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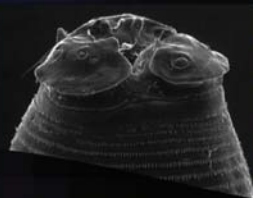
This book is the result of collaborative work by a group of researchers in charge of inventorying and guarding the diversity of helminth parasites of vertebrates in Latin America. Nine institutions from 7 countries participated in the elaboration of this Guide.

This first attempt of collective work has the main objective of disseminating the information among the international scientific community, presenting the development and conditions of the collections in this area, establishing them as real repositories of specimens from these and other regions.

PUBLICACIONES ESPECIALES DEL INSTITUTO DE BIOLOGÍA 22



GUIDE TO HELMINTHOLOGICAL COLLECTIONS OF LATIN AMERICA



GUIDE TO HELMINTHOLOGICAL COLLECTIONS OF LATIN AMERICA

COMPILED BY

RAFAEL LAMOTHE-ARGUEDO
CRISTINA DAMBORENEA
LUIS GARCÍA-PRIETO
LIA I. LUNASCHI
DAVID OSORIO-SARABIA



PUBLICACIONES ESPECIALES
DEL INSTITUTO DE BIOLOGÍA **22**

***GUIDE TO HELMINTHOLOGICAL
COLLECTIONS OF LATIN AMERICA***

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Back cover image: DIGENEA: *Ochetosoma heterocoelium* [From: Lenis, C. , J.C. Arredondo & J.I. Calle. 2009. *Ochetosoma heterocoelium* (Digenea: Plagiorchiidae) en ofidios de Colombia. *Ochetosoma heterocoelium* (Digenea: Plagiorchiidae) in snakes from Colombia. *Revista Mexicana de Biodiversidad* 80(4): 603-609]

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COMPILED BY



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**UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO
FUNDACIÓN MUSEO DE LA PLATA “FRANCISCO PASCASIO MORENO”**

MÉXICO, D.F., 2010





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PROLOGUE

The study of the helminth parasites of wild vertebrates in Latin America has a long tradition; the contribution of researchers as Lauro Travassos, Adolpho Lutz, and João FerreiraTeixeira de Freitas in Brazil, Lothar Szidat and Margarita Ostrowski de Núñez in Argentina, Eduardo Caballero y Caballero and Margarita Bravo-Hollis in Mexico, Carlos Díaz-Ungria in Venezuela, Rodrigo Brenes-Madrigal in Costa Rica, Nicanor Ibáñez and Manuel Tantalean in Peru, Idelfonso Pérez-Vigueras in Cuba, and Fernando Mañé-Garzón in Uruguay, among others, was transcendental to the understanding of the biodiversity of this group of parasites. The first reference of a scientific collection in Latin America dates back from the early XX Century when the Helminthological Collection of the Oswaldo Cruz Institute was established in Brazil. Since then, many other helminthological collections were founded in several countries of this region; however, their development has been uneven and some of them have actually disappeared.

The existence of these collections in one of the most species rich and diverse regions of the world is essential. The information contained in these biodiversity repositories is invaluable, and their protection is responsibility of the institutions and governments of their countries of origin. However, the deposition of helminth specimens collected in Latin America in foreign collections used to be a common practice, and unfortunately continues to be so to some extent, without taking into consideration the local or even national collections. The main reason for the prevalence of this situation is probably the lack of knowledge about their existence or concerns about the security conditions of the material.

As a result of the meeting: “*Colecciones Helminológicas de América Latina: estado actual y perspectivas*” held in March, 26, 2009 in La Plata City, Argentina, representatives of collections from Argentina and Mexico, proposed the co-edition of a document where the information related to helminth collections in Latin America was compiled. In order to reach this goal, 13 institutions from nine countries were invited; the majority of them responded positively, and these contributions constitute the content of this Guide.

This first attempt of collective work has the main objective of disseminating the information among the international scientific community, presenting the development and conditions of the collections in this area, establishing them as real repositories of specimens from these and other regions.

THE COMPILERS



COLECCIÓN HELMINTOLÓGICA DEL MUSEO DE LA PLATA (MLP)¹

Museo de La Plata, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata (UNLP)

LÍA I. LUNASCHI, CRISTINA DAMBORENEA & VÍCTOR H. MERLO ÁLVAREZ

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Fax: 54 221 4257527; e-mail: lunaschi@fcnym.unlp.edu.ar.

Financial support: Museo de La Plata, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata.

HISTORY

The “Colección Helmintológica” of Museo de La Plata is one of 8 collections housed in the División Zoología Invertebrados (DZI). It is the largest helminthological collection in Argentina.

Carola Sutton founded the collection based on her research with endoparasitic fauna from rodents in 1970. In 1981, **Lía Lunaschi** began her research work with trematode parasites of fishes. Until then the collection was included in the Invertebrate Zoology Collections, and it did not have distinct status as a helminthological collection.

In 1990, the reorganization and restructuring process of the Museo de La Plata, gave it a formal “Collection” status and the Helminthology Section in the DZI was created due to the relevance of the research group and the Helminthological Collection.

¹ Lunaschi, L.I., C. Damborenea & V.H. Merlo-Álvarez. 2010. COLECCIÓN HELMINTOLÓGICA DEL MUSEO DE LA PLATA (MLP). In: Lamothe-Argumedo, R., C. Damborenea, L. García-Prieto, L.I. Lunaschi & D. Osorio-Sarabia (COMPS.). *Guide to Helminthological Collections of Latin America*. Publicaciones Especiales 22, Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Universidad Nacional de La Plata, Argentina, Mexico City: 5-10.

Thus, the current collection is based primarily on the research work of Carola Sutton and Lía Lunaschi.

Since then, the Collection has increased with the material collected by the researchers of the DZI and by contributions of researchers from other Institutions.

STAFF

CURATOR

Lía I. Lunaschi, Ph. D.

Systematics and taxonomy of helminths, particularly trematodes Digenea from wild vertebrates

ASSOCIATE RESEARCHERS

Francisco Brusa, Ph. D.

Systematics and taxonomy of Turbellaria

Celina Digiani, Ph. D.

Systematics and taxonomy of helminths, particularly Nematoda from rodents

Fabiana Drago, Ph. D.

Systematics and taxonomy of endoparasites from wild birds

Matias Lamas, B. Sc. – Fellowship on endoparasites

Systematics and ecology of helminths of saurians

Lisandro Negrette, B. Sc.

Taxonomy of Tricladida Terricola (Turbellaria)

COLLECTION MANAGERS

Cristina Damborenea, Ph. D.

Systematics and taxonomy of Turbellaria

TECHNICAL ASSISTANT

Víctor Hugo Merlo Álvarez, B. Sc.

Management and preservation of collection specimens

THE COLLECTION IN NUMBERS

- *NUMBER OF LOTS*: 4,114.
- *NUMBER OF SPECIMENS*: not determined

- *REPRESENTED GROUPS OF HELMINTHS*: Platyhelminthes (Turbellaria, Aspidogastrea, Digenea, Monogenea, Cestoidea); Acanthocephala; Nematoda; Nematomorpha.
- *NUMBER OF SPECIES*: TOTAL: 443 species/168 holotypes; Turbellaria: 175 lots, 170 identified species; Aspidogastrea: 35 lots, 1 identified species; Digenea: 1012 lots, 153 identified species; Monogenea: 29 lots, 17 identified species; Cestoidea: 269 lots, 74 identified species; Acanthocephala: 122 lots, 7 identified species; Nematoda: 1422 lots, 144 identified species; Nematomorpha: 286 lots, 56 identified species.
- *NUMBER OF TYPES*: Holotypes/paratypes/syntypes/allotypes: TOTAL: 168 holotypes/206 paratypes/27 syntypes/43 allotypes; by group of helminth: Turbellaria 12/24/1/0; Digenea 38/62/9/0; Monogenea 11/12/0/0; Cestoidea 8/7/0/0; Acanthocephala 2/6/1/1; Nematoda 62/80/14/42; Nematomorpha 35/15/2/0.
- *REPRESENTED GROUPS OF HOSTS*:

Insecta (Coleoptera, Dictyoptera, Hemiptera, Hymenoptera, Orthoptera); **Mollusca** (Gastropoda, Bivalvia); Crustacea (Isopoda, Decapoda); **Pisces** (Characiformes, Perciformes, Pleuronectiformes, Clupeiformes, Atheriniformes, Chimaeriformes, Carcharhiniformes, Lamniformes, Cyprinodontiformes, Cypriniformes, Anguilliformes, Scorpaeniformes, Siluriformes, Osmeriformes, Carchariniformes, Salmoniformes, Gymnotiformes, Lepidosireniformes, Gadyiformes, Mugiliformes, Myliobatiformes, Rajiformes, Squaliformes, Gasterosteiformes); **Amphibia**; **Reptilia** (Squamata, Testudines, Crocodilia); **Aves**; **Mammalia** (Artiodactyla, Carnivora, Cetacea, Chiroptera, Didelphimorphia, Primates, Rodentia).

TABLE I.- REPRESENTED GROUPS OF HOSTS
(NUMBER OF HELMINTH SPECIES BY HOST GROUP)

| HOST GROUP | REPRESENTED GROUPS OF HELMINTHS | | | | | | |
|---------------|---------------------------------|---------------|---------|-----------|-----------|----------------|----------|
| | TURBELLARIA | ASPIDOGASTREA | DIGENEA | MONOGENEA | CESTOIDEA | ACANTHOCEPHALA | NEMATODA |
| INVERTEBRATES | 14 | 0 | 7 | 0 | 0 | 0 | 18 |
| FISHES | 0 | 1 | 52 | 17 | 7 | 5 | 25 |
| AMPHIBIANS | 0 | 0 | 5 | 0 | 0 | 0 | 1 |
| REPTILES | 1 | 0 | 18 | 0 | 0 | 0 | 1 |
| BIRDS | 0 | 0 | 57 | 0 | 2 | 2 | 25 |
| MAMMALS | 0 | 0 | 26 | 0 | 7 | 2 | 78 |

ANNUAL INCREASE

During 2008, 159 lots were incorporated to the collection.

GEOGRAPHIC SCOPE (NATIONAL)

Specimens have been collected in Buenos Aires, Catamarca, Chaco, Chubut, Córdoba, Corrientes, Entre Ríos, Formosa, Islas Malvinas, Jujuy, La Pampa, Mendoza, Misiones, Neuquén, Rio Negro, Salta, San Juan, San Luis, Santa Cruz, Santa Fe, Santiago del Estero, and Tucumán.

Others: Argentinean waters.

GEOGRAPHIC SCOPE (INTERNATIONAL)

In addition to the Argentinean lots, there are lots from fourteen other countries, as follows: Bolivia, Brazil, Chile, Costa Rica, Ecuador, France, Mexico, New Zealand, Peru, Scotland, Spain, Uruguay, USA, and Vietnam.

PRESERVATION OF MATERIAL

The Collection consists predominantly of wet (in alcohol) and permanent slide specimens. There are a small number of scanning electron microscope preparations. The wet collection is stored in a separate room and arranged by catalogue number. Slides (*in toto* specimens and histological sections), stained with different colourings and mounted with Canada balsam are arranged in cases by Class, Family and Genus.

DATA BASE

- Software: Microsoft Access 2003. In the future it will be migrated to an Institutional Software which will shelter all of the Museo de La Plata collections.
- Number and categories of fields: 36 fields, 4 categories:
- Bibliographic: 1 field.
- Curatorial: 8 fields.
- Geographic: 5 fields.
- Specimen: 22 fields.
- Number of entries: 4,114.
- Web site: <http://www.fcnym.unlp.edu.ar/>

BIBLIOGRAPHY ASSOCIATED TO THE COLLECTION

The collection has a partial catalogue published in 2000. It includes only the specimens mounted in slides identified at that time. A catalogue of type material is in preparation.

Published data about collection specimens are available. There are about 253 publications. The collection also has a small library with literature on different parasitic groups and on host's taxonomy.

Special publications and lists of specimens

Sutton, C.A. & M.C. Damborenea. 2000. Colección Helmintológica del Museo de La Plata: I. Catálogo de preparaciones microscópicas, material tipo y no tipo. *Serie Técnica y Didáctica Museo de La Plata* **35**: 1-20.

