BIOTA + 10: a successful experience in combining biodiversity research, personnel training, bioprospection and public-policy impact in São Paulo, Brazil.

Prof. Carlos A. JOLY

Biology Institute & Environment and Society Program

Deputy Secretary – Secretariat of Policies and Programs in Research and Development

Ministry of Science, Technology & Innovation
Number of species

Angiospermae

Amphibian

Reptiles

Birds

Mammals
High ethnic diversity pre & pos Columbus. At least 15,000 years of human presence/occupation.
ATLANTIC RAIN FOREST (Mata Atlântica) evergreen in the coast, seasonal inland + north limit of *Araucaria* Forest. Southern limits of the CERRADO (savanna). Large contact areas between Cerrado and Mata Atlântica, both considered as hot spots by Myers et al. (2000)

- 250,000 Km$^2$
- 97,656 sq.m
- 650 km coast
GLOBAL BIODIVERSITY: SPECIES NUMBERS OF VASCULAR PLANTS

Diversity Zones (DZ): Number of species per 10,000km²

- DZ 1 (<100)
- DZ 2 (100 - 200)
- DZ 3 (200 - 500)
- DZ 4 (500 - 1000)
- DZ 5 (1000 - 1500)
- DZ 6 (1500 - 2000)
- DZ 7 (2000 - 3000)
- DZ 8 (3000 - 4000)
- DZ 9 (4000 - 5000)
- DZ 10 (>5000)

Capensis Floristic regions
In the State of São Paulo de area covered by native forests decreased from 85% in 1500 to 13% in 2005. Approximately 65% of forest remnants are along the Serra do Mar, and only 50% are protected within State Parks.
Originally 14% of the State of São Paulo was covered by Cerrado, and until 1950 most of it (85%) was preserved.

Since the first ethanol boom, in the 70’s, conversion of Cerrado into sugarcane plantation has been fast.

In 2005 only approximately 2% of the original area was still covered by native Cerrado, and less then 10% was preserved within State Parks.

\[ \approx 8.500 \text{ fragments} \]
Three realities
Information about Brazilian biodiversity could be summarized in the following equation:

- Oceans of data
- Rivers of information
- Streams of knowledge

- **Drops of understanding**
  - Droplets of sustainable use
The big challenge in this strategic area was to establish an integrated biological information system, using taxonomic, biogeographic & ecological knowledge associated with bio-informatics and remote sensing tools.
To face this challenge in February 1996 a group of researchers started to work together with FAPESP (State of São Paulo Research Foundation), aiming to establish the basis of a Research Program on Biodiversity Conservation and Sustainable Use for the State of São Paulo.
1996
Research Leaders
FAPESP’s Biological Science Coord.
FAPESP’s Scientific Director
COORDENATION GROUP - BIOTASP
1997

Homepage
Discussion List

Diagnostic  ➔  PUBLICATION

WORKSHOP DE SERRA NEGRA

ARTICULATED THEMATIC PROJECTS
1998

18 THEMATIC PROJECTS

INTERNATIONAL EVALUATION

2 FIRST VOLUMS OF THE SERIES
Biodiversity of the State of São Paulo: synthesis of the available knowledge at the end of the XX century.
The Research Program on Characterization, Conservation and Sustainable Use of the Biodiversity of the State of São Paulo, called "BIOTA/FAPESP, The Virtual Institute of Biodiversity", is the result of the articulation of the scientific community in compliance to the Convention on Biological Diversity signed at the 1992 Earth Summit in Rio de Janeiro and ratified by the Brazilian National Congress in 1994.
The Research Program on Characterization, Conservation and Sustainable Use of the Biodiversity of the State of São Paulo, called "BIOTA/FAPESP: The Virtual Institute of Biodiversity", is the result of the articulation of the scientific community in compliance to the Convention on Biological Diversity, signed at the 1992 Earth Summit in Rio de Janeiro and ratified by the Brazilian National Congress in 1994.
SCOPE

Microorganisms

Higher Plants & Vertebrates

Terrestrial

Fresh Water

Marine
SCOPE

Inventories

Landscape Ecology

Human dimensions of biodiversity conservation and sustainable use
MANDATORY USE OF GPS AND A STANDARD SAMPLING PROTOCOL WITH 9 OBLIGATORY FIELDS
Data bank structure
DIGITAL ON LINE MAP BASE

ESCALA 1:50,000

Urban Areas; Roads & Highways; Political & Administrative Divisions, Rivers & Watersheds, Conservation Units, Reforestation with *Pinus* spp & *Eucalyptus* spp

