

IABIN Pollinator Thematic Network

A. Title: Pollinator/Visitors plant associations: an implement for CEPANN bee collection

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Title: Pollinators/Visitors plant associations: an implement for CEPANN bee collection (S. Paulo, Brazil)

Título: Associações entre plantas e visitantes florais/polinizadores: um implemento para a coleção de abelhas CEPANN (S. Paulo, Brasil).

Resumo

A coleção entomológica Paulo Nogueira Neto (CEPANN) foi digitalizada pelo projeto FAPESP- Digitalização de Coleções Biológicas, e está disponível em <http://splink.cria.org.br/manager/detail?resource=CEPANN&setlang=pt> . Trata-se de uma coleção de referência para estudos ecológicos. Consta de aproximadamente 38.600 exemplares, sendo identificadas por especialistas 442 espécies de abelhas e outras identificadas até gênero. As abelhas foram coletadas em levantamentos anuais em regiões de Mata Atlântica, jardins em áreas antrópicas e fragmentos de cerrado de diferentes tamanhos, no Estado de S. Paulo, além de exemplares obtidos em coletas ocasionais e em ninhos, provenientes de várias localidades. Entretanto, em cadernos de campo referentes a estas coletas sistemáticas temos dados adicionais das plantas em que estas abelhas foram coletadas, sexo, localização geográfica (ver tabela 1). Estes dados são relacionados a 17.173 exemplares. Esta solicitação visa à digitalização dos dados de relações abelhas-flores ou abelhas/iscas de cheiro, no caso específico dos Euglossini. Sua maior importância está no depósito das abelhas coletadas em coleção oficial no Brasil, fiel depositária segundo as normas vigentes no Ministério do Meio Ambiente, e em séries temporais para as localidades estudadas.

Project summary

The entomological collection Paulo Nogueira Neto (CEPANN) was digitalized by the Project supported by FAPESP (Biological Collections Digitalization) and is available on line in <http://splink.cria.org.br/manager/detail?resource=CEPANN&setlang=pt>. It is a reference collection for ecological studies, with 38.600 bees, among them 442 species identified by specialists and some more identified until genus (1694 bees). Those bees were collected in annual bee surveys in Atlantic Rainforest, cerrado fragments, gardens in antropic areas, as well as in occasional bee collections in several areas and bees gotten from their nests. Nevertheless, we have also field books with data on the flowers where some bees were collected, available for 17. 173 specimens (see table 1). This proposal aims to digitalize the information contained in field books, concerning bees and flowers where they were collected as well as bees and fragrances for Euglossini, in order to make them available on line. The bee collection from IBUSP is an official collection, being able to receive additional samples, according to the rules established by the Ministry of Environment for Biological Collections. The importance of its content is related to temporal series of bees collected in important areas and different sizes of fragments of cerrado.

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Project description

INTRODUCTION

Until the end of the sixties, information related to bee species and the plants visited by them for pollen and nectar collection were available through observations of the naturalists that worked at the beginning of the XX century (Cockerell, 1900; Ducke, 1906, 1907; Friese, 1910; Schrottky, 1902) in Brazil, also considering lists of bees and plants visited by them. Generally these records consist in presence or absence of bees visiting flowers- without quantitative information.

In 1967, Sakagami and cols proposed a standard methodology for sampling bees visiting flowers. After this publication, scientists that work on bee surveys adopted this methodology for their assessment, although sometimes some small modifications occurred in the methodology established by Sakagami and coauthors (see Laroca &Orth, 2002) . Basically it consists in defining transects or areas to be sampled, where bees are collected with entomological nets on flowers or near the flowers, during a standard period (some minutes), all day long, during seasons or a year round. After this successful methodology was established, additional bee surveys were done in several parts of Brazil, and nowadays they are around 100: some were repeated in the same area, because of the interest of having data on pollinators/visitors declining.

All information resulting from these bee surveys are dispersed in articles, but most of them in unpublished thesis and dissertations (for a review, see Ramalho, 1995; Pinheiro-Machado *et al.*, 2002; Biesmeijer *et al.* 2005; Biesmeijer & Slaa, 2006). Data used in these evaluations are species lists, relative abundance, daily and seasonal activities, bee plants and sometimes phenology of bee plants and bee species. After these data, an overview of the composition and structure of Apoidea communities, as well as of the interactions among bees and plants, are possible.

Limitations for the areas' comparison are provided by the correct identification of specimens (plants and bees, Silveira *et al.*, 2002). Most publications do a general overview and comparison of species richness of the Apoidea families that are found in this place or around it, in the same biome (e.g. Silveira & Campos, 1995), or different biomes in the same geographic region (e.g. Jamhour & Laroca, 2004); an actual synthesis or this knowledge is needed. In this way, Pinheiro-Machado et al (2002) did a revision on 46 works did in Brazil, presenting information related to species richness in Apoidea families for different biomes.