GENERAL INFRASTRUCTURE

The Colección Helmintológica is one of the 8 invertebrate (except insect) collections housed in the DZI of Museo de La Plata. The wet preserved specimens of the helminthological collection are in a special room, shared with other wet collections of the DZI. The storage facilities are equipped with compact storage systems that greatly increase the amount of usable floor area. This area is equipped with the adequate security.

The slides are stored in plastic boxes, housed in special furniture.

The DZI also has an area for curatorial work with the informatics equipment, printers, etc. to carry out the everyday work.

PROCEDURES FOR INFORMATION, LOANS AND SERVICES

The Museo de La Plata has a collection management policy to regulate all the collections. The DZI has three documents to guide the procedure to send material and to ask for loans. The Curator can provide those documents.

Services: Specimens, including paratypes may be loaned for study to researchers at recognized institutions. The loan period is usually six months. Inquiries concerning loans should be addressed to the collection curator. Holotype specimens may be loaned only under exceptional circumstances. The Curator reserves the right to determine whether or not a specimen can be shipped.

Laboratory facilities are available to visiting workers, but must be prearranged with the curator. A limited identification service is available, but prior arrangement is necessary.



COLECCIÓN NACIONAL DE PARASITOLOGÍA (MACN-PA)²

Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (MACNBR)

ALEJANDRO TABLADO & FABIÁN TRICÁRICO

Av. Ángel Gallardo 470. C1405DJR. Ciudad Autónoma de Buenos Aires, Buenos Aires. ARGENTINA.

Telephone: 54-11 4982-9410 / 8797 Ext. 204 / 153; Fax: 54-11 4982-9410 / 8797 Ext. 204.

e-mail: tablado@macn.gov.ar , meb@macn.gov.ar

Financial support: Government of Argentina

HISTORY

Currently the National Collection of Parasitology is based on the material collected and studied by **Lothar Szidat** from 1947 to 1973. This material, mainly helminth parasites, was donated by Dr. Szidat and deposited in the Invertebrates Division Collection of the Museo Argentino de Ciencias Naturales (MACN). After Dr. Szidat death, his disciple, **Margarita Ostrowski de Nuñez**, formalized the collection status, registering it in a Helminthological Catalogue of the Parasitology Laboratory in 1975. Dr. Ostrowski de Nuñez always has been associated with the collection; however, she is not a formal researcher at MACN, and works in the Faculty of Exact and Natural Sciences of the University of Buenos Aires (FCEN-UBA).

Teodoro Stadler took charge of Parasitology Laboratory of the MACN and its collection in the 90's. The curatorial tasks were entrusted to **Fabián Tricárico**. Nevertheless, the Parasitology Laboratory currently does not have any specialists, but

² Tablado, A. & F. Tricárico. 2010. COLECCIÓN NACIONAL DE PARASITOLOGÍA (MACN-PA). In: Lamothe-Argumedo, R., C. Damborenea, L. García-Prieto, L.I. Lunaschi & D. Osorio-Sarabia (COMPS). *Guide to Helminthological Collections of Latin America*. Publicaciones Especiales 22, Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Universidad Nacional de La Plata, Argentina, Mexico City: 11-14.

its administration and maintenance is ongoing thanks to the permanent collaboration of Fabián Tricárico and by the support of Margarita Ostrowski de Nuñez and her research team at the FCEN-UBA. In 2002, MACN officially recognized a total of 23 collections; then, the formerly “Helminthological Collection of Parasitology” was designated as the National Collection of Parasitology, identifying it with the acronym MACN-Pa. This collection depends organization-wise from the Invertebrate Division and on its Curator, **Alejandro Tablado.**

STAFF

CURATOR

Alejandro Tablado, B. Sc.

Systematics of Asterozoa (Echinodermata) and ecology of benthic intertidal communities

ASSOCIATE RESEARCHERS

Margarita Ostrowski de Nuñez, Ph. D.

Biological cycles and systematics of freshwater Digenea, which have fishes and birds as final hosts, and mollusks as intermediate hosts.

COLLECTION MANAGER

Fabián Tricárico, B. Sc.

Scanning electron microscope service.

THE COLLECTION IN NUMBERS

- *NUMBER OF LOTS:* 2,224.
- *NUMBER OF SPECIMENS:* 4,822.
- *REPRESENTED GROUPS OF HELMINTHS:* Turbellaria, Digenea (Aspidogastrea, Digenea), Monogenea, Cestoidea (Cestodaria, Eucestoda), Acanthocephala, Nematoda (Ascaridida, Spirurida), Hirudinea. In addition, specimens of Mixozoa and Crustacea have been deposited.
- *NUMBER OF SPECIES:* TOTAL: 332 species; Turbellaria: 12; Digenea: 163; Aspidogastrea: 2; Monogenea: 19; Cestoidea: 70; Acanthocephala: 9; Nematoda: 28; Hirudinea: 1; other taxa: 28.
- *NUMBER OF TYPES:* Holotypes/paratypes: TOTAL: 118/187; by group of helminth: Digenea: 30/56; Aspidogastrea 0/1; Monogenea 6/19; Cestoidea 36/49; Acanthocephala 3/14; Nematoda 17/22; Hirudinea: 1/1; other taxa: 25/25.

- *REPRESENTED GROUPS OF HOSTS*: Mollusca, other invertebrates (Chaetognatha, Crustacea and Insecta), Pisces (Chondrichthyes, Osteichthyes), Amphibia, Reptilia, Aves, and Mammalia.

TABLE I. REPRESENTED GROUPS OF HOSTS
(NUMBER OF LOTS BY HOST GROUP)*

| HOST GROUP | | | | | | | | |
|---------------|-------------|---------------|---------|-----------|-----------|----------------|----------|---------------------|
| | TURBELLARIA | ASPIDOGASTREA | DIGENEA | MONOGENEA | CESTOIDEA | ACANTHOCEPHALA | NEMATODA | OTHER INVERTEBRATES |
| MOLLUSCS | 28 | 0 | 81 | 1 | 4 | 0 | 0 | 0 |
| INVERTEBRATES | 3 | 0 | 5 | 0 | 1 | 0 | 2 | 7 |
| FISHES | 0 | 22 | 450 | 136 | 346 | 51 | 42 | 43 |
| AMPHIBIANS | 7 | 0 | 82 | 0 | 58 | 0 | 16 | 0 |
| REPTILES | 1 | 0 | 19 | 0 | 3 | 0 | 0 | 0 |
| BIRDS | 0 | 0 | 381 | 0 | 37 | 0 | 4 | 0 |
| MAMMALS | 4 | 0 | 92 | 0 | 63 | 0 | 25 | 0 |

* Hosts of 210 lots are unknown.

ANNUAL INCREASE IN THE LAST DECADE

No data available.

GEOGRAPHIC SCOPE (NATIONAL)

Buenos Aires, Chaco, Chubut, Córdoba, Corrientes, Entre Ríos, Formosa, La Pampa, Neuquén, Río Negro, Salta, Santa Fe, Tierra del Fuego, Tucumán.

GEOGRAPHIC SCOPE (INTERNATIONAL)

Antarctica, Brazil, Bulgaria, Chile, Gulf of Aqaba, South Orkney Islands, Uruguay.

PRESERVATION OF MATERIAL

The material is mostly in slides, mounted with different media (Canada balsam, synthetic resin, etc), and a few lots with complete and bigger specimens are preserved in 70 % alcohol.

DATA BASE

- Software: Microsoft Access 97 + Aurora (application for viewing and entering data).
- Data base: A principal table and 6 related tables (taxonomy, collectors and determinators, geography, synonym, images, other data). All fields agree with Darwin-Core 2.0 standard.
- Specimen: 10 fields.
- Taxonomy: 12 fields.
- Determination: 4 fields.
- Bibliographic: 2 fields.
- Curatorial: 14 fields.
- Geographic: 17 fields.
- Collection: 9 fields.
- Number of entries: 2,224
- Web site: under construction through Global Biodiversity Information Facility portal (GBIF).

BIBLIOGRAPHY ASSOCIATED TO THE COLLECTION

There is not a formal publication about this collection, i.e., list of type specimens. However, the material studied by Lothar Szidat and Margarita Ostrowski de Núñez has been published in several scientific papers.

GENERAL INFRASTRUCTURE

The whole collection is housed in one locker of glass and metal.

PROCEDURES FOR INFORMATION, LOANS AND SERVICES

The National Collection of Parasitology can be visited and consulted in the Museum on all working days, from 10:00 to 16:00 hs, but previous appointment with the curator is needed.

Loan of the material is possible, and a written request must be addressed to the curator (an e-mail is enough) detailing the material needed, justifying the need for the loan and the methods of study that will be used on them. International loans of biological material require previous authorization from the National Office of Natural Resources.

Digital images of the material also can be solicited.



Ministério da Saúde
FIOCRUZ
Instituto Oswaldo Cruz
Laboratório de Helminthos Parasitos de Vertebrados
Coleção Helmintológica do Instituto Oswaldo Cruz



COLEÇÃO HELMINTOLÓGICA DO INSTITUTO OSWALDO CRUZ (CHIOC)³

Laboratory of Helminth Parasites of Vertebrates (LHPV), Oswaldo Cruz Institute (IOC)

**MARCELO KNOFF, DELY NORONHA, ROBERTO MAGALHÃES-PINTO,
MAGDA SANCHES, LIEGE RENATA SIQUEIRA, FABRÍCIO BRAUNS-MATTOS &
DELIR CORRÊA-GOMES**

Cardoso Fontes Pavillion, 3rd floor. Av. Brasil, 4365, Manguinhos, Rio de Janeiro, RJ, BRAZIL.
CEP 21045-900. Telephone: + 55 (21) 2562-1458 /62; Fax: 2562-1511; e-mail: knoffm@ioc.fiocruz.br
Financial support: FIOCRUZ

HISTORY

The history of the Helminthological Collection of the Oswaldo Cruz Institute (CHIOC) is mixed with that of the Laboratory of Parasites of Vertebrates of the Oswaldo Cruz Institute. It derived from material collected during field work by **Gomes de Faria** and his apprentice **Lauro Pereira Travassos**, together with the specimen deposits made by researchers at the beginning of the XX century, such as **Adolpho Lutz**, **Oswaldo Cruz**, and **Gaspar Viana**, among others. The holdings kept on increasing by means of the incorporation of either private or institutional collections from the end of the XIX century onward. The CHIOC contains helminths of the Brazilian fauna representing a great biodiversity and recovered from a wide range of hosts captured in different biomes that include the Amazon, the Atlantic forest, the “Cerrado”, the Caatinga, the Swamplands, the Pampas, the Urban and the Continental and Marine Waters. Due to donations of foreign specimens, there are helminths from the five continents. The number of specimens has increased often, taking into account

³ Knoff, M., D. Noronha, R. Magalhães-Pinto, M. Sanches, L.R. Siqueira, F.B. Mattos & D. Corrêa-Gomes. 2010. COLEÇÃO HELMINTOLÓGICA DO INSTITUTO OSWALDO CRUZ (CHIOC). In: Lamothe-Argumedo, R., C. Damborenea, L. García-Prieto, L.I. Lunaschi & D. Osorio-Sarabia (COMPS.). *Guide to Helminthological Collections of Latin America*. Publicaciones Especiales 22. Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Universidad Nacional de La Plata, Argentina, Mexico City: 15-27.

the great number of deposits made either by Brazilian or foreign researchers. To date, the collection preserves about 37,000 numerical lots that can vary from one to hundreds of specimens per lot. The first scientific data on the CHIOC as a collection was referred to in 1913 and one year later, a type specimen deposited in the Instituto Oswaldo Cruz was referred to define the nature of the deposit. Samples that are derived from other institutional or private collections and that were included in the CHIOC, maintain their original numbers, together with those of the new incorporation in accordance with the procedures adopted in 1917, in papers dealing with the collections of the Bacteriological Institute of São Paulo and the Paulista Museum. The private collection of Pedro Severiano de Magalhães, researcher from the Bahiana School of Medicine, an important center for the study of helminths during the XIX and the beginning of the XX centuries was deposited in the CHIOC. Other reports supplied data on the incorporation of the helminth survey from the Pasteur Institute of São Paulo, a notorious research institute in the early XX century. Thus, the first type-specimen from the above referred school to be numbered and referred in a scientific paper was the trematode *Nephrostomus limai* Travassos, 1922, deposited in the CHIOC under the number 3767. Nevertheless, the types of *Cruzia tentaculata* Travassos, 1917, and that were part of unidentified samples collected by Adolpho Lutz and donated for study by the Bacteriological Institute of São Paulo, were really the first to be incorporated under numeration. To previously catalogue the helminthological material collected during incursions to the Brazilian hinterlands, the number(s) of the helminth(s) was matched to the numeration that appeared at the top of the pages of the necropsy books maintained at the CHIOC. Thus, the samples are deposited in the collection on the basis of the necropsy number and further on the serial number corresponding to their definitive inclusion. In 1979, hundreds of type species of helminths deposited in the CHIOC were catalogued. The

collection was referred to in a guide to the parasitological collections of the world in 1982, and in that same year the process to institutionalize the CHIOC was started to be finally established in 1993. In 2000, during the festivities to commemorate the centenary of the Oswaldo Cruz Institute, the CHIOC home page was made available to the public. Three years later, during 2003, a new electronic data basis was developed to facilitate the access to the helminthological collection. In 2005, the CHIOC was included in the Environment Information Reference Center (CRIA) in a survey of the Brazilian zoological collections, to be, immediately after, considered one of the trustee depositories of the Brazilian genetic patrimony.