REMNANTS OF NATIVE VEGETATION
Phytogeographic Domains
## Código: 736

**Sobre a coleta/registro:**
- **Coletor:** Biseuq Duigan
- **Data:** 30/07/1990 a 29/07/1990
- **Município:** Campos Novos Paulista, SP
- **Localidade:** Fazenda Alvoreda de Engarca
- **Unidade de Conservação:** Terrestre
- **Bacia Hidrográfica:** Médio Paranapanema
- **Precisão do GPS:** 100m
- **Precisão da Coleta:** Área da Coleta

**Ecossistema:** Cenário: meio de terra firme (Ravaina)
**Habitat:** Comodo "sólido e orelou" (Ravina Arbórea Arboral)
**Microhabitat:** Áreas do Estado

**Método:** Levantamento Botânico Expedido

**Descrição do Método:** Método de levantamento botânico rápido cuja unidade de amostragem é de 30 minutos. O tempo total de coleta é definido pela área de coleta. O tempo mínimo de coleta é de 30 minutos.

**Outras observações:**
A lista de espécies associadas a esta coleta é constituída de espécies arbóreas em sua maioria de algumas espécies não arbóreas mas de interesse econômico.

**Palavras-chave:** Árvores

### Informações taxonômicas:
- **Conteúdo:** 185 Taxa e 1 Grupo Taxonômico
- **Grupos taxonômicos:** Angiospermae

### Dados sobre o autor da coleta:
- **Nome:** Monitor de Conservação das remanescentes de Cerrado do Mato Grosso
- **Endereço:** Rua João de Albuquerque, 123, Cidade de São Paulo, SP
- **Telefone:** (11) 1234-5678
- **E-mail:** joao@arvore.com.br
- **Web:** www.arvore.com.br
Consulta ao Banco de Dados

Lista de espécies associada a coleta 736

Definição do grupo: Angiospermae

<table>
<thead>
<tr>
<th>TAXONOMIA</th>
<th>DESCRIÇÃO</th>
</tr>
</thead>
<tbody>
<tr>
<td>REINO</td>
<td>Fungi</td>
</tr>
<tr>
<td>FRAÇÃO</td>
<td>Plantae</td>
</tr>
<tr>
<td>SUB-FRAÇÃO</td>
<td>Spermatophyta</td>
</tr>
<tr>
<td>CLASSE</td>
<td>Angiospermae</td>
</tr>
</tbody>
</table>

Hierarquia taxonômica obrigatória para este grupo: família, gênero, espécie, autor, ano, UI IUD.
Nome(s) Comum: angiosperma, plantas com flor.

<table>
<thead>
<tr>
<th>FAMÍLIA</th>
<th>GÊNERO</th>
<th>ESPECIE</th>
<th>AUTOR ANO</th>
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<td>Anacardium</td>
<td>L.</td>
<td>A. Sc-Hil.</td>
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<td>Aub.</td>
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<td>Annona</td>
<td>Warb.</td>
<td></td>
</tr>
<tr>
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<td>SP</td>
<td>Annona</td>
<td>Mart.</td>
<td></td>
</tr>
<tr>
<td>Annonaceae</td>
<td>SP</td>
<td>Annona</td>
<td>Mart.</td>
<td></td>
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<tr>
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<td>Annona</td>
<td>Mart.</td>
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<td>Jugueira</td>
<td>A. Sc-Hil.</td>
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<td>Jatropha</td>
<td>L.</td>
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<tr>
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<td>SP</td>
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<td>L.</td>
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<td>Aponosaerma</td>
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<tr>
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<td>Jatropha</td>
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<td>SP</td>
<td>Heteraxias</td>
<td>Moll Arg. Woot.</td>
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<td>Aponoaceae</td>
<td>SP</td>
<td>Heteraxias</td>
<td>Moll Arg. Woot.</td>
<td></td>
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</tbody>
</table>
VI – Evaluation Meeting of the BIOTA/FAPESP Program
08 – 13th July 2008 - Araraquara

Scientific Advisory Committee

Arthur D. CHAPMAN - Marcelo TABARELLI - Gordon CRAIG - João Batista CALIXTO - Rober VERPOORTE

BIOTA - http://www.biota.org.br/info/sac/sac6

Recursos investidos por instituição

TOTAL AMOUNT OF FAPESP’S INVESTMENT IN THE BIOTA/FAPIESP PROGRAM 1998-2010

R$ 98.772.262,50 ≈ US$ 40.000.000,00
Georeferenced databank with
102,704 registers
11,820 species
Native Forest remnants

