Hacia un proyecto CYTED para el Inventario y Estimación de la Diversidad entomológica en Iberoamérica: PrIBES 2000
F. Martín Piera, J.J. Morrone & A. Melic (eds.)
Monografías Tercer Milenio, vol. 1, 2000.

I. INTRODUCCIÓN

Presentación: Medir la Biodiversidad
Gonzalo Halffter

Introducción
Fermín Martín Piera

Practical estimations of biodiversity using higher-rank insect taxa
Fermín Martín Piera

Abstract: After more than two centuries of taxonomic work, measuring Biodiversity, or any other aspect of life's variability, is still an expensive goal both in terms of time and investment. In the last few years higher-taxon richness has been explored (**'RESTAR'** models) as a surrogate for species richness, but its potential still remains poorly explored.

This paper addresses two fundamental questions: Which function best reflects the relationship between species richness and higher-taxon richness, thus presenting the greatest predictive value?, and, Which is the best higher-taxon predictor for species richness?. In order to answer both questions, the fit of linear, log/log, and exponential functions has been checked. Two predictive variables were used: genus richness, and family richness. To ascertain whether the resampling of variables increases the predictive value of the *'RESTAR'* functions, the randomization of samples order was applied to calculate new versions of the linear and exponential functions. All examples were taken from terrestrial Arthropods.

It was concluded that, both theoretically and empirically, a curvilinear function usually fits the relationship between species richness and higher-taxon richness better than a linear function. However, the best-fitting function should be investigated in each particular case, depending on both the spatial scale and sampling intensity. When using linear functions, the use is recommended of higher-taxon predictors which are taxonomically close to the associated variable (genus richness *versus* species richness). However, if the data are fitted to log/log or exponential functions it seems possible to use higher-taxa predictors such as families. Resampling the scores of the variables allows us to use predictors of different taxonomic rank, and also different functions.

'RESTAR' functions generate predictions congruent with other estimators of maximum richness (species accumulation curves, *'ACE'*, and *'ICE'),* but the degree of congruence also depends on the sampling effort, the the spatial scale to which the inventory was made, and on the taxonomic 'distance' between the variables. However, prediction accuracy does not depend so much on the kind of function as on the species richness score used as reference of accuracy (either observed species or maximum richness predicted by other estimators) and on the higher-taxon predictor used as an independent variable (genera or families). If the observed species richness is the reference score, then the number of genera is a better predictor than the number of families. But if the maximum richness predicted by other estimators such as *'ICE'* is used, the number of families is an even better predictor of species richness than the number of genera.

In order to validate the *'RESTAR'* functions, a more robust empirical base is needed at all levels of the taxonomic hierarchy. In hyperdiverse and exhaustively inventoried groups a considerable decrease in the predictive value of the *'RESTAR'* functions is to be expected. In such cases it would be necessary to establish the point where the function loses its predictive value and becomes asymptotic to the axis representing the independent variable. However, as there is no region on Earth where an insect group has been exhaustively inventoried, *'RESTAR'* functions are still a promising methodology to estimate biodiversity, or at least, a working hypothesis deserving a more complete investigation than it has received until now.

It is possible to predict the greographical distribution of species on the basis of environmental variables?

Jorge M. Lobo

Abstract: Getting to know the geographical distribution of the various species of a taxon is a task so colossal that, even in countries with an important taxonomic and biogeographic body of knowledge, the well-surveyed areas are a rather modest proportion of the total. The development of predictive functions based on environmental variables is proposed as a way to tackle this problem. Predicting species richness can be an effective method to describe a taxon's biodiversity in a poorly collected area. The methods and problems associated with accomplishing such predictive functions are reviewed, with the help of various examples, and some solutions are proposed that may be useful to improve their efficiency.

Key words: Biodiversity, Species richness distribution, Predictive models.

The importance of biogeographic atlases for biodiversity conservation

Juan J. Morrone

Abstract: Although global inventories of the world's biota may represent an appropriate action for the preservation of biodiversity, the time required to both survey and document all taxa would outstrip current taxonomic expertise. It has been suggested that panbiogeographic and cladistic biogeographic methods can be useful tools for conservation biology. Some biogeographic methods, namely track or panbiogeographic analysis, parsimony analysis of endemicity, and cladistic biogeography, are briefly presented and their application to biodiversity conservation is discussed. Biogeographic atlases encompassing tracks, areas of endemism, and area cladograms are proposed as a mean to contribute to biodiversity conservation.