Until 2007, the collection was located in a 30 m² room, where the helminths, as wet material, were kept in glass flasks in wooden closets with drawers; whereas whole mounts were maintained in sliding trays, horizontally arranged, that made the work very difficult. Thus, changes were necessary and now the collection is maintained in modern steel closets with smoothly sliding doors. The capacity for future deposits was enlarged to be available for the next hundred years. At the moment the data base of the collection is being updated to permit that all the scientific information can be properly accessed.

The former researcher responsible for the first deposits in the CHIOC was **José Gomes de Faria** (20/May/1887-09/Aug/1962). The initial material of the Helminthological Collection of the Oswaldo Cruz Institute mostly derives from the necropsies performed by Dr. Faria.

In 1915, **Lauro Pereira Travassos** (02/Jul/1890-20/Nov/1970) took command of the Helminthology Laboratory and the curatorship of the helminth survey that was then becoming a real collection. He had a Medical Doctor degree from the Faculdade de Medicina do Rio de Janeiro in 1913. In 1929 attending an invitation of Fülleborn, he stayed for 10 months in Germany, at the Hamburg Tropical Medicine Institute, where

he acted as a lecturer. He was a member of the Brazilian Academy of Sciences. He left an extensive list of disciples, most in helminthology: César Pinto, Jayme Lins de Almeida, Manoel Proença, Hugo de Souza Lopes, Herman Lent, João Ferreira Teixeira de Freitas, Domingos Arthur Machado Filho, Sebastião de Oliveira, Zeferino Vaz, Paulo Artigas, Clemente Pereira, Newton Santos, Henry Pearson, Romualdo Ferreira de Almeida, José Oiticica Filho, Alfredo Rey do Rego Barros, Rita Kloss, Dirce Lacombe, Jayade Mendonça, Amílcar Arandas Rego, Paulo Bührnheim, Henrique de Oliveira Rodrigues, Anna Kohn, Sylvio Celso Gonçalves da Costa, Sérgio Fragoso, Catarina da Silva Motta, Joaquim Júlio Vicente, Delir Corrêa Gomes and Dely Noronha. He published 436 scientific papers, of which 314 are in helminthology and 122 in entomology. Skrjabin, from the Sciences Academy of Moscow, declared that Travassos was the greatest helminthologist in the world. Thus, the Brazilian school of helminthology is recognized worldwide. Travassos was the symbol of an era, and he died at the Hospital Evandro Chagas in the campus of the Oswaldo Cruz Institute.

In the 40's, Dr Travassos transferred the curatorship of the Helminthological collection to **João Ferreira Teixeira de Freitas** (15/Mar/1912-10/Apr/1970). He was born in Rio de Janeiro; received his degree from the Faculdade de Medicina do Rio de Janeiro in 1934. While still a student, he completed the Instituto Oswaldo Cruz Application Course and was admitted to the institution in 1936. He was one of the most outstanding followers and co-author of Travassos in helminthological research. He published several original papers, and with Travassos was responsible for the Brazilian School of Helminthology. His classical work is the catalogue of the Brazilian digenetic trematodes, in collaboration with Lauro Travassos and Anna Kohn. He had an extensive teaching activity in several institutions of Brazil and also in Paraguay, where as the chief of a scientific mission, received the Order of Merit from that country. In 1940 he

became the first to maintain and enlarge the helminthological collection. As a great leader, he worked with Cavalcante Proença, Herman Lent, Jayade Machado Mendonça, James Dobbin, Lins Almeida among others. He was a member of the Editorial Board of the former *Revista Brasileira de Biologia* (presently *Brazilian Journal of Biology*), from 1942 to 1957. Among his followers, we can distinguish Paulo Bührnheim, Anna Kohn, Henrique de Oliveira Rodrigues, Amilcar Arandas Rêgo, Catarina da Silva Motta, Delir Corrêa Gomes, Joaquim Júlio Vicente and Roberto Magalhães Pinto.

After the death of Teixeira de Freitas, **Delir Corrêa Gomes Maués da Serra Freire**, became the curator of the CHIOC from 1982 to 1989. A biologist, he graduated in Natural History from the former Universidade do Estado da Guanabara / UEG presently UERJ; his post-graduate work included a Magister Scientie fellowship in 1977 and a Doctorate in Sciences in Veterinary Medicine/Veterinary Parasitology from the Universidade Federal Rural do Rio de Janeiro (UFRRJ). She was directly related to João Ferreira Teixeira de Freitas with whom she worked from 1963 to 1970. She authored 108 published original scientific papers. Besides these activities, she also developed administrative functions in the institution, where she was vice-director between 1993-1997. Conscious of the valuable institutional collection, and its importance, she introduced methodologies to preserve and increase the exchange of helminths with Brazilian and foreign researchers, and later proposed Dely Noronha as her substitute. Group Leader, she worked with the staff of the Laboratory of Helminth Parasites of Vertebrates as well as with other outside groups from UERJ, UFRJ e UFF. Among other activities, she was a member of the Editorial Board of the *Memórias do Instituto Oswaldo Cruz* - 1986-1999; coordinator of the Scientific Vocation Program of the *Escola Politecnica de Saúde Joaquim Venâncio / Fiocruz* - 1986-1997; member of the *IOC Post-Graduate Technical Chamber* - 1998-2001; member of the *IOC Reference*

and Administration Centers Chamber: She also participated in the orientation of Master and Doctor fellows in the Post-Graduate Courses of Veterinary Medicine/UFRRJ and Parasitology Biology/IOC/Fiocruz.

Dely Noronha de Bragança Magalhães Pinto was the curator of the Helminthological Collection of the Oswaldo Cruz Institute from 1989 to Jul/2007. Biologist, graduated in Natural History from the former Faculdade Nacional de Filosofia of the Universidade Federal do Rio de Janeiro. She was as an apprentice, under the orientation of Lauro Travassos, from 1964 to 1969; and published as his co-author 25 original papers. She was also under the guidance of Teixeira de Freitas and Delir Corrêa Gomes, still as a trainee. She was a CNPq research fellow from 1964-1984. In 2007, together with Delir Corrêa Gomes Maués da Serra Freire obtained a Grant from the BNDES, which permitted the changes now applied to the CHIOC. A brief summary of her activities includes: Head of the Laboratory of Helminth Parasites of Vertebrates/Department of Helminthology/IOC, from 1989 to 2007; Invited teacher of the Post-Graduate (Master Degree) Course in Human Parasitology of the Escola Nacional de Saúde Pública, Fiocruz (1976), and of the Post-Graduate course in Biological Sciences (Biophysics) of the Instituto de Biofísica Carlos Chagas Filho/UFRJ (1992-1993). Teacher (Topic of Helminthology) in the Technical Course in Parasitological Research/IOC from 1980 to 2005, in the Post-Graduate (Master & Doctor Degrees) Course of Tropical Medicine/IOC from 1991 to the present. Teacher in the Post-Graduate (Master Degree) Course of Parasitology Biology/IOC from 1991 to 2005. Orientation in the programs/projects: Scientific Vocation, PAP/IOC/Fiocruz, Tec-Tec I, II/Fiocruz/ FAPERJ.

STAFF

CURATOR

Marcelo Knoff, Ph. D.

Systematics and taxonomy of helminth parasites of vertebrates, with special reference to trematodes, cestodes and nematodes parasites of fishes

ASSOCIATE RESEARCHERS

Laboratory of Helminth Parasites of Vertebrates of the IOC

Delir Corrêa Gomes Maués da Serra Freire, Ph. D.

Systematics and taxonomy of helminth parasites of vertebrates, with special reference to trematodes, cestodes and nematodes

Dely Noronha de Bragança Magalhães Pinto, Ph. D.

Systematics and taxonomy of helminth parasites of vertebrates, with special reference to acanthocephalan

Luís Claudio Muniz Pereira, Ph. D.

Systematics and taxonomy of helminth parasites of vertebrates, with special reference to parasites of birds

Roberto Regis Magalhães Pinto, Ph. D.

Systematics and taxonomy of helminth parasites of vertebrates, with special reference to trematodes, cestodes and nematodes

Rosângela Rodrigues Silva, Ph. D.

Systematics and taxonomy of helminth parasites of vertebrates, with special reference to trematodes, cestodes and nematodes parasites

Laboratory of Helminth Parasites of Fishes of the IOC

Anna Kohn Hoineff, Ph. D.

Systematics and taxonomy of helminth parasites of fishes, with special reference to trematodes and monogenea

Berenice Maria Fernandes de Lima, Ph. D.

Systematics and taxonomy of helminth parasites of fishes, with special reference to trematodes

Marcia Cristina Nascimento Justo, Ph. D.

Systematics and taxonomy of helminth parasites of fishes, with special reference to trematodes and monogenea.

Melissa Querido Cárdenas, Ph. D.

Systematics and taxonomy of helminth parasites of fishes, with special reference to trematodes and nematodes

Simone Chinicz Cohen, Ph. D.

Systematics and taxonomy of helminth parasites of fishes, with special reference to trematodes and monogenea

SCIENTIFIC ASSESSORS

Delir Corrêa Gomes, Ph. D.

Roberto Magalhães Pinto, Ph. D.

TECHNICAL ASSISTANTS

Prof. Magda Sanches de Oliveira

Assistant for the receipt of deposits, loans, maintenance of the collection and updating the data base

Prof. Liege Renata Siqueira

Assistant for the receipt of deposits, loans, maintenance of the collection and updating the data base

Prof. Fabricio Brauns Mattos

Support and maintenance of the data base and the updating of the CHIOC site

Mr. Elias do Nascimento

Responsible for the preparation of chemical solutions and materials routinely used during the maintenance and preservation of the samples

THE COLLECTION IN NUMBERS

- *NUMBER OF LOTS:* 37,234 (extended into 49,241 samples of specimens preserved either as whole mounts or wet material).
- *NUMBER OF SPECIMENS:* 32,720 slides and 16,458 glass flasks with specimens as wet material.
- *PARASITE GROUPS REPRESENTED (IN PERCENTAGES) ACCORDING TO THE NUMBER OF SAMPLES:* Nematoda (61.28), Digenea (23.72), Acanthocephala (3.97), Monogenea (3.57), Cestoidea (3.47), Aspidogastriada (0.90), Copepoda (0.87), Temnocephalida (0.83), Pentastomida (0.71), Nematomorpha and Hirudinea (0.68).
- *NUMBER OF SPECIES (TOTAL):* under analysis.
- *NUMBER OF SPECIES/GROUP:* under analysis.
- *NUMBER OF TYPES:* in a previous report (1979), there were 719 types, without considering paratypes: Nematoda of Vertebrates (345); Nematoda of Invertebrates (63); Platyhelminthes (Digenea and Monogenea [227]; Cestoidea [28]); Acanthocephala (52); Pentastomida (4). From 2002 to 2009, 81 holotypes and 440 paratypes have been deposited. The complete list of types in the CHIOC is under preparation and will be available soon.
- *REPRESENTED GROUPS OF HOSTS:*

Vertebrates: Pisces, Amphibia, Reptilia, Aves and Mammalia. Invertebrates: Echinodermata, Ctenophora, Annelida, Mollusca and Arthropoda.

ANNUAL INCREASE IN THE LAST DECADE

From 1998 to 2008, 3,858 whole mounts and 1,058 wet material helminth samples were deposited in the CHIOC.