PRODUCT

On line 1:50,000 Digital Map customized “on the fly”

34 types of native vegetation (IBGE)
- Conservation Units
- Urban areas
- Rivers & dams
- Roads
- Municipalities

Pinus spp & Eucalyptus spp
Production Forests

Cerrado remnants
Integrated system using open source software

Intel/Linux Server

Data Bank - PostgreSQL

Standards and protocols

172 taxonomic groups

On line data "feeding"

Public access to all data and maps

Interoperability with other initiatives like GBIF
SpeciesLink in Numbers

> 200 collections & sub-collections
> 4,000,000 registers on-line
> 1,900,000 georreferenced
> 315,000 species
Change in the Provisional Measure/Decree that regulates access to genetic patrimony, traditional knowledge and benefit sharing.

www.bioprospecta.org.br
BIOTA NEOTROPICA is a scientific journal of the Program Biota/Fapesp – The Virtual Institute of Biodiversity that publishes the results of original research work, associated or not to the program, that involve characterization, conservation and sustainable use of biodiversity in the Neotropical region.
Phanerogams ....

Cryptogams ....
# Professional training

<table>
<thead>
<tr>
<th>Agência</th>
<th>IC</th>
<th>MSc</th>
<th>PhD</th>
<th>Pos-Docs</th>
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<tr>
<td>FAPESP</td>
<td>125</td>
<td>104</td>
<td>64</td>
<td>62</td>
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<tr>
<td>CNPQ/CAPES</td>
<td>47</td>
<td>65</td>
<td>44</td>
<td>17</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>172</strong></td>
<td><strong>169</strong></td>
<td><strong>108</strong></td>
<td><strong>79</strong></td>
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</table>
In 10 years the BIOTA Program published > 850 papers, in 210 journals, at least 130 indexed by ISI, including Nature and Science. The average impact index of published papers is 1.219.
PRODUCTS
<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Phanerogams</th>
<th>Cryptogams</th>
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<tr>
<td>Registers</td>
<td>62,600</td>
<td>1,815</td>
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<tr>
<td>Species</td>
<td>5,463</td>
<td>433</td>
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</table>

<table>
<thead>
<tr>
<th>Class</th>
<th>Mammals</th>
<th>Reptile</th>
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</thead>
<tbody>
<tr>
<td>Registers</td>
<td>8,062</td>
<td>431</td>
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<tr>
<td>Species</td>
<td>149</td>
<td>74</td>
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</table>

<table>
<thead>
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<th>Class</th>
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<th>Amphibians</th>
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</thead>
<tbody>
<tr>
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<td>19,742</td>
<td>17,351</td>
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<tr>
<td>Species</td>
<td>520</td>
<td>Espécies: 168</td>
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</table>

<table>
<thead>
<tr>
<th>Class</th>
<th>Fishes</th>
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<tbody>
<tr>
<td>Registers</td>
<td>11,620</td>
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<tr>
<td>Species</td>
<td>349</td>
</tr>
</tbody>
</table>
Landscape Metrics

1. Remnant area
2. Area index – size and format
3. Proximity

Biodiversity Indexes

1. List of species/remnant richness
2. Number of endemic species
3. Number of endangered species (category of Risk)
4. Single occurrences for the State of São Paulo
5. Number of occurrences in the State of São Paulo
6. Presence/Risk of invasive species
BIOTA/FAPESP Program – Map of the priority areas for biodiversity conservation and restoration for the State of São Paulo.
XICO GRAZIANO
Secretário de Estado do Meio Ambiente
convida para o lançamento do livro

DIRETRIZES PARA A CONSERVAÇÃO E RESTAURAÇÃO
DA BIODIVERSIDADE NO ESTADO DE SÃO PAULO*

Dia 24 de novembro de 2008
Segunda-feira, às 16:30 horas
Av. Miguel Estêfano, 3.031 - Água Funda
São Paulo - SP

Informações:
Jardim Botânico • Tel: 11 5073 6300 ramal 219
Assessoria de Comunicação • 11 3133 4099

*Exemplares disponíveis aos presentes no evento

Realização:
The map produced by BIOTA/FAPESP is adopted by the State Secretary of Environment as State police for biodiversity conservation and restoration.