Key words: Biodiversidad, Biogeografía, Atlas, Conservación.

The concept of Distribution Area: some theoretical reflexions

Mario Zunino

Abstract: This paper deals mainly with the following question: does the distribution area of a monophyletic unit (and firstly of a species) have some reality or is it simply the spatial representation of its occupant? If the species is an individual-like entity, having ontological and genealogical properties, and interacting with the environment as such an entity, then it grants the status and reality of distribution area to the fraction of physical space it occupies, and the distribution area itself has the same ontological and genealogical properties of the species. According to this viewpoint, since the species can be viewed as the largest succession of eidophoronts (= bearers of the image) linked by exclusive genealogic (tocogenetic) relationships, the distribution area (of a species) can be considered the largest succession of nemophoronts (bearers of places) linked by exclusive ancestor-descendant relationships. Such a theoretical approach allows us to build Steiner trees representing hypothetical relationships between distribution areas, which are independent of any hypothesis about organism phylogeny and geographical history. A methodological procedure is also proposed and discussed by means of the analysis of a Mediterranean genus of Coleoptera.

Key words: Distribution Area, nemophoront, Theoretical Biogeography, methodology.

The species problem and its implications for the survey development and biodiversity estimations

Jorge Llorente Bousquets y Layla Michán Aguirre

Abstract: The species is fundamental to taxonomy as a category, a natural group, and a basic unit of evolution. The species concept is an old and controversial problem. Historically we have two main polemics: the first one about the reality of the species (realism vs. nominalism) and the second about its change over time (fijism vs. evolutionism). In this paper we review the different species concepts, considering their authors, uses, interpretations, and some historical and philosophical considerations. In addition, we discuss some implications of these concepts for biodiversity studies.

Key words: Specie, history of Taxonomy, realism vs. Nominalism, biodiversity.

Neotropical Coleoptera, State of Knowledge

Cleide Costa

Abstract: The Coleoptera is the most speciose order among the insects. The described species, about 357,899, comprise *circa* 40% of all known insects and 30% of all described species on Earth. In the Neotropical Region there are 127 families and 72,476 described species, although this last number is certainly underestimated. Knowledge of the Neotropical beetles is still scarce and there are no general books or treatises about that region, although there are a number of regional treatises. This work provides a synthesis of our knowledge of the Neotropical beetles with reference to the beetles of the world. Some of the most important characteristics of the Coleoptera, its classification and phylogeny, together with an inventory with the number of genera and species of the Neotropical Region, are also given.

Key words: Classification, Diversity, Phylogeny, Sistematics, Coleoptera.

Diagnostic of the main Brazilian collections of Coleoptera

Cleide Costa, Sergio Ide, Germano Henrique Rosado-Neto, Maria Helena Mainieri Galileo, Claudio Ruy Vasconcelos da Fonseca, Roberta Melo Valente y Miguel Angel Monné

Abstract: A diagnosis of the main Brazilian Coleoptera collections is presented. A survey is also included of part of the infrastructure available for systematic research on insects. Brazil has seven main entomological collections, which house about 8,730,000 specimens of Coleoptera: "Instituto Nacional de Pesquisas da Amazônia" (INPA), Manaus; "Museu Paraense 'Emílio Goeldi'" (MPEG), Belém; "Museu Nacional, Universidade Federal do Rio de Janeiro" (MNRJ), Rio de Janeiro; "Coleção Entomológica 'Adolph Hempel', Instituto Biológico" (IBSP), São Paulo; "Museu de Zoologia, Universidade de São Paulo" (MZSP), São Paulo; "Museu de Entomologia 'Pe. Jesus Santiago Moure', Departamento de Zoologia, Universidade Federal do Paraná" (DZUP), Curitiba; and "Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul" (MCNZ), Porto Alegre. Resources for researches include 723 national parks, biological and ecological reserves (corresponding to an approximate area of 733,000 km^2), and 12 main journals are, at least in part, devoted to the systematics of Coleoptera.

Key words: Coleoptera Collections, Systematics, Support for research, Brazil.