GEOGRAPHIC SCOPE (NATIONAL)

All biomes from all Brazilian regions. North: Acre, Amapá, Amazonas, Pará, Rondônia and Roraima; Northeast: Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco (including Fernando de Noronha), Piauí and Sergipe; Central-West: Goiás, Mato Grosso, Mato Grosso do Sul and Tocantins; Southeast: Espírito Santo, Minas Gerais, Rio de Janeiro and São Paulo; South: Paraná, Rio Grande do Sul and Santa Catarina.

GEOGRAPHIC SCOPE (INTERNATIONAL)

North America (Canada, Mexico and United States of America), Central America (Cuba and Guatemala), South America (Argentina, Brazil, Bolivia, Chile, Colombia, Ecuador, French Guiana, Peru, Paraguay, Uruguay and Venezuela), Europe (Belgium, England, France, Germany, Italy, Netherlands, Portugal, Romania, Russia, Switzerland and Czech Republic), Africa (Angola, Benin, Congo, Egypt, Gabon, Ivory Coast, Tanzania, Uganda, African North Coast and Cape North), Asia (China Republic [Taiwan], India, Israel, Japan and Vietnam) and Oceania (Australia and New Zealand).

PRESERVATION OF MATERIAL

The specimens are mounted in Canada balsam, Hoyer, etc. Many of the slides dating back to the decade of the 1950's contain more than one specimen/slide, with up to 20 specimens/slide, and with 2-4 different species on the same slide. Only from the 1960's onward, the slides preserve one specimen each. Nevertheless, even today some

deposits can be represented by more than one specimen/slide as in the case of the monogeneans. In some cases (adult cestodes) a single specimen can be partially preserved in separate slides. The collection has 16,458 glass flasks with specimens preserved as wet material (5-10% formalin, acetic formaldehyde, 5% glycerin + 70° alcohol, Bouin, etc). Most of the flasks contain more than one specimen and frequently in one single flask, a hundred individuals can be found; 63 plastic flasks with samples of specimens and helminth eggs preserved in 70% alcohol are maintained in a freezer (-30 °C). Many samples recovered previously still need to be identified.

DATA BASE

- Software: Microsoft SQL. (88 % of data have been processed).
- Number and categories of fields: 8 fields, 4 categories.
- Curatorial: 2 fields.
- Geographic: 6 fields.
- Specimen: 32 fields.
- Number of entries: 8.
- Web site: <http://helmintologia.ioc.fiocruz.br/>. Data are not still available on line. Backups of the data are preserved in HD and pen drives. The back up is updated monthly.

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GENERAL INFRASTRUCTURE

The CHIOC is physically a part of the Laboratory of Helminth Parasites of Vertebrates (LHPV), which is located on the 3rd floor of the Pavillion Cardoso Fontes, with three rooms connected by internal doors. In the first room is the office, where the curator is found, along with an informatics professional for entering the digital data of the new acquisitions and updating the records from the old data stored in paper files (stored in steel filing cabinets), two biologists that help carry out the procedures for requesting services such as deposits and loans from the collection; and often there is the training of college students in general biology, in the systematic of helminths and curatorial routines. In this room we have three computers and three printers, a multifunctional machine able to make photocopies, and a central table with capacity for eight to ten people to hold meetings. In the second room, with 30 m², are the sliding

steel cabinets, in which are stored the specimens on slides (whole mounts) and in liquid medium (wet material); a table with four chairs and two stereomicroscopes, two light field microscopes and two closets (1,70 m x 1,00 m), which are used to manage the newly deposited material or the actual routine of preservation and maintenance. The third room, with 25 m², which is home to a small library, has two computers: in one is stored all the data on the deposits of helminths (database); and the other to enter and store data on the bibliographies of library holdings, and a laser printer for printing data on paper files that are stored in the first room. Among other rooms of the LHPV, there is another room equipped with a laminar flow hood where the chemical vapors are eliminated, used by the technician to manufacture the chemicals used as part of the maintenance of the collection contained in liquid and slides. Another room is used to store flammable liquids in a chemical safety cabinet. One more room, with 5 m², has a Leica stereomicroscope and a Zeiss Axiophot microscope, both with a image-capturing system connected to a microcomputer.

PROCEDURES FOR INFORMATION, LOANS AND SERVICES

Deposits and loans of specimens; permitted visits for examination of samples *in loco*; loans of books and reprints that are included in the CHIOC facilities; mini-courses and lectures focusing the history of the CHIOC; professional capacitation courses.

Requests can be made by researchers of public or private, recognized institutions.

All service requests are to be addressed personally or by e-mail to the Curator by means of a specific form (available at <http://helmintologia.ioc.fiocruz.br>).

Loans and deposit requests must be made in a formal request on institutional letterhead, signed by the person responsible for the request (this letter can be a scanned PDF file and can be sent attached to the e-mail).

Accepted deposition of samples must be received together with another letter with the data of the material, in accordance with the deposit form of the CHIOC. This form is also to be sent by e-mail. Deposits of new species only will be permitted once the paper in which the specimens' description are included has been accepted for publication, confirmed by means of an acceptance letter from the Editor of the scientific periodical.

Visits, mini courses and lectures are to be booked a minimum of 30 days prior to the event, and will be accepted depending on the availability.



COLECCIÓN COLOMBIANA DE HELMINTOS (CTUA.116)⁴

Universidad de Antioquia, Colombia

IMELDA VÉLEZ & CAROLINA LENIS

Laboratorio de Malacología Médica y Trematodos-LMMT. Programa de Estudio y Control de Enfermedades Tropicales-PECET. Sede de Investigación Universitaria-SIU. Calle 62 # 52-59 Torre 2, laboratorio 730. Medellín, COLOMBIA. Telephone: 57(4)2196514; Fax: 57(4)2196511; e-mail: ivelez@matematicas.udea.edu.co ; caro_lenis16@yahoo.com

Financial support: Programa de Estudio y Control de Enfermedades Tropicales-PECET, Universidad de Antioquia.

HISTORY

In 1977, the biologist **Imelda Vélez** initiated a personal collection of trematodes, based on studies carried out on the masked booby *Sula dactylatra* (Aves) and fishes (Lutjanidae) from Santa Marta and the surrounding area, under the supervision of **B. Werding**.

Between 1983 and 2003 this trematode collection was expanded to include material from bats collected in the Colombian departments of Antioquia and Valle del Cauca. During this period, five holotypes and several of the paratypes of those new species were deposited in the Manter Laboratory of Parasitology (HWML), University of Nebraska and U.S. National Parasite Collection (USNPC).

⁴ Vélez, I. & C. Lenis. 2010. COLECCIÓN COLOMBIANA DE HELMINTOS (CTUA.116). In: Lamothe-Argumedo, R., C. Damborenea, L. García-Prieto, L.I. Lunaschi & D. Osorio-Sarabia (COMPS.). *Guide to Helminthological Collections of Latin America*. Publicaciones Especiales 22, Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Universidad Nacional de La Plata, Argentina, Mexico City: 28-32.

In 2000 the *Instituto de Investigación de Recursos Biológicos Alexander von Humboldt* (IAvH) established the National Registry of Collections, where Imelda Vélez registered her private collection under the name: “Colección de Tremátodos de la Universidad de Antioquia”, using the acronym CTUA.116.

In 2004, this collection was deposited by Vélez in the *Laboratorio de Malacología Médica y Trematodos-PECET*, and together with biologist **Carolina Lenis** began the process of systematization. In 2008, Lenis received training in curatorial activities by the personal of the Colección Nacional de Helmintos (CNHE) of the *Instituto de Biología* of the *Universidad Autónoma de México*. This instruction allowed establishing new parameters of curation and data processing currently employed by the CTUA.116, now re-named “Colección Colombiana de Helmintos”.

The Colección Helmintológica de Colombia has received support from the *Instituto de Investigaciones Marinas y Costeras* (INVEMAR); *Comité para el Desarrollo de la Investigación* CODI, and *Programa de Estudio y Control de Enfermedades Tropicales* (PECET), Universidad de Antioquia, and *Departamento Administrativo de Ciencia, Tecnología e Innovación* (Colciencias).

STAFF

CURATOR

Imelda Vélez, Ph. D.

Taxonomy of helminth parasites

ASSOCIATE RESEARCHER

Luz Elena Velásquez, M. Sc.

Coordinator of the Laboratorio de Malacología Médica y Trematodos-PECET

COLLECTION MANAGER

Carolina A. Lenis, M. Sc.

Taxonomy of helminth parasites

THE COLLECTION IN NUMBERS

- *NUMBER OF LOTS*: 135 of the classes Digenea and Monogenea.
- *NUMBER OF SPECIMENS*: 1005 catalogued in 31 families and 60 genera.
- *REPRESENTED GROUPS OF HELMINTHS*: Digenea; Monogenea
- *NUMBER OF SPECIES*: TOTAL: 75 species /3 holotypes/ 8 paratypes/ 124 voucher specimens; Digenea: 74/75; Monogenea: 1/75.
- *REPRESENTED GROUPS OF HOSTS*:

TABLE I. REPRESENTED GROUPS OF HOSTS
(NUMBER OF HELMINTH SPECIES BY HOST GROUP)

| HOST GROUP | % | DIGENEA | | MONOGENEA | |
|-------------|------|---------|---|-----------|--|
| | | | | | |
| GASTROPODS | 7.1 | 2 | 0 | | |
| CRUSTACEANS | 5.3 | 1 | 0 | | |
| FISHES | 1.8 | 27 | 0 | | |
| AMPHIBIANS | 10.7 | 2 | 0 | | |
| REPTILES | 46.4 | 11 | 1 | | |
| BIRDS | 1.78 | 7 | 0 | | |
| MAMMALS | 26.7 | 24 | 0 | | |

ANNUAL INCREASE IN THE LAST DECADE

Between 2001 and 2009 the CTUA.116 included 416 specimens in 56 lots; 16 families, 22 genera and about 26 species have been added in the last decade, representing a growth of nearly 42%. The average annual growth is 3 lots, except for the years 2005 and 2008, in which 14 and 18 lots were deposited, respectively.

GEOGRAPHIC SCOPE (NATIONAL)

The CTUA.116 includes specimens from the Colombian departments of Antioquia, Bolívar, Chocó, Magdalena, Meta, Montería, Sucre and Valle del Cauca.

PRESERVATION OF MATERIAL

Specimens in CTUA.116 are preserved in permanent slides mounted in Canada balsam; slides are organized in wooden boxes, in a progressive catalogue number.

DATA BASE

- Software: Microsoft Access 2007
- Number and categories of fields: 84 fields, 7 categories
- Collection: 28 fields.
- Catalogue: 34 fields.
- Bibliography: 22 fields.
- Number of entries: 135 lots.
- Web site: www.pecet-colombia.org/mal.html

BIBLIOGRAPHY ASSOCIATED TO THE COLLECTION

The CTUA.116 possesses 22 publications related to the specimens deposited in the collection and a specialized consultation library, which belongs to the *Laboratorio de Malacología Médica y Tremátodos-PECET*. It has more than 700 publications and currently is under systematization.

GENERAL INFRASTRUCTURE

The collection is physically housed at the *Laboratorio de Malacología Médica y Tremátodos -PECET*. The infrastructure of this laboratory allows dissection of hosts or host tissues, mounting of specimens, measurement and illustration of the helminths and data processing. In addition, PECET has a molecular biology research program and space in its Animal House for both conventional and SPF (Specific Pathogen-Free) animals, allowing the maintenance of larval stages or adults of helminth species to conduct studies related to life cycles and molecular genetics.

PROCEDURES FOR INFORMATION, LOANS AND SERVICES

Consultations

Permission to consult CTUA.116 involves contacting, eight days in advance, the curator responsible. The request should contain: *i*) a summary of the project, *ii*) type of

service solicited, *iii*) institution making the request, *iv*) person carrying out the study and *v*) proposed date of visit.

Every specimen studied or used for scientific articles, undergraduate studies or theses, must be cited using the acronym CTUA.116, and institutional credit given to the Universidad de Antioquia. On finalizing the study, a copy of the article, document, text or thesis should be donated to the CTUA.116 library.

Loans

The CTUA.116 specimens may only be loaned for research purposes in recognized institutions, by means of a loan agreement between the Universidad de Antioquia and the institution making the request (responsible for its care and return). The loan of type specimens is available only within Colombia and only considered to be justified when the original description of a species is thought to be incorrect. The material is lent for a period of 60 days, which may be extended if necessary, subject to request. The soliciting entity must cover the cost of postage and return of the specimens.

