



The Hymenoptera Collection of the National Museum of Costa Rica

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Abstract

The heritage collection of the National Museum had significant growth in 2015, when it received the collections of the National Institute of Biodiversity (INBio), which contained close to 3 million specimens. Through a diagnosis and continuous healing, it is determined that particularly the collection of insects of the order Hymenoptera has 476,400 specimens, divided into approximately 2472 species identified until September 2023, listed in this document. It is concluded that many groups still need a lot of taxonomic work to achieve identification at the species level.

Keywords: Ants, Bees, Scientific collection, species, Wasps.

1. INTRODUCTION

The collection of the National Museum of Costa Rica (MNCR) began around 1890 with important collections and research by scientists such as José Cástulo Zeledón, Adolfo Tonduz, Henri Pittier, José Fidel Tristán and Paul Biolley Matthey, who made important scientific contributions on natural history from Costa Rica. However, between the 1930s and 1960s the collection was on the verge of being completely lost, making it necessary to carry out a rescue and restoration project.

Until 2015, the insect collection of the National Museum mainly presented diurnal butterflies and some species of other orders, but upon receiving the collections of the former National Institute of Biodiversity whose volume of specimens exceeded 3 million specimens, it began to have an important representativeness of species from other important orders of insects, one of them is the order Hymenoptera.

The Hymenoptera are a group that has around 150,000 registered species, including bees, ants and wasps. The collection houses 476,400 specimens, which represent approximately 1.4% of those species, and given that only 26.08% of the collection is identified at the species level, that percentage will increase as curation work and collaborations take place scientists advance.

The information associated with the specimens is 100% digitized in a Specify 7 database, which has facilitated both internal work and that of visiting researchers, and therefore the preparation of this document is based mainly on these data and a physical corroboration.

2. METHODOLOGY

2.1. Hymenoptera Collection

The hymenoptera collection of the National Museum of Costa Rica is located in the district of Santa Rosa, Canton of Santo Domingo, Province of Heredia. It is stored in a repository shared by the collections of Diptera, Hemiptera and minor orders. It has a total space of 2,168, 91 metal shelves with 30 spaces each (2,730 spaces in total), and another 4 small metal shelves with doors with 12 spaces each (48 spaces). It has air conditioning and humidity extractors in the tank, to control pests and fungi.

This collection currently has more than 476,400 specimens, representing to date 66 families, 1,152 genera and 2,472 species. The vast majority of the specimens were collected using Malaise traps and nets, between 1988 and 2022 (specimens from the former INBio collection), and a very small part between 1904 and 1985 (specimens from the initial collection of the National Museum), this last one with great historical value.

Likewise, it has a large amount of unprepared material, which is preserved in alcohol in the wet collection. This large amount of material is mostly in good condition and a minority in need of restoration. Andrés Duarte (Entomology Technician) proceeded to carry out a diagnosis and inventory of the bottles preserved in alcohol from the entire collection, results based on which the material belonging only to Hymenoptera was physically reviewed.

2.2. Taxonomic Characterization of the Hymenoptera Collection

To characterize the collection, the specify database was used, and an exhaustive physical review was carried out to know the real state of conservation, with a particular focus on the taxonomic composition and the state of the data and associated information in the system.

A palette of basic colors was used to determine the level of progress of taxonomic identification or inclusion of information (Table 1).

Table 1. Color range according to the information available or achieved results

Color	Range	Knowledge status
Red	Bad	There is no information or it is very little (without identification)
Orange	Well	There is the basic information (Family identification level)
Yellow	Very good	There is information at an acceptable level (Genus identification level)
Green	Optimum	There is complete information (species identification level)

2.3. Physical Characterization

An assessment was made of the state of conservation of the furniture, accessibility, the taxonomic update of the labeling and the volume of material pending preparation, as well as a detection of the needs of the collection to satisfy events such as exhibitions, courses, workshops, visits , and research.

For this, the same range of colors from Table 1 was used.

3. RESULTS

3.1. Taxonomic Characterization and General Aspects

A total of 66 families were found (Table 2), of which the 10 with the highest volume of specimens, in descending order, are Ichneumonidae, Formicidae, Braconidae, Apidae, Diapriidae, Vespidae, Scelionidae, Pompilidae, Pteromalidae and Bethylidae, which makes them a priority for physical arrangement, due to the volume of drawers that are necessary for their organization.