Capacidad nacional de investigación en sistemática biológica en Colombia y breve reseña del estado actual del conocimiento taxonómico del orden Coleoptera

Germán Amat y Federico Escobar

Abstract: Infomation about priorities of the conservation and investigation on the principal ecosistems and provinces biogeographic of Colombia is offert. Due to low biological knowledge, high diversity and threat, emphasize start inventory programs at dry forest, Orinoquía and montane forest between 1000 and 2000 m in the Oriental and Occidental mountains. Regions that coincide with Provinces Biogeographic conservation priorites. Inclued a little review about national capacity in Biological Systematic; the firts census showing 150 investigators dedicates to study *Phylum* Artropoda and 39 colections, with low curatory and sistematization. A partial assess about to knowledge of orden Coleoptera, indicate that alone information by 10 % of the families, 15 family are best knowlege and only has an acceptable knowledge. The state of the principal referents colections show a low value of conservation and the idetification is only to family.

Key work: Colombia, Ecosistem diversity, investigation priorities, systematic, biodiversity inventory, Coleoptera.

Chilean Coleoptera

Mario Elgueta

Abstract: An updated view of current knowledge of the Chilean Coleoptera is given, based upon a bibliographical review; 96 families, 1,196 genera and 3,947 species are included. Information about families, genera, and species numbers is given. The main entomological resources available at present are listed. The high degree of isolation and endemism of Chile's coleopteran fauna is emphasized. The Valdivian forests, and arid and semiarid habitats, are important centers of endemism.

Key words: Coleoptera, composition, endemisms, entomological resources, collections, research, Chile.

State of the art and prospects of studies on Coleoptera (Insecta) in Portugal
Artur Serrano
Abstract: In this work an historical approach of Coleoptera studies in Portugal is presented. As a result of an updating of the knowledge of the Coleoptera of Portugal, 93 families, 1,163 genera and 3,676-3,690 species have been recorded for this country. The most relevant bibliography and the current status of some collection assemblages (both institutional and private) are given. Current knowledge of the coleopteran fauna (with some emphasis on endemics) in the protected areas (e.g., Reserves, National Parks) is discussed, and attention is drawn to the urgent need for more taxonomic, faunistic and biogeographic studies on Coleoptera (as well as other insect groups occurring in Portugal) in order to help political decisions in conservation and management issues.
Key words: Coleoptera, State of the art, Protected Areas, Future, Portugal.

Present degree of knowledge of the Brazilian Scarabaeidae *s. str.* (Coleoptera: Scarabaeoidea)
Fernando Z. Vaz-de-Mello
Abstract: Beetles of the family Scarabaeidae are important as decomposers, natural enemies of coprobiont pests and biodiversity indicators. The aim of this work is to determine the present degre of taxonomic and faunistic knowledge of Brazilian species in this group. Between 1926 and 1998, 62 papers dealing with Brazilian Scarabaeidae Systematics have been published by 12 Brazilian researchers. Thirteen local or regional faunal lists have been published between 1875 and 1999. There are by now two Brazilian researchers publishing on the Systematics of Brazilian Scarabaeidae *s. str.* 618 species are cited as occurring in Brazil, 223 endemic to this country. Just five genera, out of the 49 occurring in Brazil, have been reviewed made in the last two decades. The study of a big collection showed 768 Brazilian species of Scarabaeidae, 41% identified to the species level, 8% new and the others unidentifiable without examining types or reviewing genera. Similar proportions have been found in unpublished data from 25 faunal listings in eight states. We conclude that the main limitations of the study of this group in Brazil are the many undersampled areas and the low number of researchers working on the Taxonomy of this group. The Appendix presents a preliminary list of species known to occur in Brazil.
Key words: Diagnostic, Taxonomy, Faunistics, Scarabaeidae, dung beetles, Brasil.

Diversidad y distribución de los escarabajos del estiércol (Coleoptera: Scarabaeidae: Scarabaeinae) de Colombia
Federico Escobar
Abstract: Based on field collections, national museums, and the literature, a total of 249 species in 32 classes and six tribes of coprophagous beetles (Scarabaeinae) were identified for Colombia. Some 27 from the total of the classes are endemic to the Neotropical region and two are cosmopolites; 77.7% of the total of the species are registered locally. A good number of the species, specially of the genera *Canthon, Canthidium, Uroxys,* and *Ateuchus*, are deposited in national collections. Many of the specimens are still unidentified and contain new species. The major richness is presented in the Guyana and Norandina biogeographic provinces with 76 and 68 species, respectively. The major number of species was found in intermediate rainfall sites between 2,500 and 3,500 mm annually. Factors such as elevation and mosaic soils have a strong influence over the diversity patterns of these beetles. A more detailed study in the different regions and habitats is required to learn more about the distribution and biogeographic affinities of this group in Colombia.
Key words: Distribution, biogeography, Coleoptera, Scarabaeidae, Scarabaeinae, Colombia