Services

Deposition of specimens: Specimens to be deposited in CTUA.116 should contain the information included in the specimen deposit form. All specimens should be clearly labeled. Catalogue numbers are only assigned to specimens deposited in the collection.

Taxonomic identification: When the taxonomic identification service is solicited it is recommended that at least one specimen be deposited in the CTUA.116. The price of this service was set by the LMMT-PECET.



COLECCIÓN HELMINTOLÓGICA DE COSTA RICA (CHCR)⁵

Facultad de Microbiología, Universidad de Costa Rica (UCR)

GABRIELA SOLANO-TREJOS

Laboratorio de Helmintología Médica, Facultad de Microbiología, Ciudad Universitaria, Universidad de Costa Rica, San José. COSTA RICA. P.O. Box 2060. Telephone: (506) 25 11 41 93; Fax: (506) 25 11 43 60; e-mail: maria.solanotrejos@ucr.ac.cr

Financial support: Universidad de Costa Rica.

HISTORY

The Helminthological Collection of Costa Rica [Colección Helmintológica de Costa Rica (CHCR)] started more than 50 years ago in the Parasitology Department, School of Microbiology, Universidad de Costa Rica. **Rodrigo Brenes-Madrigal** made the first checklist of parasites from both wild and domestic vertebrates, as well as from human beings present in Costa Rica. This list published in 1961 included 150 species. His effort represented the first attempt to compile the information regarding Costa Rica's biodiversity of helminth parasites.

The collection of specimens housed in the School of Microbiology, reemerged by initiative of **Beatriz Rodríguez-Ortiz** as a result of a collaboration with researches from the Helminthology Laboratory of the Instituto de Biología, Universidad Nacional Autónoma de México in 2001. As a result of this effort a Checklist of the helminth parasites of vertebrates in Costa Rica was published in 2004. Parallel to this initiative, the University of Costa Rica supported the creation and maintenance of biological collections in its different schools, which resulted in economic support and

⁵ Solano-Trejos, G. 2010. COLECCIÓN HELMINTOLÓGICA DE COSTA RICA (CHCR). In: Lamothe-Argumedo, R., C. Damborenea, L. García-Prieto, L.I. Lunaschi & D. Osorio-Sarabia (COMPS.). *Guide to Helminthological Collections of Latin America*. Publicaciones Especiales 22, Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Universidad Nacional de La Plata, Argentina, Mexico City: 33-36.

standardization of the data collection in the institution. Since then, the number of helminth parasites collected from Costa Rican hosts saved in this repository has increased and it is hoped that this collection will become an important source of information for foreign and national parasitologists.

STAFF

CURATOR & COLLECTION MANAGER

Gabriela Solano Trejos, M. Sc.

Molecular diagnostic tests for parasitic nematodes

THE COLLECTION IN NUMBERS

- *NUMBER OF LOTS:* 256
- *NUMBER OF SPECIMENS:* 304.
- *REPRESENTED GROUPS OF HELMINTHS:* Digenea, Monogenea, Cestoidea, and Nematoda.
- *NUMBER OF SPECIES:* TOTAL: 164; Digenea: 125; Monogenea: 7; Cestoidea: 1; Nematoda: 31.
- *NUMBER OF TYPES:* Holotypes/paratypes: TOTAL: 19/47; by group of helminth: Digenea 16/37; Monogenea 0/1; Nematoda 3/9.
- *REPRESENTED GROUPS OF HOSTS:*

TABLE I. REPRESENTED GROUPS OF HOSTS
(NUMBER OF HELMINTH SPECIES BY HOST GROUP)

| HOST GROUP | HOST GROUP | | | |
|------------|------------|-----------|-----------|----------|
| | DIGENEA | MONOGENEA | CESTOIDEA | NEMATODA |
| FISHES | 9 | 9 | 1 | 3 |
| AMPHIBIANS | 21 | 4 | 0 | 0 |
| REPTILES | 128 | 0 | 0 | 12 |
| BIRDS | 40 | 0 | 0 | 7 |
| MAMMALS | 24 | 0 | 0 | 41 |

ANNUAL INCREASE

In the last four years, the collection increased its number of Digenean specimens by 50%.

GEOGRAPHIC SCOPE (NATIONAL)

Specimens have been collected in seven Costa Rican provinces: Alajuela, Cartago, Guanacaste, Heredia, Limon, Puntarenas, and San José.

GEOGRAPHIC SCOPE (INTERNATIONAL)

The CHCR has helminth species from four different countries: Mexico, Panama, Brazil and Guatemala.

PRESERVATION OF MATERIAL

The majority of the helminths in the collection are mounted permanently on slides using Canada balsam and more recently Cytoseal. The bottled specimens are preserved in screw cap bottles in a solution of 70% ethanol.

DATA BASE

- Software: File Maker Pro 6 Unlimited.
- Number and categories of fields: 56 fields. Categories:
- Identification: 8 fields.
- Parasite information: 16 fields.
- Host information: 10 fields.
- Miscellaneous information: 22 fields.
- Number of entries: 280.
- Web site: There is no website available at the moment.

BIBLIOGRAPHY ASSOCIATED TO THE COLLECTION

The Bibliography section keeps the information about Costa Rican helminth species, including the ones that are not part of the CHCR. The Checklist database records all the information available about Costa Rican worms described up to date. Unfortunately this information is not available on line.

Special publications and list of specimens

Brenes-Madrigal, R. 1961. Catálogo de los Helminthos parásitos de Costa Rica. *Revista de Biología Tropical* 9: 67-95.

Rodríguez- Ortiz, B., L. García-Prieto & G. Pérez-Ponce de León. 2004. Checklist of Helminth Parasites of Vertebrates in Costa Rica. *Revista de Biología Tropical* 52: 313-354.

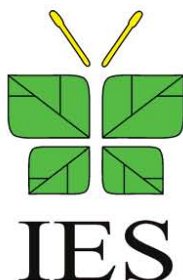
Rodríguez- Ortiz, B., L. García-Prieto, J. Herrera-Vázquez & G. Pérez-Ponce de León, G. 2004. Addendum to the Checklist of the Helminth parasites of vertebrates in Costa Rica. *Revista de Biología Tropical* 52: 355-361.

GENERAL INFRASTRUCTURE

The specimens of the collection are housed at the Helminthology Laboratory, School of Microbiology, University of Costa Rica. The glass slides are stored in wooden slide boxes and bottles are kept in larger boxes. The Helminthology Laboratory is equipped with two Olympus CX31 microscopes, one of which has an adaptable camera and three Olympus microscopes CH-BI45-2. There are also two dissecting scopes: a Nikon SMX 645 and a Leica Zoom 2000. Also, the laboratory has a small library containing more than 600 parasitology books and scientific journals. Among these books, classification keys to Nematoda, Digenea and Cestoidea can be found. There are two refrigerators, one freezer and two centrifuges: Thermo Scientific Sorvall ST-16 and a Fischer Scientific 228.

PROCEDURES FOR INFORMATION, LOANS AND SERVICES

The specimens in the CHCR were deposited for permanent preservation. Type specimens are generally not available for loans but they can be accessed for consultation at the Helminthology Laboratory, School of Microbiology, University of Costa Rica. Specimens may be sent on loan at the request of researchers affiliated to different institutions. The requests should be addressed to the curator and should include the nature of the study. The duration of the loan will be discussed when the request is made. The borrowing institution will be responsible for the material while in transit and the duration of the loan. In addition to this, the institution should assume the costs of the return shipment and the adequate packaging of the specimens for mailing. The packages should be strong enough to withstand transit using shockproof absorbent material.



**COLECCIONES ZOOLOGICAS DEL INSTITUTO DE
ECOLOGIA Y SISTEMÁTICA- COLECCIÓN
HELMINTOLÓGICA (CZACC)⁶**

Instituto de Ecología y Sistemática, La Habana (IES)

JANS MORFFE-RODRÍGUEZ, NAYLA GARCÍA-RODRÍGUEZ & MARÍA LUISA VENTOSA-ZENEA

Instituto de Ecología y Sistemática, Carretera de Varona km 3¹/₂, Capdevila, Boyeros, A.P. 8029 C.P. 10800, Ciudad de La Habana, CUBA. Telephone: (537) 643-8266, 643-8090, 643-8010; Fax: (537) 643-8088; e-mail: jans@ecologia.cu, nayla@ecologia.cu, mluisa@ecologia.cu.

Financial support: Agencia de Medio Ambiente (AMA), Ministerio de Ciencia, Tecnología y Medio Ambiente (CITMA).

HISTORY

The collection was created in 1965, on the basis of the Laboratorio de Parasitología from the Instituto de Biología, Academia de Ciencias de Cuba. It was led initially by **Alberto Coy Otero**. The initial arrangement of the collection was based on the main groups of endoparasites. The specimens deposited initially were the result of the first studies on parasites of Cuban vertebrates.

With the creation, in 1972, of the Instituto de Zoología, the collection was re-arranged in sections according with the groups of hosts. It was still led by Alberto Coy. In 1987 was created the Instituto de Ecología y Sistemática (IES), as a result of the coalition of the institutes of Zoology, Botany and Experimental Chemistry and the

⁶ Morffe-Rodríguez, J., N. García-Rodríguez & M.L. Ventosa-Zenea. 2010. COLECCIONES ZOOLOGICAS DEL INSTITUTO DE ECOLOGIA Y SISTEMÁTICA- COLECCIÓN HELMINTOLÓGICA (CZACC). In: Lamothe-Argumedo, R., C. Damborenea, L. García-Prieto, L.I. Lunaschi & D. Osorio-Sarabia (COMPS). Publicaciones Especiales 22, *Guide to Helminthological Collections of Latin America*. Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Universidad Nacional de La Plata, Argentina, Mexico City: 37-41.

collection was moved to its actual location. In 1992 the IES was attached to the Ministerio de Ciencia, Tecnología y Medio Ambiente (CITMA).

In 2000 was established the Curatorial Procedure for Cuban Zoological Collections (González *et al.*, 2008). This document standardizes the protocols of formation, increment, conservation and management of such collections. In 2002 was created the Departamento de Colecciones Zoológicas and **Luisa Ventosa Zenea** was designated as curator of the Helminthological Collection.

Among people that contributed to the formation and growth of this collection as collectors and/or parasitologists we can mention Dr. V. Barus, Dr. B. Rysavyi, Dr. Alberto Coy, Dr. J. Martínez, Dr. L. F. de Armas, Dr. A. Pérez, M. Sc. N. García, M. Sc. L. Ventosa and Lic. J. Morffe.

This collection is specialized on parasitic helminths from wild fauna, and is unique in Cuba. The collection has 76 of the 621 species of Cuban helminths (25.7%). Also, 37 species from domestic animals are included.

STAFF

CURATOR

María Luisa Ventosa Zenea, M. Sc.

Parasitic nematodes (Thelastomatidae, Protrelloididae) of cockroaches.

ASSOCIATE RESEARCHER

Jans Morffe Rodríguez, B. Sc.

Parasitic nematodes of Coleoptera (Passalidae, Hydrophilidae and Scarabaeidae) and millipedes (Diplopoda)

COLLECTION MANAGER

Nayla García Rodríguez, M. Sc.

Parasitic nematodes of millipedes (Diplopoda), Coleoptera and cockroaches.

THE COLLECTION IN NUMBERS

- *NUMBER OF LOTS*: 764 lots of parasites from vertebrates (parasites of invertebrates are in the process of mounting).
- *NUMBER OF SPECIMENS*: 4512; 4353 of them are parasites of vertebrates and 159 of invertebrates.
- *REPRESENTED GROUPS OF HELMINTHS*: Digenea, Cestoidea and Nematoda.
- *NUMBER OF SPECIES*: TOTAL: 76; Digenea: 7; Cestoidea: 4; Nematoda: 65.
- *NUMBER OF TYPES*: Holotypes/paratypes: TOTAL: 48/211; by group of helminth: Digenea 3/3; Cestoidea 4/8; Nematoda 41/200.
- *REPRESENTED GROUPS OF HOSTS*:

TABLE I. REPRESENTED GROUPS OF HOSTS
(NUMBER OF HELMINTH SPECIES BY HOST GROUP)

| HOST GROUP | DIGENEA | CESTOIDEA | NEMATOIDA |
|------------|---------|-----------|-----------|
| | | | |
| ARTHROPODS | 0 | 0 | 39 |
| FISHES | 2 | 0 | 1 |
| AMPHIBIANS | 1 | 0 | 2 |
| REPTILES | 3 | 0 | 13 |
| BIRDS | 0 | 4 | 2 |
| MAMMALS | 1 | 0 | 8 |

ANNUAL INCREASE

Unstable due to the scarcity of resources for collecting, processing and conservation of material.

