

MASTER

DEVELOPMENT OF
A CENTER FOR BIOSYSTEMATICS RESOURCES

Summary Report
for Period November 1, 1979-October 31, 1980

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ABSTRACT

The objective in the development of a Center for Biosystematics Resources is to provide a centralized source of information regarding the biological expertise available in the academic/museum community; and the federal and state regulations concerning the acquisition, transport, and possession of biological specimens. Such a Center would serve to facilitate access to this widely dispersed information.

The heart of the Center is a series of computer assisted data bases which contain information on biologists and their areas of expertise, biological collections, annotated federal regulations, and federal and state controlled species lists. In the last year these data bases have been updated and expanded. Additional data bases have been constructed and are being maintained.

The purpose of this three-year contract with the Department of Energy is to continue the updating and revision of the original data bases, make the information they contain readily available to the Department of Energy, other government agencies, the private sector, and the academic community; and to achieve financial independence by the end of the three-year period.

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SUMMARY REPORT TO PROJECT OFFICER

(Year 2 of a 3 year project)
DEVELOPMENT OF
A CENTER FOR BIOSYSTEMATICS RESOURCES
Contract No. DE-AC02-79EV10026

Submitted By

THE ASSOCIATION OF SYSTEMATICS COLLECTIONS

In November of 1978, the Association of Systematics Collections (ASC) initiated a three year program to create a Center for Biosystematics Resources (CBR). Core funding to establish the CBR has been provided by the Department of Energy (DOE) under contract number DE-AC02-79EV10026. The principle objective of the Association in establishing the Center was to develop a single resource to which federal, state, and local governments, private industry, and interested individuals could turn in order to locate desired or essential services within the biosystematics community. It has been the intent of the Association that the Center become self-sufficient at the conclusion of the three year development program.

Establishing the Center and its subsequent financial independence has required that we address a number of tasks under the following topical areas: 1) Services; 2) Data Bases; 3) Computer Hardware; 4) Computer Software; and 5) Promotion. The work accomplished during the past year toward these various tasks is described below and, where appropriate, the relevance of the task to the future financial independence of the Center is discussed.

SERVICES

Services provided by the Center fall into three classes: informational, list development and maintenance, and project management.

Informational Services

Response to the informational services of the CBR has been excellent as exhibited by these comments from users: "A wonderful service. I am very pleased with the information received. Thank you very much." and "Absolutely outstanding. You have been more than helpful. What more could I ask for?" Not a single negative comment has been received. From 1 November 1979 through 1 October 1980, the Center has responded to 196 inquiries for CBR information services.

The various types of informational services available through the Center are described below.

1. Referral services.-- Referral services are provided using the Registry of Taxonomic Resources and Services, a computer based system containing the names of biologists and biological collections, their areas of taxonomic expertise, and the consulting services they will provide (Table 1). While the

services offered by the Registry are conceptually easy to understand, inquiries involve many complex associations of the various data elements. Many inquiries are actually compound questions that take considerable effort to answer. For example, one individual may simply want to know who can identify species of a particular Order of birds from California, while another may desire to know all the collections that contain invertebrates that were collected along the Pacific Coast. The first question involves only a few minutes of computer time, while the second requires a complete search of all Registry invertebrate collection files. This service offered by the Center is unique.

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 TABLE 1: Services Available through the Registry
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Individual Services	Collection-Oriented Services
Collection of specimens	Repository for specimens
Preparation of specimens	Access to collections and data
Sorting of specimens	Access to library facilities
Identification of specimens	Identification of specimens
Information about species	
Biological reconnaissance	
Training of personnel	
Review of reports, impact statements	
Evaluation of project designs	
Provision of expert testimony	
Preparation of scientific illustrations	
Consultations of computer based management for collections	
Review of grant/contract proposals	

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 2. Permit requirements.-- The Center responds to inquiries which request information concerning: a) clarification of federal regulations and wildlife permit procedures; b) the kinds of permits that are needed to collect, transport, and import various species of plants and animals; and c) schedules for submitting permit applications and the persons to whom the applications should be submitted.

Of particular interest to inquirers have been the rules and regulations concerning endangered and threatened species. Typical questions include: a) What species are controlled? By whom? b) What are the procedures for handling endangered and threatened species? c) Is a particular species that is considered to be endangered under U.S. law also controlled under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)? d) Is a particular species on the U.S. Endangered Species list? e) Is an endangered species, according to U.S. law, also protected by a particular state?