Coleoptera Passalidae of Mexico
Pedro Reyes-Castillo
Abstract: The Passalidae are represented in Mexico by one subfamily, two tribes, 21 genera, two subgenera, and 81 species. These species are distributed in the cloud forests and tropical rain forests, from sea level up to 3,000 m altitude. The greatest species richness and most abundant populations are found in the cloud forests, between 1,200-1,800 m altitude, and in the tropical rain forests of the lower areas, in comparison with the less abundant populations and lower species richness found in the pine forests and mixed oak-pine forests, as well as the tropical subdeciduous and deciduous forests. The presence of endemic species characterizes the country, with 57% of all the endemic passalid species, three in the

Passalini and 45 in the Proculini, distributed in the cloud forests from the Sierra Madre Oriental, Sierra Madre del Sur, Sierra Madre de Chiapas, the Central Massif of Chiapas, the mountains of Oaxaca, and the Transverse Volcanic System.
Key words: Passalidae, Coleoptera, geographical distribution, species richness, Mexico

Systematics and phylogeny of Neotropical Hymenoptera: State of the art and prospects
Fernando Fernández C.
Abstract: The Hymenoptera is one of the most diverse insect orders in the world. The Neotropical region is very rich, although the real magnitude of its species richness is unknown. A synthesis of current knowledge about of the group is presented, including numbers of families, subfamilies, tribes, genera, and species. The Hymenoptera comprises 20 superfamilies, 77 families, 2,527 genera and about 24,000 described species in the Neotropics. A short guide to their identification and a list of many taxa are presented. The real size of the Neotropical hymenopterofauna may surpass 60,000 species, most of them undescribed, which contrasts with the poor number of taxonomists devoted to their study.
Key words: Hymenoptera, Synopsis, Neotropical Region.

Systematics of the Colombian Hymenoptera: Current knowledge and prospects
Fernando Fernández C.
Abstract: Information about the knowledge of Colombian Hymenoptera is presented. The order comprises 16 superfamilies, 65 families, 1082 genera and around 4800 species. Colombia possesses the 80% of the superfamiles, 84% of the families, 40% of the genera and 20% of the species of Hymenoptera of the Neotropical region. A synthesis of the size of the order in terms of the number of genera and species for each superfamily and family is offered, together with a comprensive literature on phylogenetic and taxonomic publications. The status of researchers and national collections in the country are briefly discussed. In the appendix, the state of knowledge of Colombian ants is presented.
Key words: Hymenoptera, Systematics, Family list, Colombia.

Chilean Hymenoptera
Mario Elgueta y Fresia Rojas
Abstract: An updated overview of the Chilean Hymenoptera is given. They include a total of 54 families, 506 genera, and 1.411 species, and are characterized by a high degree of endemism. The Ichneumonidae, a characteristic group in Valdivian and subantarctic forests, have the highest species number and percentage of endemic species. Other families rich in species numbers are the Colletidae, Sphecidae, and Braconidae. The small species number in soil related groups, such as Diapriidae and Proctotrupidae, is emphasized. Human and physical resources (collections) in Chile are detailed.
Key words: Hymenoptera, composition, endemism, research, collections, Chile.

Present state of knowledge of Lepidoptera Systematics, with special reference to the Neotropical Region
Gerardo Lamas
Abstract: It is estimated that more than 250,000 species of Lepidoptera inhabit the Earth, out of which some 150,000 have been described until present. Although there seems to be a consensus in dividing the order into four suborders (Zeugloptera, Aglossata, Heterobathmiina and Glossata), there is no stable, universally accepted classification of the order, not even at the superfamily level. The Neotropical region contains the highest diversity of Lepidoptera in the world, estimated at over 35% of the total number of species. This percentage rises to over 42% when only butterflies (Hesperioidea + Papilionoidea) are considered. A brief evaluation of the degree of knowledge of the lepidopterological faunas in the different countries of the Neotropics is presented herein, indicating the main resources (human and physical) available at present. Two important bioinformatics projects on Lepidoptera are also mentioned, one started in 1981 (the "Atlas of Neotropical Lepidoptera"), the other in 1998 (the "Global Butterfly Information System"). Their methodologies and objectives are described.
Key words: Biodiversity, Bioinformatics, Lepidoptera, Neotropics, Systematics.