GEOGRAPHIC SCOPE (NATIONAL)

In the collection are deposited specimens from the 14 provinces of Cuba: Camagüey, Ciego de Ávila, Cienfuegos, Ciudad de La Habana, Granma, Guantánamo, Holguín, La Habana, Las Tunas, Matanzas, Pinar del Río, Sancti Spiritus, Santiago de

Cuba, and Villa Clara. Included also are the Special Municipality Isla de la Juventud and several keys adjacent to Cuban shores.

GEOGRAPHIC SCOPE (INTERNATIONAL)

Four countries are represented in the collection: Dominican Republic, Mexico, Nicaragua, and Puerto Rico. All of this material consists of nematodes from arthropods.

PRESERVATION OF MATERIAL

Most of the specimens in the collection (both Nematoda and Platyhelminthes) are preserved in 70% ethanol. Some species of Cestoidea, Digenea and Nematoda from vertebrates are mounted on slides in Canada balsam. Part of the collection of nematodes from arthropods (Diplopoda and Coleoptera) is mounted on slides in glycerine (edges of coverslip sealed with nail polish). Actually we are working on mounting of the rest of the collection.

DATA BASE

Recently lost, due to problems with the PC. Actually in process of recovery.

BIBLIOGRAPHY ASSOCIATED TO THE COLLECTION

A catalogue of types (Ventosa *et al.*, 2002) was published, but it is not available on line. More than 30 papers on parasites of vertebrates and approximately 26 on parasites of invertebrates are published. Most of these papers are available in the collection or the library of the institution.

Special publications and list of specimens

González, H., G. Silva, N. García & A. Pérez. 2009. Procedimiento Curatorial para Colecciones Zoológicas Cubanas. *Acta Botánica Cubana* **Special number:** 1-41.

Ventosa, L., A. Coy & N. García. 2002. Tipos de helmintos (Nematoda, Cestoda, Trematoda) depositados en el Instituto de Ecología y Sistemática, Cuba. *Poeyana* **486:** 8-12.

GENERAL INFRASTRUCTURE

The Helminthological Collection is one of the eight collections that conform the

Colecciones Zoológicas del Instituto de Ecología y Sistemática. It is located in a air-conditioned room, together with the Arachnological and Acarological collections. The jars and slide boxes are stored in two cabinets of metal and wood.

PROCEDURES FOR INFORMATION, LOANS AND SERVICES

We follow the procedures standardized in the Curatorial Procedure for Cuban Zoological Collections (González *et al.*, 2008). The collection is open to specialists, students and public in general. Loans are authorized only to qualified personnel belonging to recognized institutions. As a rule, only paratypes and/or vouchers are loaned for six months to one year.

ACKNOWLEDGEMENTS

To Dr. Alberto Coy Otero for his contribution to the parasitology of the Cuban wild fauna. To Dr. Nerly Lorenzo Hernández and Lic. Lorenza Basulto Chaple for their work in the preservation of the material deposited in the collection. To Dr. V. Barus, Dr. B. Rysavyi, Dr. J. Martínez, Dr. L. F. de Armas, Dr. A. Pérez and all the collectors that contributed to the growth of the collection.



COLECCIÓN HELMINTOLÓGICA DEL CINVESTAV (CHCM)⁷

Departamento de Recursos del Mar, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (IPN), Unidad Mérida

MA. LEOPOLDINA AGUIRRE-MACEDO, HUGO H. MEJÍA-MADRID & VÍCTOR M.-VIDAL-MARTÍNEZ

Carretera Antigua a Progreso Km 6 Cordemex, Mérida, Yucatán, 97310, MEXICO. Telephone: 999 9429400 ext. 9450; Fax: 999 9812334; e-mail: leo@mda.cinvestav.mx

Financial support: Centro de Investigación y de Estudios Avanzados del IPN

HISTORY

The Colección de Helmintos del CINVESTAV-IPN Unidad Mérida, housed by the Centro de Investigación y de Estudios Avanzados del IPN in its Merida campus was formally founded in 2000. In that year, it was organized and partially systematized as part of the CONABIO grant “Helmintos parásitos de peces del sureste de México” awarded to **Victor M. Vidal-Martinez** and **Ma. Leopoldina Aguirre-Macedo**. Former researchers at CINVESTAV-IPN Parasitology Laboratory such as Guillermo Salgado-Maldonado (1985-1989), Tomas Scholz (1993-1994) and Frantisek Moravec (1994-1995) (this last 2 as visiting professors from the Institute of Parasitology of the Academy of Sciences of the Czech Republic) had preserved material of parasites found during their investigations in marine and freshwater fishes from the Yucatan Peninsula, the Caribbean and the gulf of Mexico. In 2000, the collection was formally recognized

⁷ Aguirre-Macedo, M.A., H. Mejía-Madrid & V.M. Vidal-Martínez. 2010. COLECCIÓN HELMINTOLÓGICA DEL CINVESTAV (CHCM). In: Lamothe-Argumedo, R., C. Damborenea, L. García-Prieto, L.I. Lunaschi & D. Osorio-Sarabia (COMPS.). *Guide to Helminthological Collections of Latin America*. Publicaciones Especiales 22, Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Universidad Nacional de La Plata, Argentina, Mexico City: 42-47.

by CONABIO within the “Catálogo de Autoridades Taxonómicas” (<http://www.conabio.gob.mx>), and initially held 395 specimens from 131 hosts.

The collection was created with the aim of keeping reference material of helminth and other parasites of vertebrate and invertebrate hosts from Southeastern Mexico, Central America and the Caribbean. The collection supports regional research on taxonomy, systematic biology, ecology, biodiversity and biogeography of parasitic helminths in the region. Since its inception in 2000 the collection has received 110 specimens mainly from research conducted by the members of the laboratory, in collaboration with other research groups including those of Dr. David González-Solis (Colegio de la Frontera Sur), Dr. Sergio Guillén-Hernández (Universidad Autónoma de Yucatán), Dr. Juan Violante-González (Universidad Autónoma de Guerrero), M. en C. Eduardo Siu (Bluefields Indian and Caribbean University of Nicaragua), Dr. Mark Torchin (Smithsonian Tropical Institute, Panama), Dr. Delane C. Kristky (University of Idaho), Dr. Tomas Scholz and Dr. Frantisek Moravec (Institute of Parasitology of the Academy of Sciences of the Czech Republic). The collection is still incipient and in a stage of development that will lead to the improvement of the organization and systematization of its data base.

STAFF

CURATOR

Victor M. Vidal Martínez, Ph. D.

Taxonomy, systematics, and ecology of helminths of aquatic organisms

ASSOCIATE RESEARCHERS

Ma. Leopoldina Aguirre-Macedo, Ph. D.

Taxonomy, systematics and ecology of helminths, especially on trematodes and their vertebrate and invertebrate intermediate hosts

Hugo H. Mejía-Madrid, Ph. D.

Molecular systematics, phylogeny, and biogeography of helminths, with special reference to nematodes

Edgar Mendoza-Franco, Ph. D.

Phylogeny, systematics and biogeography of helminths, with special reference to monogeneans

COLLECTION MANAGERS

Ma. Leopoldina Aguirre-Macedo, Ph. D.

Hugo H. Mejía-Madrid, Ph. D.

TECHNICAL ASSISTANT

Clara M. Vivas-Rodríguez, B. Sc.

Maintenance of the collection

THE COLLECTION IN NUMBERS

- *NUMBER OF LOTS*: 7 (containing 83 specimens each).
- *NUMBER OF SPECIMENS*: 581.
- *REPRESENTED GROUPS OF HELMINTHS*: Aspidogastrea, Digenea, Monogenea, Cestoidea, Acanthocephala, Nematoda, and Hirudinea.
- *NUMBER OF SPECIES*: TOTAL: 175; Digenea: 101; Aspidogastrea: 4; Monogenea: 16; Cestoidea: 8; Acanthocephala: 7; Nematoda: 38; Hirudinea: 1.
- *NUMBER OF TYPES*: Holotypes/paratypes: TOTAL: 0/4; by group of helminth: Digenea: 0/2; Monogenea: 0/2.
- *REPRESENTED GROUPS OF HOSTS (SPECIMENS)*: The Colección Helmintológica del CINVESTAV contains species recorded basically as parasites of marine, brackish and freshwater fishes. The family of hosts most widely studied by the researchers associated to this collection is Cichlidae, followed by marine species of the genera *Epinephelus* and *Lutjanus*, among others.

TABLE I. REPRESENTED GROUPS OF HOSTS
(NUMBER OF HELMINTH SPECIES BY HOST GROUP)

| HOST GROUP | ASPIDOGASTREA | DIGENEA | MONOGENEA | CESTOIDEA | ACANTHOCEPHALA | NEMATODA | HIRUDINEA |
|------------|---------------|---------|-----------|-----------|----------------|----------|-----------|
| FISHES | 6 | 305 | 46 | 10 | 17 | 185 | 2 |
| REPTILES | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| BIRDS | 0 | 3 | 0 | 0 | 0 | 1 | 0 |

ANNUAL INCREASE IN THE LAST DECADE

Despite its recent inception, the CHCM has nearly duplicated its number of specimens during its first decade from 395 to 576.

GEOGRAPHIC SCOPE (NATIONAL)

Specimens have been collected mainly in Southeastern Mexico covering the states of Campeche (53), Chiapas (41), Guerrero with only one specimen, Quintana Roo (211), Tabasco (48), Veracruz (5 specimens), and Yucatán (160).

GEOGRAPHIC SCOPE (INTERNATIONAL)

The collection has a total of 57 specimens from outside Mexico, four from Cuba, one from Guatemala, and 52 from Nicaragua.

PRESERVATION OF MATERIAL

The specimens are preserved in 2 primary media: slides, which are mounted in Canada balsam or synthetic resin; and the wet collection containing vials with preserving liquid: 96% OH (67%), formaldehyde (7.2%), and distilled water (20.8%).

DATA BASE

- Software: Excel 2003.
- Number and categories of fields: 10 fields. Categories:
- Catalogue number
- Parasite species name

- Author of the parasite species
- Host species
- Author of the host species
- Locality Name
- Collecting date
- Intensity
- Locality coordinates
- Number of entries: 505.
- Website: under construction.

BIBLIOGRAPHY ASSOCIATED TO THE COLLECTION

Although the information contained in the collection has not been catalogued, a part of that information was formally published as an atlas of helminths of cichlid fishes from southeastern Mexico (Vidal-Martinez et al., 2001).

Special publications and list of specimens

Vidal-Martinez, V.M., M.L. Aguirre-Macedo, T. Scholz, D. Gonzalez-Solis & E.F. Mendoza-Franco. 2001. *Atlas of the helminth parasites of cichlid fish of Mexico.* Academia, Praha, Czech Republic.

GENERAL INFRASTRUCTURE

The CHCM is housed in the laboratory of Parasitology and Aquatic Pathology at CINVESTAV-IPN Campus Merida. The physical space comprises 2 Aluminum cabinets exclusively for the catalogued specimens and one more for backup specimens.

PROCEDURES FOR INFORMATION, LOANS AND SERVICES

1. Requests of specimen loans must be made to the Collection managers via e-mail.
2. Loans are temporary (duration: 3 months, renewable twice) for the purpose of research. Borrowers must return the specimen(s) in the same manner in which they were sent (generally, via courier). Shipping costs are covered by the CHCM; on return to CHCM, shipping will be billed to the borrower.
3. Deposition of specimens must be accompanied by a letter containing the following data: Scientific name of parasite, scientific name of host, site of

infection, locality of collection (including geographic coordinates), collector (s) name and date, identifier name and date, and number of specimens.