Biesmeijer *et al.* (2005) overviewed data related to the social Apidae gotten in 27 studies, doing a matrix considering presence /absence of bees in the sampled flowers, in order to analyze generalization patterns of the connectance's networks and factors that contribute to them, as the altitudes, longitudes, kind of habitat. Biesmeijer & Slaa (2006), used 28 Brazilian bee surveys, compared quantitatively their data, in order to analyze the richness patterns, niche breath and associations among taxa in eusocial Apidae.

The comprehension of functioning and structure of bee communities, considering their association with particular habitats and the existent interactions with the plant species, is very useful for identifying the vulnerability of these organisms to landscape changes, as

well as for evaluate the potential of bee species to adapt to the agricultural environment and their potential for a sustainable use as pollinators (Pinheiro-Machado *et al.*, 2002).

Table 1 shows the kind of data that we propose to add to the databank in this Project. Bees were collected in S. Paulo State and are unpublished papers, although some data are related to PHD thesis.

Below, a brief summary of the bee surveys that comprises this proposal:

1. **Bee survey at Biosciences Institute gardens.** This garden (23°33'S, 46°43'W) was sampled for the first time in 1981-1982, and the result was 132 bee species found in an area of 12 ha (by Fatima Knoll, Luci Bego and Vera Imperatriz-Fonseca; 288 hours/visitors collection, 3 times/month/one year). An additional annual sample was performed in 1992, by Priscila Darakjian & Luci Bego, in the same area, with a similar collection effort; data must be analyzed. In 2004 Naxara did another bee collection in the same area, during the spring, the richer season of the year in number of bees' species. Data must be compared for publishing. Flowers where these bees were collected, as well as seasons, are available in field books.

2. Bee survey in Cantareira Park, a remnant of Atlantic Forest in S. Paulo city. Mauro Ramalho did this survey (1992-1993), published mainly as a thesis and one paper (Ramalho, 2004). This is an important area, a large park in an antropic area. In this survey, 173 bee species were found, and a special attention was related to bees in the canopy of the forested area. Most of bees belonged to Halictidae and Anthophoridae (that nowadays is considered as Apidae). In this study a comparison with data from USP gardens and the Boracéia Biological Station (Wilms, 1995; Wilms et al, 1996) area presented.

3. Bee survey in Morro Grande. This is another PH D, from João Baptista Vicentim Aguilar. Area: 10.700ha. This thesis contains climate data besides interactions in flowers. Bees collected: 2429 bees collected. This is an important forested area around S. Paulo City. Data were collected from 1996 to 1997, collected during 50 days, including 400 hours of field work. In this forested environment 2429 bees were collected, belonging to 109 bee species. Apidae was more abundant, with 75% of the collected individuals, followed by Halictidae (10%), Anthophoridae (8%), Megachilidae (5%), Colletidae (1%) and Andrenidae (< 1%). Anthophoridae represents 36% of the collected species, Halictidae (23%), Apidae (17%), Megachilidae (12%), Colletidae (95) and Andrenidae (3%). Bees were more abundant in July 1996, December 1996 and March 1997. Bees were captured visiting 91 bee plants, belonging to 39 plant families, which the more important were: Asteraceae (21%), Rubiaceae (16%), Sapindaceae (11%), Melastomataceae (9%) e Symplocaceae (8%).

4. The fragments of cerrado in S. Paulo state were studied by Cynthia Pinheiro Machado, in bee collections performed from 1995 to 1996. Bees were sampled in four cerrado's fragments of S. Paulo state. The bee fauna (Apoidea, Hymenoptera) from four areas of cerrado (Brazilian savannas) in the same geographic region was simultaneously sampled (4.039 bees). They were collected with entomological nets when foraging on the flowers,

during the day, each 15 days, all year round. Smaller areas are less rich, although this pattern is not significant. The species loss is observed in areas bigger than 1000ha, considered as continental areas in other studies. The rarest species disappear first.

The field books of these surveys are available and must be organized and digitalized. Information therein consists in day of the bee collection, author, hour, temperature, relative humidity, etc., as showed in table 1.

Tabela 1. Dados associados às 17713 relações entre abelhas e flores em cada um dos levantamentos efetuados no Estado de São Paulo. **Table 1.** Data associated to the 17713 registers of relations between bees and flowers in some bee surveys in S. Paulo State.