To ensure the broadest communication of this information, the ASC has published a Directory of State Protected Species and a Directory of Federally Controlled Species. Each is kept current through an annual subscription program. Publication of these volumes would not have been possible without the facilities and data resources that have been compiled through the Center. Based on current sales, it is anticipated that income from sales of these publications will provide a significant portion of the support needed to make the Center self-supporting in the future.

List Development and Maintenance Services

The data bases maintained by the CBR (see pages 3 through 6) and ASC's unique relationship with the biosystematics community, readily enable the Center to develop and maintain various specialized lists for agencies or organizations. Funds derived from such work will contribute directly to the support of the Center. The Center has negotiated a contract with the American Society of Mammalogists (ASM) to maintain a "Recent Literature" list. The first ASC-produced issue will be distributed in December 1980.

Project Management Services

The Center also provides management services for the direction of interdisciplinary projects, usually at a much lower cost and with earlier completion dates than if an agency, institution, or organization were to attempt the project themselves. Recently, at the request of the U.S. Fish and Wildlife Service, the Center submitted a proposal to the Eastern Energy Land Use Team (EELUT) to develop and maintain a checklist of "Vertebrates of the United States, its Territories, and Possessions." This proposal was accepted and the development phase of the project began on 30 September 1980. As with the listing services, overhead derived from such projects will contribute directly toward the support of the Center, and the data compiled will enhance the Center's service potential.

DATA BASES

During the past year, the data bases maintained by the Center have grown both in number and complexity. Each has contributed to the Center's ability to respond to inquirers. The data bases currently maintained by the Center are described below.

Registry - The Registry of Taxonomic Resources and Services is a computerized data base containing both the names of professional biologists and of systematics collections. Each is cross referenced by taxonomic discipline, geographic area of expertise, and the services the biologists or collection personnel are willing to provide to others. Since up-to-date information is essential in this data base, a continuous effort is maintained to update the information contained in the Registry. In the first updating effort, response from registrants has been 80 to 85%. Selected taxonomic areas of the Registry are also being expanded and refined by increasing taxonomic and geographic resolution and adding qualifying parameters. Questionnaires for the collection of data to the family level for insects, mammals, fish, birds, herps and vascular plants are complete. A system for handling specific taxonomic and geographic comments provided by the respondent has been developed and will enable Registry personnel to provide much more precise answers to inquiries. In addition, as a result of procedural and programming changes derived from

the updates, the Registry data files are being reformatted to provide a more efficient method of making corrections and changes in the future. These same changes should also provide for more simple methods of querying the data base.

A problem noted in the first year of the project was addressed during the updating procedure. With the questionnaire in its original matrix form, it was possible for a respondent mistakenly to indicate an expertise in an area where no such expertise could possibly exist. For instance, an expert on alligators might accidentally check the column indicating expertise on alligators from Alaska instead of Alabama. While the next update of the registrant's file would correct this error, a general request to list the experts on alligators will indicate that one registrant feels that alligators are to be found in Alaska, a "nonsense" statement. A matrix of potential "nonsense" information has been reviewed by the registrants as part of the updating process and is being incorporated in the data base reformatting to eliminate "nonsense" answers. In addition, the revised questionnaires discussed above contain a format change which eliminates the possibility of this kind of error.

Data for the Registry is collected via questionnaires, with the questionnaires corresponding to various taxonomic categories (Table 2). With the continued use of the Registry system it has become apparent that certain taxa within these categories should be rearranged and some of the categories themselves should be changed in order to increase the efficiency of data collection, storage, and retrieval. Geographic categories of information are also being increased with the option of specific geographic comments by taxonomists. One of the major problems with the original distribution of taxa within the Registry categories was that many taxa occurred in more than one place, for instance, information on gastropods was listed both in the "Invertebrates" category and in the "Mollusk" category. Therefore a collection of gastropods may have been listed in two places in the Registry data base or in either "Invertebrates" or "Mollusks." By insuring that a single taxon is listed in only one Registry category, time involved in producing a Registry query response has been reduced greatly. The most thorough changes have been made in the Invertebrate taxa and they are not as yet complete. All references to crustaceans and mollusks have been removed from the "Invertebrates" category. In addition, the category "Invertebrates" has been divided into three categories for the collection and storage of data. These are "Invertebrates - Terrestrial," "Invertebrates - Fresh Water and Marine," and "Invertebrates - Parasitic." Table 2 lists the changes in taxonomic and geographic data collection and management which have been made in the last year.