ACKNOWLEDGEMENTS

The authors are indebted to all the undergraduate, M. Sc. and Ph. D. students that have developed their thesis in the laboratory. Without their help, all the collection of data and processing of the material would have not been possible. Thanks are also due to Clara Vivas-Rodriguez, Gregory Arjona Torres and Ana Maria Sanchez Manzanilla for technical assistance. We acknowledge the financial support of the following funding agencies: SEP-PROMEP grant “Propuesta sobre Calentamiento Global y Cambio Climático de la Red Académica de Instituciones SEP-PROMEP del Sureste: área Sensibilidad Marina”; FOMIX Yucatán Grant “Sensibilidad y vulnerabilidad de los ecosistemas costeros del sureste de México ante el Cambio Climático Global”. This document is also an output from the British Council Mexico Research Links Project funded by the British Council for the benefit of the Mexican Higher Education Sector and the UK Higher Education Sector. During a number of years, also other agencies have supported the collection of material; including the Comisión Nacional para el Conocimiento y uso de la Biodiversidad (CONABIO), the Consejo Nacional de Ciencia y Tecnología (CONACyT), the Comisión Nacional de Pesca y Acuicultura (CONAPESCA) and Petróleos Mexicanos (PEMEX).



COLECCIÓN NACIONAL DE HELMINTOS (CNHE)⁸

Instituto de Biología, Universidad Nacional Autónoma de México (UNAM)

MARCOS RAFAEL LAMOTHE Y ARGUMEDO, LUIS GARCÍA-PRieto, DAVID OSORIO-SARABIA & GERARDO PÉREZ-PONCE DE LEÓN

Tercer Circuito Exterior s/n, Ciudad Universitaria, Coyoacán, Mexico City, 04510. MEXICO. P.O. Box 70-153. Telephone: 55 56228222 ext. 47870; Fax: 55 55500164;

e-mail: gprieto@ibiologia.unam.mx.

Financial support: Universidad Nacional Autónoma de México.

HISTORY

The Colección Nacional de Helmintos, housed at the Instituto de Biología, UNAM, Mexico City, was founded in 1930 by **Eduardo Caballero y Caballero**, based on 50 lots of leeches collected in Mexico. Since then, the CNHE has had two main purposes: 1) to support the inventory work to document helminth diversity from Mexico, through the collection and donation of specimens; and 2) the curation, and long-term maintenance of these specimens. Former curators were Eduardo Caballero y Caballero (1932-1960), **Margarita Bravo-Hollis** and **Jorge Caballero-Deloya** (1960-1970). **Rafael Lamothe-Argumedo** has been the curator since 1970. Currently all records have been incorporated into an electronic data base. This process allowed systematizing it, and linking the specimens to bibliographic information related to morphometric descriptions, host occurrence, geographic distribution, and other important data. At present, the CNHE is one of the largest and more dynamic

⁸ Lamothe-Argumedo, R., L. García-Prieto, D. Osorio-Sarabia & G. Pérez-Ponce de León. 2010. COLECCIÓN NACIONAL DE HELMINTOS (CNHE). In: Lamothe-Argumedo, R., C. Damborenea, L. García-Prieto, L.I. Lunaschi & D. Osorio-Sarabia (COMPS.). *Guide to Helminthological Collections of Latin America*. Publicaciones Especiales 22, Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Universidad Nacional de La Plata, Argentina, Mexico City: 48-55.

collections of helminths in Latin America. In 1982, it was included in the “*Guide of Parasite Collections of the World*” (Lichtenfels & Pritchard, 1982), and since 1997 it is recognized as a National collection by the Mexican government. The collection is mainly constituted by specimens collected and identified by the staff and Mexican researchers as Ma. Leopoldina Aguirre Macedo, Juan M. Caspeta Mandujano, Ignacio Cid del Prado, María del Carmen Gómez del Prado, David González Solis, Sergio Guillén Hernández, Emma Fajer Ávila, Martín García Varela, F. Agustín Jiménez, Edgar Mendoza Franco, Berenit Mendoza Garfias, Scott Monks, Víctor Manuel Vidal Martínez, Griselda Pulido Flores, Guillermo Salgado Maldonado, and Juan Violante González. In addition, an important portion of the material has been deposited by foreign parasitologists who conducted field work in Mexican territory, such as Janine Caira, Ronald A. Campbell, Daniel R. Brooks, Anindo Choudhury, Delane C. Kritsky, Harold W. Manter, Frantisek Moravec, and Tomas Scholz.

The inventory of the helminth parasites of wildlife vertebrates in Mexico is far from complete. A large progress has been made since the collection was established 80 years ago; however, sampling effort requires the involvement of more systematists in the coming years, with a concomitant increase in the infrastructure of the national collection to support systematic work and information retrieval to guarantee that deposited specimens will be kept safe in the future.

STAFF

CURATOR

Marcos Rafael Lamothe y Argumedo, Ph. D.

Systematics and taxonomy of helminths, particularly trematodes and monogeneans.

ASSOCIATE RESEARCHERS

Virginia León Règagnon, Ph. D.

Molecular systematics of helminths, focused in parasites of amphibians and reptiles.

Gerardo Pérez Ponce de León, Ph. D.

Phylogeny, systematics and biogeography of helminths, focused on freshwater fishes.

COLLECTION MANAGERS

Luis García Prieto, M. Sc.

Systematics and taxonomy of helminths, particularly cestodes.

David Osorio Sarabia, M. Sc.

Systematics and taxonomy of helminths, particularly nematodes.

TECHNICAL ASSISTANT

Leticia Barragán Lira

Digitalization of reprint collection; maintenance of exhibition and wet collections.

THE COLLECTION IN NUMBERS

- *NUMBER OF LOTS:* 7, 225.
- *NUMBER OF SPECIMENS:* 50, 429.
- *REPRESENTED GROUPS OF HELMINTHS:* Turbellaria, Temnocephala, Aspidogastrea, Digenea, Monogenea, Cestoidea, Acanthocephala, Nematoda, Hirudinea.
- *NUMBER OF SPECIES:* TOTAL: 1643; Turbellaria: 15 species; Temnocephala: 6; Digenea: 609; Aspidogastrea: 3; Monogenea: 274; Cestoidea: 178; Acanthocephala: 68; Nematoda: 450; Hirudinea: 40.
- *NUMBER OF TYPES:* Holotypes/paratypes: TOTAL: 489/555; by group of helminth: Turbellaria 2/2; Temnocephala 1/3; Aspidogastrea 0/1; Digenea 122/184; Monogenea 123/129; Cestoidea 58/54; Acanthocephala 13/15; Nematoda 156/153; Hirudinea 14/14.
- *REPRESENTED GROUPS OF HOSTS:* The Colección Nacional de Helmintos contains specimens that parasitize invertebrates, vertebrates and plants. The most widely represented group of hosts is constituted by marine, brackish and freshwater fishes, which are parasitized by 801 helminth species.

TABLE I. REPRESENTED GROUPS OF HOSTS
(NUMBER OF HELMINTH SPECIES BY HOST GROUP)

| HOST GROUP | TEMNOCEPHALA | ASPIDOGASTREA | DIGENA | MONOGENEA | CESTOIDEA | ACANTHOCEPHALA | NEMATODA | HIRUDINEA |
|---------------|--------------|---------------|--------|-----------|-----------|----------------|----------|-----------|
| INVERTEBRATES | 6 | 0 | 8 | 0 | 1 | 4 | 11 | 1 |
| FISHES | 0 | 3 | 295 | 247 | 104 | 31 | 116 | 5 |
| AMPHIBIANS | 0 | 0 | 59 | 5 | 8 | 3 | 49 | 2 |
| REPTILES | 0 | 0 | 80 | 7 | 9 | 6 | 62 | 5 |
| BIRDS | 0 | 0 | 94 | 0 | 22 | 15 | 49 | 0 |
| MAMMALS | 0 | 0 | 70 | 0 | 31 | 10 | 152 | 3 |
| PLANTS | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |

ANNUAL INCREASE IN THE LAST DECADE

The global rate of annual increase of the collection is 18.2 species, 606 specimens, and 75.3 lots per year. However, in the last 10 years these rates increased to 99.4 species, 1488 specimens, and 300 lots per year.

During the last 10 years, 370 publications have resulted from research both within the CNHE, and from specimens loaned from, or deposited into, the CNHE as types or vouchers.

GEOGRAPHIC SCOPE (NATIONAL)

Specimens have been collected in all 32 states of Mexican territory, with an heterogeneous representation; thus, states such Aguascalientes are represented by only one species, whereas in others, as Veracruz, 140 have been recorded.

GEOGRAPHIC SCOPE (INTERNATIONAL)

A total of 567 species of helminths collected in 37 countries have been deposited in the CNHE, including: Brazil (9 species; 2 holotypes); Canada (17; 0); Colombia (12; 0); Costa Rica (89; 20); Cuba (7; 1); Ecuador (18; 4); Ex-Soviet Union (34; 0); Guatemala (24; 4); Hungary (13; 0); India (7; 6); Japan (13; 0); Nicaragua (35; 6); New

Zealand (11; 0); Panama (128; 36), United States of America (83; 3), and Venezuela (23; 1). Eighty-three of the 567 species are holotypes, 1 of them collected in crustacean hosts, 50 in fishes, 5 in amphibians, 13 in reptiles, 3 in birds, and 11 in mammals.

PRESERVATION OF MATERIAL

The specimens are preserved in two primary mediums: slides are mounted in Canada balsam; the wet collection is contained in vials inside amber glass flasks, both with conservative liquid: 96% 0H (67%), Glycerin (5%), formaldehyde (7.2%), and distilled water (20.8%). Specimens in exhibition are maintained in 96% alcohol. Two incipient collections were established in 2008: preserved specimens prepared for scanning electronic microscopy (aluminum stubs stored in plastic boxes with silica gel), and helminth tissues (contained in plastic vials with absolute alcohol, deposited in an ultrafreezer at -20°C).

DATA BASE

- Software: Microsoft Access 2003
- Number and categories of fields: 53 fields. Categories:
- Bibliographic: 9 fields.
- Curatorial: 7 fields.
- Geographic: 14 fields.
- Specimen: 23 fields.
- Number of entries: 7225.
- Web site: <http://unibio.unam.mx/collections/specimens/urn/IBUNAM:CNHE>

BIBLIOGRAPHY ASSOCIATED TO THE COLLECTION

Information contained in the collection has been catalogued three times: 1973, 1979, and 1997 (Bravo-Hollis & Caballero-Deloya, 1973; Bravo-Hollis & Caballero-Deloya, 1979; Lamothe-Argumedo *et al.*, 1997, respectively). In 1973, the number of catalogued species was 687; in 1979, 64 species were added (totaling 751), and 18 years later, the total number of species contained by the CNHE increased to 975. During the past 80 years, 1353 publications have resulted from research both within the CNHE and from specimens loaned from, or deposited into, the CNHE as types or vouchers. These

publications include 158 theses (117 undergraduate, 28 masters and 11 doctoral), 45 book chapters, 23 books, and 1127 papers (379 published in national and 748 in international journals). To date, a total of 800 of these publications have been digitalized (PDF format), and are available upon request to the collection managers.

Special publications and lists of specimens

- Bravo-Hollis, M., & J. Caballero-Deloya.** 1973. *Catálogo de la Colección Helmintológica del Instituto de Biología*. Instituto de Biología, Universidad Nacional Autónoma de México, Publicaciones Especiales 2, Mexico City, 138 p.
- Bravo-Hollis, M., & J. Caballero-Deloya.** 1979. Catálogo de la Colección Helmintológica del Instituto de Biología. Addenda I. *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología* **50**: 743-768.
- García-Altamirano I.** 2001. *El Dr. Eduardo Caballero y Caballero (1904-1974) y la institucionalización de la Helmintología en México*. Tesis de Maestría, Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico City, 139 pp.
- Lamothe-Argumedo, R.** 1976. La Colección Helmintológica del Instituto de Biología de la UNAM. *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología* **47**: 61-62.
- Lamothe-Argumedo, R.** 1981. La Colección Helmintológica del Instituto de Biología (Funcionamiento). *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología* **52**: 489-491.
- Lamothe-Argumedo, R.** 1982. Colección Helmintológica del Instituto de Biología, UNAM. In: J. R. Lichtenfelds & M. H. Pritchard (Eds.). *Guide to Parasite Collections of the World*. American Society of Parasitologists, Special Publications, Lawrence, KS, USA, 35-36.
- Lamothe-Argumedo, R.** 1993. La Colección Helmintológica del Instituto de Biología. In: H. Brailovsky y B. Gómez Varela (Comp.). *Colecciones Zoológicas. Colecciones Biológicas Nacionales*. Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City, 3-22.
- Lamothe-Argumedo, R., E. Lázaro-Chávez & O. Meave-Gallegos.** 1985. *Colección Helmintológica del Instituto de Biología*. Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City, 32 p.
- Lamothe-Argumedo, R., L. García-Prieto, D. Osorio-Sarabia & G. Pérez-Ponce de León.** 1997. *Catálogo de la Colección Nacional de Helmintos*. Instituto de Biología, Universidad Nacional Autónoma de México- Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, Mexico City, 211 pp.
- Pérez- Ponce de León, G., & L. García Prieto.** 2001. Diversidad de Helmintos Parásitos de Vertebrados Silvestres de México. *Biodiversitas* **6**: 7-11.