Table 2. Volume of specimens per family

Family	Specimens	Family	Specimens	Family	Specimens
Agaonidae	883	Encyrtidae	2066	Pelecniidae	1182
Ampulicidae	257	Eucharitidae	1916	Pergidae	305
Andrenidae	53	Eucolidae	6	Perilampidae	454
Anthophoridae	5	Eulophidae	8833	Platygastridae	2591
Aphelinidae	3	Eupelmidae	781	Pompilidae	16667
Apidae	35390	Eurytomidae	2352	Proctotrupidae	2070
Argidae	540	Evaniidae	4690	Pteromalidae	11314
Aulacidae	12	Figitidae	8116	Rhopalosomatidae	548
Bethylidae	10665	Formicidae	74009	Scelionidae	21710
Braconidae	38034	Gasteruptiidae	71	Sclerogibbidae	26
Bradynobaenidae	3	Halictidae	7699	Scolebythidae	21
Ceraphronidae	1979	Heloridae	1	Scoliidae	3829
Chalcididae	6086	Ibaliidae	2	Sphecidae	8284
Chrysididae	2455	Ichneumonidae	116884	Stephanidae	97
Colletidae	1645	Leucospidae	148	Tanaostigmatidae	6
Crabronidae	3074	Liopteridae	12	Tenthredinidae	378
Cynipidae	136	Megachilidae	1558	Tiphiidae	4048
Diapriidae	31368	Megaspilidae	91	Torymidae	1135
Diprionidae	1	Monomachidae	247	Trichogrammatidae	16
Dryinidae	2214	Mutillidae	4698	Trigonalyidae	53
Elasmidae	93	Mymaridae	1416	Vespidae	25509
Embolemidae	39	Ormyridae	1	Xiphydriidae	51

On the other hand, this total volume of specimens is found almost entirely at least at the Family level, and only 5,582 specimens are found at the order level in the area of material in transit, which represents only 1.17% of the total. from the collection; 66.37% of the collection is identified at least at the genus level, of this portion 26.08% is at the species level, which represents a quarter of the collection (Fig. 1).

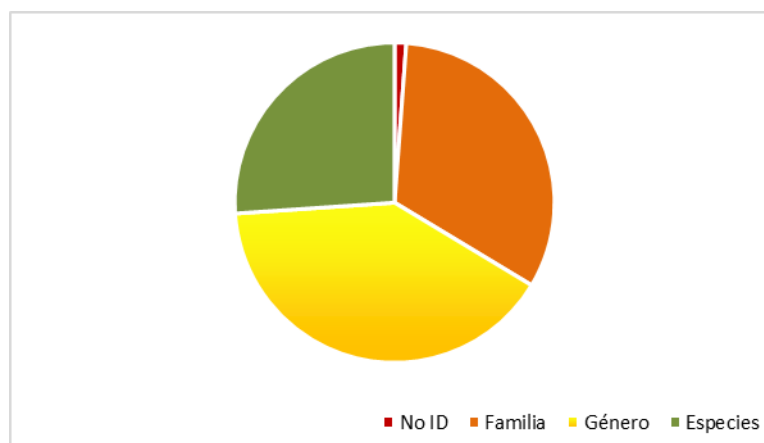


Figure 1. Taxonomic identification level of the specimens of hymenoptera collection.

The order has in the database a total of 112,827 scientific names divided into 8 taxonomic levels (omitting the subtribes, because they have not been incorporated) (Table 3), of which a little less than half (41.17% corresponding to 46,453 taxa) have the assigned author, the rest do not have this information (58.88% corresponding to 66,374 taxa).

Table 3. Number of scientific names by taxonomic level

Taxonomic level	Names
Suborder	2
Superfamily	14
Family	66
Subfamily	160
Tribe	183
Genus	1152
Subgenus	53
Species	2472

Considering the 2472 species found in the database, it was found that the vast majority belong to only 7 of the 66 families, which could both increase or decrease in some of them, due to the large amount of material that remains to be identified to the species level.

In the wet collection there are a total of 351 jars with material pending processing, which dates from between 1992 and 2018. This material is separated at the super-family level by 19% while the remaining 81% corresponds to a mixture of jars from various families.

4. DISCUSSION

The MNCR collection presents an enormous wealth of species already identified and a significant volume of material that has not been processed and continues to yield new species and important information; However, it is little used by government authorities and the general public for the deposit of witness specimens, both resulting from academic research and reference sampling for rapid biological studies, environmental impact studies and wildlife management sites. Although this not only supports information provided to scientific journals and environmental files, but also provides a lot of important information regarding the biology and conservation of the species.

However, as Professor Geoffry Boulton indicates, science with its results must be considered a global public good, since it is knowledge with very particular characteristics, among them the meticulous scrutiny to which each work is subjected to verify its veracity, as well as it has the virtue of evolving by providing important data and applicable objectives to strengthen policies, reduce uncertainty in decision-making and stimulate the search for innovation and improvement of already existing

strategies [2]. Despite this, for decades, the general public has tended to distrust scientific knowledge and even reject it, causing discomfort on the part of scientists and academics who have pointed out the low level of knowledge of scientific principles in the general public as the source of this friction [3], which only aggravates the distance between science and society. Along these lines, some point out that scientific literacy, which basically refers to providing society with a means of communication that allows the exchange of information between science and society, is the key to achieving the democratization of knowledge [4].

In this sense, the collection has great potential that has already begun to bear fruit in terms of environmental education, through the Museum's web portal, where efforts have begun to generate biocultural articles, as well as slightly more specialized material. but always within the line of providing the public with a form of useful, applicable knowledge in an understandable language, because although 2,472 species may seem like a small number, it is actually an important representation of the national species richness. Furthermore, it is essential for the management of collections not to lose sight of the main objective: to serve as an inventory, support and consultation on the species richness of a country, as well as have an important function in education for all audiences [5]. In this sense, the collection presents an excellent work base, threatened only by the lack of political interest, which increasingly allocates fewer economic resources to the maintenance and educational production of the collections.

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