Current level of taxonomic knowledge of the butterflies of Venezuela (Lepidoptera: Rhopalocera)

Ángel L. Viloria

Abstract: Based on a historical overview, it is given a diagnosis of the current level of taxonomic knowledge of the butterflies of Venezuela (Insecta: Lepidoptera, Rhopalocera). The taxonomic diversity of these insects is estimated, and the degree of knowledge by physiographical regions in Venezuela is evaluated to propose priorities for future studies. A table of the main butterfly collections in the country, with descriptive data, as well as a directory of lepidopterists currently dealing with the Venezuelan fauna, are shown. Bibliographical resources available to specialists in Venezuelan institutions are commented upon. It is concluded that the butterflies of Venezuela are taxonomically and biogeographically well known, but success and improvement of future developments would depend on the application of measures to strengthen institutional infrastructure and training of more specialists. This work ends up appendixing a model of diagnosis of the knowledge on a group of butterflies from the Venezuelan mountains, the subfamily Satyrinae.

Key words: Diagnosis, specialist directory, montane fauna, history, species checklists, Andean Satyrinae, Venezuelan Andes, Serranía del Turimikire, Cordillera de La Costa, physiographical regions of Venezuela.

A preliminary synthesis of the knowledge on the Mexican Papilionoidea (Lepidoptera: Insecta)

Armando Luis Martínez, Jorge Llorente Bousquets, Isabel Vargas Fernández y Ana Lilia Gutiérrez

Abstract: Butterflies, together with vertebrates and higher plants, are often used for conservation studies and monitoring worldwide. This is due to the advanced development of their systematic, ecology and biogeography. In Mexico, studies on butterflies go back to the last century (*Biologia Centrali-Americana*) and since then knowledge has advanced significantly. More than 1,800 species of butterflies in five families, 20 subfamilies, 50 tribes and almost 500 genera have been already recognized. This information has appeared in more than one hundred monographs and books and in many papers published in at least 12 major periodical journals. The main synthetic results of the above work are: (1) Mexico holds 10% of the Rophalocera of the world and ranks among the ten most rich countries in butterflies; (2) our country and neighboring areas hold paleo and neoendemic groups of the great interest, some of them relictuals, mainly in the xeric parts of the north and west and in the mountain ranges of the south; (3) the richness pattern is independent of the endemism pattern because the richest areas are the tropical humid lowlands; (4) the areas with higher endemism and richness are those with the greatest physiographic, climatic and vegetational heterogeneity (e. g. Los Tuxtlas, Vercaruz and Sierra de Juárez, Oaxaca, each one with about 35% of the species richness), the conservation of butterfly diversity depends on habitat conservation because slight changes may induce local extinctions, but we still lack in depth and long term studies about these problems; and (5) Mexico presents several insular intracontinental patterns, which are the product of the disjunct and heterogeneity distribution of xeric and humid parts, which are the result from the complex biogeographical history of the country.

Key words: Distribution, richness, endemism, collections, databases, Papilionoidea, Papilionidae, Pieridae, Nymphalidae, Lycaenidae, México.

Diagnosis of current systematic and biogeographical knowledge of three hyperdiverse insect orders in Spain: Coleoptera, Hymenoptera and Lepidoptera

Fermín Martín Piera y Jorge Miguel Lobo

Abstract: Taxonomic knowledge of the Iberian Coleoptera, Hymenoptera, and Lepidoptera is assessed. The total species richness of the Iberian Peninsula for these three hyperdiverse orders (some 24,000 species) is estimated at nearly 4% of the worldwide fauna. The main Spanish taxonomic resources are described, including both a selection of the main systematic works of the last century and the leading private and institutional entomological collections. While the species richness of the entomological fauna of the Iberian Peninsula and the richness of entomological funds kept in a few institutional collections are highlighted, stress is also laid on the current precarious situation of Spanish entomology as a scientific discipline, regarding both human resources and financial support. Compiling the systematic

and faunistic information currently available and obtaining, in the medium term, a reliable description of the distributional patterns of Spanish entomological diversity, call for a serious scientific policy which sets out to further research into our entomological resources and is designed to give both Systematic Entomology and Insect Biogeography in Spain a chance to develop and overcome their present difficulties.
Key words: Coleoptera, Hymenoptera, Lepidoptera, State of Art, Spain.

COLOFÓN:

Conclusiones del 1º Taller Iberoamericano de Entomología Sistemática
Villa de Leyva (Colombia), 28 de junio al 5 de julio de 1999
Fermín Martín Piera

PriBES *on line*
A. Melic, J.J. De Haro y D. Campos