O SECRETÁRIO DE ESTADO DO MEIO AMBIENTE, em cumprimento ao disposto nos artigos 23, VII, e 225, § 1º, I, da Constituição Federal, nos artigos 191 e 193 da Constituição do Estado, nos artigos 2º e 4º da Lei federal nº 6.938, de 31 de agosto de 1981, e nos artigos 2º, 4º e 7º da Lei estadual nº 9.509, de 20 de março de 1997, e

Considerando os resultados obtidos pela equipe de pesquisadores do Projeto Biota FAPESP e as informações presentes no mapa de "Áreas prioritárias para incremento da conectividade" e "Áreas prioritárias para criação de Unidades de Conservação" resultantes do Projeto Biota FAPESP;
The map produced by the BIOTA/FAPESP Program is adopted by the State Secretary of Agriculture – areas of sugarcane expansion.
Biodiversity Conservation Research, Training, and Policy in São Paulo


Since the Convention on Biological Diversity (CBD) in 1992, biodiversity conservation (the protection of species, ecosystems, and ecological processes) and restoration (recovery of degraded ecosystems) have been high priorities for many countries. Scarce financial resources must be optimized, especially in developing countries considered megadiverse (1), by investing in programs that combine biodiversity research, personnel training, and public-policy impact. We describe an ongoing program in the state of São Paulo, Brazil, that may be a useful example of how conservation initiatives with a solid scientific basis can be achieved.

São Paulo’s rich native biodiversity is threatened by changes in land cover and fragmentation (2, 3). This prompted scientists in 1999 to found the Virtual Institute of Biodiversity, BIOTA-FAPESP. FAPESP, the State of São Paulo Research Foundation, is a nonpolitical, taxpayer-funded foundation, one of the main funding agencies for scientific and technological research in Brazil.

The BIOTA-FAPESP program is linking a decade of research on biodiversity into public policy in the state of São Paulo.
SCIENCE PLAN & STRATEGIES FOR THE NEXT DECADE
Changes in the Brazilian Forest Code - Senate
Primary & High School - General Public
Ecosystem Functioning

- Hydrology
- Hydrochemistry
- Natural Ecosystems
- Ecophysiology, Isotopy
- Land use changes
- Carbon, nitrogen & water fluxes
- Biosphere-Atmosphere Coupling
- Phytosociology
- Biometry (C stocks)
- Photosynthesis
- Leaf metabolism C & N
- Plant-Atmosphere Coupling
- Water balance

Courtesy Humberto R. Rocha
Ecosystem Services

**INDIRECT DRIVERS OF CHANGE**
- Demographic
- Economic
- Sociopolitical

**DIRECT DRIVERS OF CHANGE**
- Climate change
- Nutrient loading
- Land use change
- Species introduction
- Overexploitation

**HUMAN WELL-BEING**
- Basic Material for good life
- Health
- Security
- Good social relations
- Freedom of choice and action

**ECOSYSTEM GOODS AND SERVICES**

**GOODS** (provisioning services)
- Food, fiber, and fuel
- Genetic resources
- Biochemicals
- Fresh water

**CULTURAL SERVICES**
- Spiritual and religious values
- Knowledge system
- Education and inspiration
- Recreation and aesthetic values

**REGULATING SERVICES**
- Invasion resistance
- Herbivory
- Pollination
- Seed dispersal
- Climate regulation
- Pest regulation
- Disease regulation
- Natural hazard protection
- Erosion regulation
- Water purification

**SUPPORTING SERVICES**
- Primary production
- Provision of habitat
- Nutrient cycling
- Soil formation and retention
- Production of atmospheric oxygen
- Water cycling
Invasive species

Source of original data
Global Invasive Species Data Base

Number of invaders

Countries

- All - 283 spp.
- Worst 100 - 54 spp.

Courtesy Mary Kalin Arroyo
Socio-economic data
What is the CENAPAD-SP?

CENAPAD-SP (National Center for High Performance Computing in São Paulo) was founded on March 1994, under the agreement between Unicamp (State University of Campinas) and FINEP (Finance for Studies and Projects), from Brazilian Ministry of Science and Technique.

Its mission is to provide computing and consulting services to the academic community and the private sector.