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TABLE 2: Changes in Taxonomic Categories Referenced in the Registry

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<u>Taxonomic Categories</u>	<u>Taxonomic Changes</u>	<u>Other Changes</u>
Mammals	taxonomic resolution increased to the familial level	geographic resolution increased
Birds	taxonomic resolution increased to the familial level	geographic resolution increased
Amphibians	taxonomic resolution increased to the familial level	geographic resolution increased
Reptiles	taxonomic resolution increased to the familial level	geographic resolution increased
Fishes	taxonomic resolution increased to the familial level	geographic resolution increased
Invertebrates	taxonomic resolution increased where appropriate	geographic resolution increased
Arachnids	(taxonomic revision due in 1981)	geographic resolution increased
Crustaceans	taxa incorporated from the "Invertebrates" form	geographic resolution increased
Insects	taxonomic resolution increased to the familial level	geographic resolution increased
Non-parasitic Helminths	(taxonomic revision due in 1981)	
Mollusks	taxa incorporated from the "Invertebrates" form	geographic resolution increased
Protozoans	incorporated into the various "Invertebrates" categories	
Vascular Plants	taxonomic resolution increased to the familial level	geographic resolution increased
Nonvascular Plants	(taxonomic revision due in 1981)	geographic resolution increased
Parasites of Plants	incorporated into the various "Invertebrates" categories	-----
Parasites of Animals	incorporated into the various "Invertebrates" categories	-----
Vertebrate Fossils	(taxonomic revision due in 1981)	(geographic and temporal revision due in 1981)
Invertebrate Fossils	(taxonomic revision due in 1981)	(geographic and temporal revision due in 1981)
Plant Fossils	(taxonomic revision due in 1981)	(geographic and temporal revision due in 1981)
Bacteria	-----	-----
Viruses	-----	-----
Living Cells and Tissues	-----	-----

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In addition to the use of the Registry data as a means of referring individuals to a biologist or biological collection, the Registry data has been used in another manner. The individuals listed in the Registry represent systematists and systematics collections from the major institutions in the United States and Canada. Data in the Registry can therefore be used as a reasonable estimate of the systematics resources available in the United States in Canada. These data were used recently in two workshops on Resources in Systematics ("Human Resources" and "Physical Resources") sponsored by the National Science Foundation. The data produced by the ASC's Registry were the only data available of this kind.

Wildlife Regulations - Names of species controlled by federal regulations under 21 different laws and treaties of the United States have been up-dated to 3 July 1980. In addition, the fifty states, Puerto Rico, and the Virgin Islands have been contacted in regard to updating the data on plant and animal species controlled by them. All have responded and the data have been entered into the Center's computer.

Specimens of Endangered Mammal Species in Museums - In December of 1979, a request was sent to the 40 major mammal collections in the United States requesting information on their holdings of 310 taxa of endangered species of mammals. In January of 1980, a similar request was sent to 576 additional museums around the world. At this time, data on an estimated 16,000 specimens of these endangered mammals have been received by the Center and are being computerized. In addition, a number of collections have promised to respond as soon as they are able to gather the requested information. We estimate that the additional information promised will bring the total to more than 40,000 specimens with all taxa of endangered mammals represented.

Other Data Bases - In addition to the data bases developed directly by the Center, the Association has been gathering additional information which will be made available through the CBR. These include: 1) a worldwide list of over 1500 museums and the types of systematics collections they maintain; 2) a list of mammals of the world which has been reviewed by professional mammalogists; and 3) a list of institutions using computers to manage specimen related data. The latter list will identify institutions which are able to respond quickly to inquiries for information from outside sources and thus make even more data readily available to society as a whole. All of these data bases are being developed at no cost to the CBR. At the same time, they are expanding the Center's data bases and sources of information and enabling it to respond to a broader spectrum of inquiries. Furthermore, Center personnel have identified data bases of interest located at other institutions around the United States. While we do not directly maintain these records, we are able to direct CBR users to them as the need arises.

