipment?

We mustn’t lose sight of our ultimate goal: preservation of the forest ecosystems. How can we engender a monetary value to the standing forests? I don’t think arthropods can do it alone. We will need to integrate botanists, zoologists, biochemists, anthropologists (especially in Guatemala, with the many different Mayan Indian cultures) and ecotourism. In this respect, the University already has recognized collections in botany and most areas of zoology - again facing the same problems described above. Any persons or organizations interested in working on this project with us would be welcome, if only to suggest strategies and goals.

ANNOUNCEMENTS

1993 ASC Annual Meeting

The Association of Systematics Collections will hold its 1993 Annual Meeting on May 7-9, 1993, in Pittsburgh, PA at the Carnegie Museum of Natural History. The theme is "Public Relations for Systematics Collections and Research." The featured event will be a workshop on building local community support for collections and collections-based research, including suggestions for working with trustees and friends' groups. There will also be an in-depth discussion of the draft documents of "Systematics Agenda 2000" (the effort to determine research needs and priorities in systematics), with a session on implementation strategies. A business meeting and discussion of NSF programs will be held on May 7th. A riverboat cruise will be the scene for the annual banquet and award ceremony on May 8. There will be opportunities to visit the Carnegie collections and the Hunt Institute for Botanical Documentation. For program and hotel information, contact: ASC, 730 11th St NW, 2nd Fl., Washington, DC 20001; (202) 347-2850.

First Latinamerican Reunion of Scarabaeoidology

Date: June 2-6, 1993.

Place: Universidad del Valle de Guatemala, Guatemala City and Purulhá, Baja Verapaz.

Registration fee: professionals: US $50.00; students: US $25.00 (or equivalent in Guatemalan currency).

For more information write to: Dr. Jack C. Schuster, Universidad del Valle de Guatemala, 1705 NW 79th Ave., Miami, Florida 33120-1112, USA; fax: 502-2-380212.

Notice of Review on Animal Candidates

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Office of Information Transfer
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Fort Collins, Colorado 80524

On November 21, 1991, the U.S. Fish and Wildlife Service published a notice in the Federal Register (5612253:58804-58836) that included all candidate animal species, including insects, that are under consideration for possible listing under protection of the Endangered Species Act. Entomologists and other biologists are invited to comment on this proposal. Specifically, information is sought on the status of the enumerated candidates and information on...
Entomology Collections Network

Annual Meeting - December 5-6, 1992

Beltsville Agricultural Research Center, Beltsville, Maryland

Friday, December 4 4:00 - Tour of BARC available

Saturday, December 5 (BARC-West, Building 003, Auditorium)
8:30-8:40 - Opening remarks (Richard Brown, Mississippi Entomological Museum, Mississippi State, MS)
8:40-9:15 - Institute of Museum Services: programs and funding (IMS representative, Washington, DC)
9:15-9:40 - Activities and projects of the Society for the Preservation of Natural History Collections (Carolyn Rose, SPNHC, Washington, DC)
9:40-10:15 - National Science Foundation programs for collections and biotic surveys and inventories (Leonard Kristsalka, NSF/Div. Environmental Biology, Washington, DC)
10:15-10:40 - Break
10:40-11:20 - Materials conservation for entomological collections (Catherine Hawks, National Institute for Conservation, Washington, DC)
11:20-12:00 - Fluid preservation (Robert Waller, Conservation Section, Canadian Museum of Nature, Ottawa, ON)
12:00-1:30 - Lunch
1:30-2:00 - The Association of Systematics Collections: present and future activities (Elaine Hoagland, ASC, Washington, DC)
2:00-2:30 - Data security and ownership: panel discussion
2:30-2:50 - Report on ASC Workshop on Data Processing Standards for Natural History Collections (Ron Hellenthal, University of Notre Dame, Notre Dame, IN)
2:50-3:10 - Break
3:10-4:40 - Computer software demonstrations:
- QUIKMap mapping program (Larry Speers, Biological Resources Division, Agriculture Canada, Ottawa, ON)
- Biological and nomenclatorial data (Gary Gibson, Biological Resources Division, Agriculture Canada, Ottawa, ON)
- Other(s) to be announced
4:40-5:55 - Insects of North America database (Scott Miller, Bishop Museum, Honolulu, HI and Chris Thompson, Systematic Entomology Laboratory-USDA, Washington, DC)
5:00-7:00 - Mixer (College Park Holiday Inn)

Sunday, December 6 (BARC-West, Building 003, Auditorium)
8:30-9:00 - Biodiversity sampling methods for terrestrial taxa: spiders (Jonathan Coddington, Smithsonian Institution, Washington, DC)
9:00-9:30 - Biodiversity sampling methods for aquatic taxa (John Morse, Clemson University, Clemson, SC)
9:30-10:00 - Biodiversity sampling methods for immature taxa (David Wagner, University of Connecticut, Storrs, CT)
10:00-10:15 - Break
10:15-11:00 - Business meeting
11:30 - Departure to Baltimore for ESA meeting (or to Washington Metro or airports)

Registration fee is US$20. For more information on local arrangements, contact Mike Schauff at 202-382-1784.