Young, but with tradition

Unicamp can be considered a young institution and one that has already developed a strong tradition in education, research and services to society.
NEW INTERFACES

SinBIOTA 2.0

Consortium for the Barcode of Life

DNA Barcoding

Data Management and Bioinformatics Challenges of Metagenomics

DesktopGarp

MaxEnt

DIVA Gis

Open Modeler
FULL INTEROPERABILITY

PPBIO – SISBIOTA – REPENSA
BIOTA BA - BIOTA ES - BIOTA MG
BIOTA MS - BIOTA RS
ICSU in Latin America
Vision
Mission
Secretariat
Regional Committee
Regional Consultation
Events
Forthcoming Events
Scientific Planning Groups
News
Biodiversity Knowledge, scope of research and priority areas: an assessment for Latin America and the Caribbean
PARTNERSHIPS

BIOTA AFRICA

BIODiversity Monitoring Transect Analysis in Africa

A map of Africa with regions marked for BIOTA projects such as BIOTA West Africa, BIOTA East Africa, and BIOTA Southern Africa.
Scientific support for sustainable land and resource management in the Okavango basin

The Okavango basin with its variety of savannah woodlands and wetland ecosystems linked by the central lifeline of the Okavango River is a global hot-spot of accelerating change and land use conflicts. The river has its source in the rainy highlands of Angola and terminates in the Okavango Delta, the world's largest inland delta and the largest freshwater swamp south of the equator. The TFO project will analyze ecosystem functions and services within this trans-boundary basin of high international visibility and high potential transferability of results to other tropical and sub-tropical regions.
Global plant database set to promote biodiversity research and Earth-system sciences

The world's largest database on plants' functional properties, or traits, has been published. Scientists compiled three million traits for 69,000 out of the world's ~300,000 plant species. The achievement rests on a worldwide collaboration of scientists from 106 research institutions. The initiative, known as TRY, is hosted at the Max Planck Institute for Biogeochemistry in Jena (Germany). Jointly coordinated with the University of Leipzig (Germany), IMBIV-CONICET (Argentina), Macquarie University (Australia), CNRS and...
NERC has agreed to invest £8M in the Biodiversity and ecosystem Processes in Human Modified Tropical Forests Programme.

NERC’s investment consists of work associated with the SAFE platform in SE Asia, development of new technologies for long-term observations of biogeochemical cycling in tropical ecosystems and to develop work in the Brazilian Atlantic Rainforest as a comparative site.
Forum on Science, Technology and Innovation for Sustainable Development Rio de Janeiro, May 25 to 30 2012 (Rio+20)
International Conference: Getting Post 2010 Biodiversity Targets Right
December 11 – 15th 2010
Bragança Paulista/SP
BIOTA program activities – 2010 International Year of Biodiversity

BIOTA MEETINGS

2010, November 23rd

BIOTA-FAPESP Getting Post 2010
Biodiversity Targets Right

Speakers (33)
Mr. Ahmed Djoghlaf
Nicholas King/GBIF
Bráulio Dias/MMA
Antonio Mauro Saraiva/IABIN
David Oren/MCT
Eduardo Morales Guillaumin/CONABIO
Mexico
Maria Auxiliadora Mora/INBIO Costa Rica
Monica Vera - Fund. Humboldt
Colômbia
Timothy M. Vogel/Univ. Lyon France
Jack Anthony Gilbert/Plymouth Marine
UK
Alfred Püehler/ Univ. Bielefeld Germany
Márcio Lambais/ESALQ-USP
Vivian Pellizari/ USP
Arco J. van Strien/Statistics Netherland
Philip M. Fearnside/INPA

Antonio Mauro Saraiva/USP
Carlos Grelle/UFRJ
Geraldo Wilson Afonso
Fernandes/UFMG
Luciano M. Verdade / USP
Mauro Galetti / UNESP
Ronald O'Dor / Dalhousie University – Canada.
Thomas M. Lewinsohn IB /
Eduardo Eizirik / PUCRS
Marcelo Tabarelli / UFPE
Carlos A. Joly & Alexandre F. Colombo / UNICAMP
Luiz Antonio Martinelli / CENA-USP
Humberto R. Rocha / IAG-USP
Alexandre Martensen / IB-USP
Naercio A. Menezes / MZ-USP
Célio F. B. Haddad / UNESP Rio Claro
Maria Alice dos Santos Alves & Mariana Vale / UERJ
Adriano Pereira Paglia / UFMG
Miguel Calmon / TNC
Intergovernmental Platform on Biodiversity and Ecosystem Services/IPBES

As result of a joint proposal – BIOTA & Ministry of Environment + Ministry of Science and Technology + Ministry of Foreign Affairs the Brazilian government is presenting a proposal to HOST IPBES Capacity Building Center
Thank you!