COMPUTER HARDWARE

Computer hardware has been installed which increases the Center's ability to input, manipulate, and retrieve data. This equipment includes additional terminals for data input and manipulation and a medium speed printer to reduce the time required for the printing of larger documents and reports. In addition, a magnetic tape unit will quadruple the Center's on-line data storage capacity. This unit will eliminate system interruptions for such administrative purposes as duplicating files for security. The magnetic tape unit will also

permit the Center to exchange and disseminate information with most other computer installations around the world. This method of transfer permits large volumes of data to be rapidly transferred at minimal cost (20,000.000 characters for \$20.00).

COMPUTER SOFTWARE

Several computer programs have been developed to manipulate the data stored in our system by columns, lines, or records. These programs give the Center the capability of building records of information about collections, individuals, taxa, laws, etc., under computer control. These programs also allow us to respond to complex inquiries that involve information in the variety of data bases supported by the Center. Along with these software additions, certain modifications have been made in the original data bases which change the format of data storage from a highly coded form to one easily read and understood in "English."

PROMOTION

While development of the Center's data bases has been a primary focus, a concerted effort, within budget limitations, has been made to make the existence and services of the Center more widely known.

Members of the Center staff have attended meetings of several professional groups to encourage enrollment in CBR's Registry of Taxonomic Resources and Services and to explain the services offered by the CBR. An ad was placed in Science magazine to promote use of the Center.

As part of the effort to expand the use of the Center, a workshop to introduce the services of the Center to personnel of the DOE National Laboratories was held in Lawrence on October 1-2, 1979. Representatives from four of the DOE National Laboratories; Argonne (ANL), Oak Ridge (ORNL), Battelle Northwest (BNW), and Brookhaven (BNL); were present. The workshop, in part, served as a platform to demonstrate the abilities of the Center to the representatives, and also as an arena for discussion of the type of services which the Laboratories would like to see developed for their use in the future.

As a result of the workshop, representatives of ANL and ORNL requested that the Center conduct seminars at their respective laboratories to familiarize other personnel at the laboratories with the services offered by the CBR and to give instructions in the procedures for obtaining these services.

On 19-20 February 1980, Carol Terry and Mike Neuner of the CBR staff conducted two seminars at ANL and on 18 March held another seminar at ORNL. In all, approximately 60 DOE personnel attended. In addition to the seminars, members of the Center staff had the opportunity to gain a better understanding of laboratory operations and to discuss current information needs with laboratory personnel. The Center concept was well received by the labs. This is indicated by the following quote from a letter received from ANL, "Your work will, therefore, save us considerable time in fulfilling our responsibilities in the EIS process."

It is our opinion (with concurrence by many personnel in the laboratories) that the services of the CBR are particularly useful to the DOE environmental assessment programs. At the workshop in October and again during the seminars

in February and March, a great deal of interest was shown in the capability of the Center's Registry of Taxonomic Resources and Services to locate experts who could supply information concerning various taxonomic groups. In fact, names derived during a demonstration of the Registry at the October workshop were used by personnel at ANL to obtain information on *Falconiformes* from the northwestern United States for an environmental assessment they were undertaking.

While in Lawrence, the representatives of the laboratories expressed concern over the inability to keep pace with ever changing federal regulations concerning controlled species. This concern was expressed again in the seminars at both ANL and ORNL. In the past, the usual procedure at the laboratories involved the efforts of a single individual who attempted to keep up with changes in regulations published in the Federal Register and tried to circulate this information to the appropriate people. Since this task was often performed in addition to regular duties, changes were often not communicated in the most expedient manner. Compounding the problem were changes in assignments and personnel, often leaving a laboratory without a replacement to handle this assignment. Laboratory personnel were pleased to know they could obtain this information from the Center.

In addition to the paid ad appearing in *Science* (30 November 1979) and the regularly occurring ad in the ASC NEWSLETTER, a number of other newsletters, bulletins, and magazines have also referenced the CBR and its services (Aviso, 12 December 1979; Phytopathology News, December 1979; Rod and Reel, April/May 1980; American Forests, May 1980; and Conservation Report, 16 October 1980. Of these, only the Rod and Reel reference was in response to a letter from the Center. All others were placed by persons aware of the Center and its services and called to our attention at a later date. Individuals are becoming aware of the Center and wish to share their knowledge of this resource with others.