Scientific Illustration Publications

Elaine R.S. Hodges
Department of Entomology
NMNH, Smithsonian Institution

Several publications have come out recently on scientific illustration. The Guild Handbook of Scientific Illustration, edited by Elaine R.S. Hodges, was published by Van Nostrand Reinhold in 1989 (576 pp, over 630 bl/wl and 36 color illustrations, $85.95). It is a comprehensive collection of chapters, written by 45 experts in their fields, covering general concepts of illustration (e.g., light on form, archival considerations), drawing and painting techniques (e.g., pen and ink, carbon dust, watercolor), subject matter areas (the handling of specimens such as plants, insects, birds, fossils), related subjects such as microscopy and copy photography, and business aspects. (For U.S. orders: Van Nostrand Reinhold, Mail Order Department, P.O. Box 668, Florence, KY 41022-0668. Outside the U.S., correct ordering address may be obtained from VNR, 115 Fifth Ave., N.Y., NY 10003.)

Another excellent resource is A Handbook of Biological Illustration, 2nd ed., by Frances W. Zweifel, 1988, The University of Chicago Press, Chicago IL 60637 (137 pp, 61 bl/wl illustrations, $27.00 hardcover, $9.95 paper). This book provides concise, basic coverage of the field of scientific illustration including gnomes of advice on black & white drawing techniques, reproduction, retouching photographs, measuring subjects, graphs and maps, and poster sessions.
In the Boletim da Associação Portuguesa de Biologistas, Número 10, 1º Trimestre 1990, is an article by Pedro Salgado, "Ilustração científica - Uma Ilustre Desconhecida," pp. 2-5. He discusses the field of scientific illustration and the interaction between scientist and artist. This is one of a series Mr. Salgado is writing for the Boletim. In Número 11, Abril a Junio 1990, pp. 4-6, "Ilustração científica, Apresentação visual de dados," he provides advice on how best to represent scientific data.


Friends of the Natural History Museum, London

H.S. Barlow
PO Box 10139
50704 Kuala Lumpur
Malaysia

Most ICN readers will be aware of the problems which NHM has encountered recently (see Laurence Mound's article in ICN-4:1-3).

In response to this, a Friends Organization has been set up, in the form of a company limited by guarantee, with charitable status, which provides exemption from tax in respect of gifts made by United Kingdom taxpayers.

The Friends organize a social program centred round the Museum, and produce a quarterly newsletter. Friends are also entitled to free entry to the Museum, and 10% discount in the Museum shops and restaurant. Subscription £15 p.a. For details please write to H.S. Barlow, PO Box 10139, 50704 Kuala Lumpur, Malaysia, or Miss Adele Carritt, 14A Shelley Court, Tite Street, London SW3 4JB, United Kingdom.

and research materials are intact. The National Tropical Botanical Garden received heavy damage to infrastructure, but the plants appear to be largely intact (or expected to recover).—Scott Miller (Bishop Museum).

Virgin Islands Beetles:

Richard Miller and I have received NSF funding to finish my long-running effort to provide a guide to the beetles of the Virgin Islands. In connection with this, I would like to request the loan of ALL beetles from the Virgin Islands (U.S. and British) that I have not previously borrowed (those already recorded). These islands include: St. Thomas, St. John, Tortola, Virgin Gorda, Anegada, St. Croix and some 200+ smaller islands and cays. We can identify and return the vast majority of material quite quickly, based upon my identified voucher collection of over 750 species. Undescribed species and groups being worked by others will require more time. We would like to borrow the material for up to two years, and receive permission to dissect as necessary for taxonomic determination. Also request permission to forward the material to cooperators preparing fascicles, as necessary. Thanks.—Michael A. Ivie, Department of Entomology, Montana State University, Bozeman, MT 59717.

Insect BITNET Group

The entomology discussion group in BITNET, organized by Peter Kevan from the University of Guelph, has attracted more than 200 participants.

Those interested in participating in the group should write to: LISTSERV@UOGUELPH or LISTSERV@VM.UOGUELPH.CA; and leave the following message: SUB ENTOMO-L,<text> (name, organization, etc.).