GENERAL INFRASTRUCTURE

The CNHE is housed on the third floor of building “D” in the Instituto de Biología, UNAM, contiguous to the Laboratorio de Helmintología “Dr. Eduardo Caballero y Caballero”. The particular physical space of the collection comprises 46 m²,

divided in 3 rooms: 1) Curator office (independent); 2) Library room, with 7 metallic cabinets containing approximately 20 000 reprints, and one computer connected to a scanner. Library room is connected with 3) Collection room, which contains 8 wood cabinets with aluminum trays with capacity for 19 000 slides; three metallic cabinets to preserve the wet collection, conformed by 2300 amber glass flasks, and one safety deposit box to accommodate holotype specimens. In this room is also found a computer in which the collection's data base is handled, as well as the main books related to helminth taxonomy. In addition, a small exhibition of 50 museum flasks, displays the most common species of helminths in Mexico. The equipment of the collection includes: 8 stereomicroscopes Leica 2000 zoom (45X), 1 light microscope Olympus CX40 equipped with a digital camera (Olympus SP350), and 2 drawing tubes mounted on 2 Zeiss light microscopes. Finally, the incipient helminth tissue collection is preserved in a Thermo Fisher Scientific Ultrafreezer (Revco).

PROCEDURES FOR INFORMATION, LOANS AND SERVICES

1. Requests of specimens must be made to the Collection managers via e-mail.
2. Loans are temporary (duration: 3 months, renewable twice) for the purpose of research. Loans are made by the CNHE to individuals supported by research institutions, at the discretion of the Curator. Borrowers must return the specimen in the same manner in which they were sent (generally, via courier). Outbound shipping costs are covered by the CNHE; return of the material will be covered by the borrower.
3. Paratypes are loaned only when more than one exists in the collection. Holotypes are available for consultation in CNHE facilities, and exceptionally loaned under Curator permission.
4. Deposition of specimens must be accompanied by a letter containing the following data: Scientific name of parasite, scientific name of host, site of infection, locality of

collection (including geographic coordinates), collector name and date, identifier name and date, and number of specimens.

5. Reprint collection is available (in PDF format) upon request to collection managers.

ACKNOWLEDGEMENTS

To all the present and past students associated to the CNHE, who have contributed to increase the knowledge of helminth diversity in wild vertebrates of Mexico, particularly Rogelio Rosas Valdez, Elizabeth Martinez Salazar, Lorena Garrido Olvera, Jorge Falcón Ordáz, Luis J. García Márquez, Hugo Mejía Madrid, Florencia Bertoni Ruiz, Rosario Mata López, Jorge López Caballero, Ma. Antonieta Arizmendi Espinosa, Georgina Lira Guerrero, Alejandro Ocegüera Figueroa, Serapio López Jiménez, Ulises Razo Mendivil, Elizabeth Castillo Sánchez, Isabel Jiménez García, Fernando García Vargas, Rogelio Aguilar Aguilar, Carmen Guzmán Cornejo, Andrés Martínez Aquino, and Patricia Ramos Ramos. Specific projects of the CNHE have been financially supported by Consejo Nacional de Ciencia y Tecnología (CONACyT), and Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO).



**COLECCIÓN HELMINTOLÓGICA Y DE INVERTEBRADOS
RELACIONADOS
MUSEO DE HISTORIA NATURAL (UNMSM)⁹**
Universidad Nacional Mayor de San Marcos (UNMSM)

LIDIA SANCHEZ

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Financial support: UNMSM.

HISTORY

The Department of Helminthology at the Museum of Natural History (UNMSM) began its work in 1962. **Dr. Luz Sarmiento**, responsible for the department, organized and established the Helminthological Collection with material collected in the practices of Systematic Zoology of the School of Biological Sciences, and the first expeditions for study diversity of flora and fauna of Peru. At that time, the researchers who worked in the department were: **Dr. Luis Gonzales Mugaburu, Dr. Bertha Parra, Dr. Bertha Llanos, Dr. Norma Uyema, Julio Gonzales, Dr. Raul Verano, and Biologist Elizabeth Morales**. In 1992, Biol. Morales was named head of the Department of Helminthology and Curator of the Collection. Three years later, the name of the department was changed to Department of Protozoology, Helminthology and Related Invertebrates to include a larger number of taxa under study and initiate collections representative of these groups in Peru.

⁹ Sanchez, L. 2010. COLECCIÓN HELMINTOLÓGICA Y DE INVERTEBRADOS RELACIONADOS, MUSEO DE HISTORIA NATURAL (UNMSM). In: Lamothe-Argumedo, R., C. Damborenea, L. Garcia-Prieto, L.I. Lunaschi & D. Osorio-Sarabia (COMPS.). *Guide to Helminthological Collections of Latin America*. Publicaciones Especiales 22, Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Universidad Nacional de La Plata, Argentina, Mexico City: 56-60.

In 1998, the Related Invertebrates Collection began, including the following groups: Protozoa, Turbellaria, Nematomorpha, Rotifera, Annelida, Crustacea parasites (Copepoda, Isopoda, Branchiura), Pentastomida, Bryozoa, Cnidaria, and Coelenterate. This scope extension determined another change of name for the collection, being now named: Helminthological Collection and Related Invertebrates.

Since 2002, Biologist Lidia Sanchez is responsible for the Department and Collection. The Helminth Collection is the most important in Peru. Includes helminths (Monogenea, Digenea, Cestoda, Nematoda, and Acanthocephala) of domestic and wildlife animals, as well as parasites of man. The collection is catalogued in a database with complete information on the helminths recorded, hosts, location and geographic data. Recently it is also taking into consideration the bibliographic information. Deposition of specimens is due to the contribution of national researchers, as well as foreign researchers that have been working with Peruvian material.

The research lines are related to the study of helminths in vertebrate and invertebrate wildlife hosts. The investigations are conducted with material obtained from the collections made by Department personnel and material provided by other departments of the Museum of Natural History.

STAFF

CURATOR

Lidia Sánchez, B. Sc.

Fish parasites

ASSOCIATE RESEARCHER

Patricia Salizar, B. Sc.

Helminths of lizards

TECNICAL ASSISTANTS

Beatriz Suyo, B. Sc.

Helminths of public health importance

Hugo Colquichagua, B. Sc.

Oligochaeta

Luis Gómez, B. Sc.

Helminths of mammals

THE HELMINTHOLOGICAL COLLECTION IN NUMBERS

- *NUMBER OF LOTS*: 2063.
- *NUMBER OF SPECIMENS*: determination in the process.
- *REPRESENTED GROUPS OF HELMINTHS*: Digenea, Monogenea, Cestoidea, Acanthocephala, Nematoda, Nematomorpha, Turbellaria.
- *NUMBER OF SPECIES*: TOTAL: 427 species identified. Digenea: 93 species; Aspidogastrea: 3; Monogenea: 62; Cestoidea: 91; Nematoda: 164; Acanthocephala: 14.
- *NUMBER OF TYPES*: Holotypes/paratypes: TOTAL: 34/418; by group of helminth: Digenea 3/10; Aspidogastrea: 1/1 ; Monogenea 16/9; Cestoidea 3/6; Acanthocephala 0/8; Nematoda 11/384.
- *REPRESENTED GROUPS OF HOSTS*:

TABLE I. REPRESENTED GROUPS OF HOSTS
(NUMBER OF LOTS BY HOST GROUP)

| HOST GROUP | DIGENEA | MONOGENEA | CESTODA | NEMATODA | NEMATOMORPHA | ACANTHOCEPHALA | PENTASTOMIDA |
|---------------|---------|-----------|---------|----------|--------------|----------------|--------------|
| INVERTEBRATES | 11 | - | 9 | 32 | 2 | 3 | - |
| FISHES | 116 | 133 | 151 | 174 | - | 64 | - |
| AMPHIBIANS | 31 | 2 | 20 | 167 | - | 15 | - |
| REPTILES | 13 | - | 12 | 124 | - | 1 | 6 |
| BIRDS | 31 | - | 95 | 172 | - | 57 | - |
| MAMMALS | 106 | - | 81 | 415 | - | 17 | 3 |

ANNUAL INCREASE

The growth of the collection is approximately 100 lots per year, considering the last 5 years.

GEOGRAPHIC SCOPE (NATIONAL)

The material deposited in the collection corresponds to various locations in 24 of the 25 geographic Regions currently recognized in Peru.

GEOGRAPHIC SCOPE (INTERNATIONAL)

We have material from countries as Brazil, Canada, Chile, Colombia, Czech Republic, Ecuador, Hungary, Japan, Mexico, Russia, UK, and USA. In some cases this material was collected by laboratory personnel and in others donated by researchers from other countries.

PRESERVATION OF MATERIAL

The specimens in the collection are kept preserved in alcohol at 70% and /or permanent slide mounts

DATA BASE

- Software: Microsoft Excel 2007
- Number and categories of fields: 55 fields. Categories:
- Bibliographic: 10 fields.
- Curatorial: 15 fields.
- Geographic: 9 fields.
- Specimen: 12 fields.
- Number of entries: 2910.
- Web site: Not available.

BIBLIOGRAPHY ASSOCIATED TO THE COLLECTION

Publication of a catalogue of the collection and a digital catalogue with pictures are planned. The material in the collection has been the support of numerous thesis and research projects conducted by Department staff, which allowed for several publications among which are synopses of information on Digeneans, Nematodes and

Acanthocephala of Peru. These publications were prepared by the staff of the Laboratory in collaboration with researchers from other institutions.

Special publications and lists of specimens

Tantaleán M., L. Sarmiento & A. Huiza. 1992. Digeneos (Trematoda) del Perú. *Boletín de Lima* **11**: 47 - 84.

Sarmiento L., M. Tantaleán & A. Huiza. 1999. Nemátodos parásitos del hombre y de los animales en el Perú. *Revista Peruana de Parasitología* **14**: 9-65.

Tantaleán M., L. Sánchez, L. Gómez & A. Huiza. 2005. Acanthocephalan from Peru. *Revista Peruana de Biología* **12**: 83-92.

Morales E., L. Sarmiento, L. Sánchez, D. Floríndez & G. Lamas. 2005. Type material of helminths in the Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, (MUSM), Lima, Peru. *Revista Peruana de Biología* **12**: 463- 472.

GENERAL INFRASTRUCTURE

Currently, laboratory facilities are expanding with the construction of a second floor. This will provide better conditions for the scientific collection and a expanded laboratory area. The vials and the collection of slides are kept in metal cabinets. Even though the optical equipment is old, it is in perfect condition; we have two monocular optical microscopes, an inverted microscope and two stereoscopes, one with continuous zoom.

PROCEDURES FOR INFORMATION, LOANS AND SERVICES

Among the outreach activities conducted by the department are: (1) Consultation and advice; (2) Literature is available for consultation; (3) Analysis and identification of samples; (4) Preparation of temporary and permanent mounts for material. For any request for consultation, loan or service please send a formal letter to the curator.

Publicaciones Especiales del Instituto de Biología 22. *Guide to Helminthological Collections of Latin America*, es una publicación del Instituto de Biología de la Universidad Nacional Autónoma de México y de la Fundación Museo de La Plata “Francisco Pascasio Moreno”. Se terminó de imprimir en 22 de noviembre de 2010 en Creativa Impresores, S.A. de C.V., Calle 12, No. 101, Local 1, Col. José López Portillo, Iztapalapa, C.P. 09920, México D.F. Tel. 55 92 22 40. creaimpresores@prodigy.net.mx México, D.F. Se tiraron 200 ejemplares más sobrantes para reposición, sobre papel couché de 150g, portada en cartulina sulfatada de 14 puntos. El cuidado de la edición estuvo a cargo de los compiladores y de Oscar F. Francke.