DADOS		AUTOR						
		Aguilar, 1998	Bego <i>et al.</i> , 2000	Knoll, 1990	Malagodi-Braga, 2002	Naxara, 2004	Machado, 2002	Ramalho, 1995
número de espécimes		2402	4644	2914	2431	743	4039	1074
Identificação do espécime	n° de catálogo	x	x	x	x	x	x	x
	data da coleta	x	x	x	x	x	x	x
dados da coleta	Horário	x	x	x	x	x	x	
	nome do coletor	x	x	x	x	x	x	x
	Temperature	x						
dados climáticos	Umidade	x						
	Luminosidade	x						
	n° da planta	x	x	x	x	x	x	x
dados da planta	Família	x	x	x	x	x	x	x
	Gênero	x	x	x	x	x	x	x
	Espécie	x	x	x	x	x	x	x
	autor do nome científico	x	x	x	x	x	x	x
	Tamanho	x	x	x	x	x		x
	Altura	x						
	simetria da flor	x						x
	cor da flor	x					x	
	n° de flores por planta	x						
	hábito (arbustivo, herbáceo, arbóreo, cipó, trepadeira)	x					x	x
	Dados taxonômicos do espécime	Família	x	x	x	x	x	x
Subfamília		x	x	x	x	x	x	x
Tribo		x	x	x	x	x	x	x
Gênero		x	x	x	x	x	x	x
Subgenera		x	x	x	x	x	x	x
Espécie		x	x	x	x	x	x	x
Subespécie		x	x	x	x	x	x	x
autor do nome científico		x	x	x	x	x	x	x
Informações da identificação taxonômica	nome do responsável pela identificação	x	x	x	x	x	x	x
	data de identificação	x	x	x	x	x	x	x

Outros dados sobre o espécime	sexo (macho ou fêmea)	x	x	x	x	x	x	x
	nome popular	x	x	x	x	x	x	x
	notas (observações do coletor)	x	x	x	x	x	x	x
Dados geográficos	Localidade	x	x	x	x	x	x	x
	tipo de ambiente (tipo de bioma)	x	x	x	x	x	x	x
	Município	x	x	x	x	x	x	x
	Estado	x	x	x	x	x	x	x
	País	X	x	x	x	x	x	x
	Continente	X	x	x	x	x	x	x
	Longitude	X	x	x	x	x	x	x
	Latitude	X	x	x	x	x	x	x
	Datum	X	X	x	x	x	x	x
Fonte	X	X	x	x	x	x	X	

Proposed outcome of this project

In this proposal a databank will be formed for additional data on bees that belong to the Entomological Collection CEPANN. This information will be available on line in webbee or/and other database.

Innovation: Probably will be one of the first collections to have these data available on line.

How the success will be measured: number of registers digitalized, number of access to the data (on line).

Value to Brazil and to S. Paulo University:

User communities in Brazil interested in the product of this project: academics, beekeepers, meliponiculturists, farmers.

Complementarities: We will take advantage of the existence of WebBee, who has a data base on plant-pollinator species relationship, and of the partnership with Laboratório de Automação Agrícola (LAA), that is working on the development of the schema for plant-pollinator information. Beelab is helping to develop this schema (Tereza Cristina Giannini). Beelab is also digitalizing data of bee-plant developed in other similar Brazilian studies that now are more than a hundred (Biota project, 04/15801-0).

This database will be updated with the support from other projects to be submitted to the Brazilian agency FAPESP. If changes are made, this will be automatically updated and available on line. The Beelab is helping to develop the specific standard to exchange plant-pollinator associations (Darwin core extension), with LAA and CRIA. This will be used to provide data to IABIN TAPIR will be used as the protocol.

Beelab was a pioneer in using the internet to publish information about pollinators. Since 1999 we have been working with LAA on the development of Webbee (www.webbee.org.br), which will be our partner on this project.

We also have our CEPANN on line thanks to the project developed with CRIA, specieslink. Data will be checked against checklists to ensure data quality.

Work Plan- project budgeted

1. Preparation of database to support the specific data to be input : US\$3.000,00
2. Digitalization : US\$3.000,00
3. Preparation of interface to serve data to IABIN, using the Darwin Core extension (under definition) : US\$7.000,00
4. Training- US\$2.000, 00.

Item	IABIN	“Matching funds”	Total
Operating costs: Preparation of database	US\$3.000,00	US\$3000,00 (FAPESP)	US\$6.000,00
Digitalization	US\$3.000,00	US\$2.000,00	US\$5.000,00
Training	US\$2.000,00	US\$500,00	US\$2500,00
Preparation of Interface	US\$7.000,00	US\$9500,00 (FAPESP)	US\$16.500,00
Total	US\$15.000,00	US\$15.000,00	US\$30.000,00

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