I. Research Report of Basic Information

March, 2005

Summary

The goal of this research has been to gather information to be used by the institutions involved within the "Natural Environment Conservation Project in the Iguazú Region" (also called Cabure-í Project) to develop environmental education and rural-tourism activities within Andresito area.

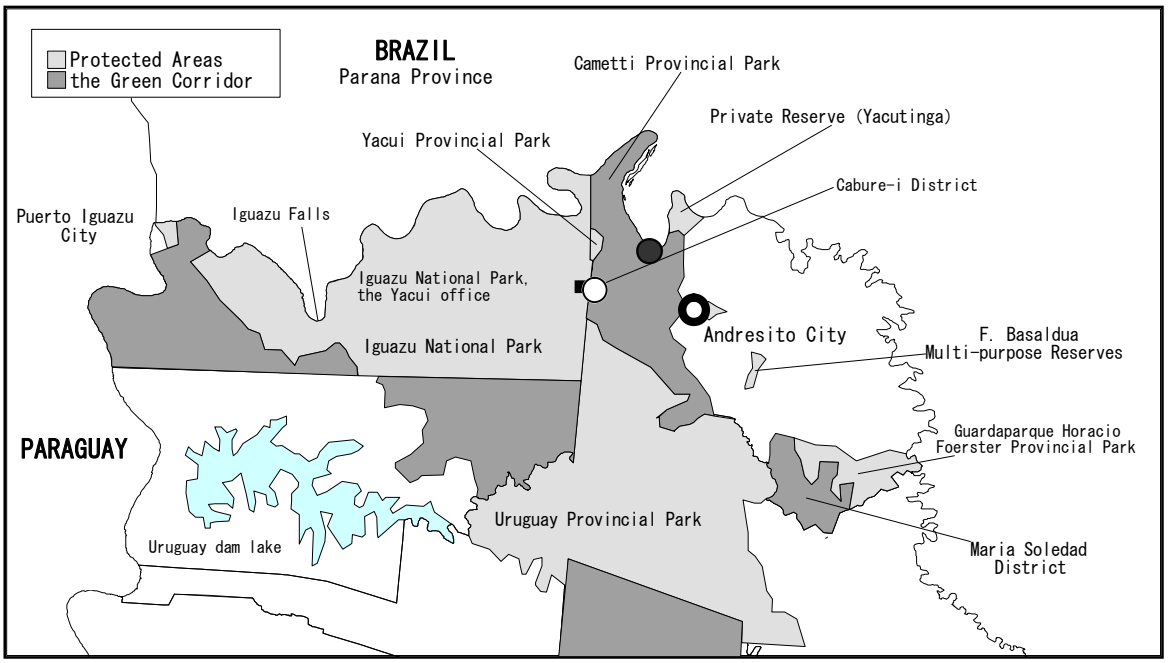
Institutions involved are the Ministry of Ecology of Misiones Province, the Administration of National Parks and the Municipality of Commandant Andresito.

The fieldwork has been accomplished by a local non-gouvernamental organization (NGO) with the support of JICA experts and personnel from the institutions involved. The mentioned NGO was in charge of selecting the researchers and coordinating the fieldwork.

Biological information was gathered in three different areas: Paraje Cabure-í; La Blanquita, and a five hectare field near Andresito´s downtown. The fieldwork was accomplished in August, with the proximity of Spring and in October, with the proximity of Summer, with the goal of studying seasonal changes. The research included the following topics: flora, fauna, soil, weather conditions and socioeconomic profile of the bordering farms. Related to fauna: mammals, arthropoda, reptiles, amphibia, birds, and invertebrate, were considered in the fieldwork; the schedules of work were organized according to animals' habits.

About flora, 61 families and 172 species of plants were recorded, which represents 34% and 11% respectively of the total families and species recorded within Misiones province. Regarding fauna, 12 families and 19 species of mammals; 5 families and 5 species of reptiles and 5 families and 13 species of amphibia were recorded. In respect of birds, 26 families and 55 species were recorded in August and 38 families and 79 species in October. About arthropoda, 33 families in August and 53 families in October were recorded.

The purpose of this report is to provide basic information about the natural environment of the area where the Project will be developed.



Map. 1: Area of research: ○ Cabure-í ● La Blanquita ◎ Andresito

Areas of research

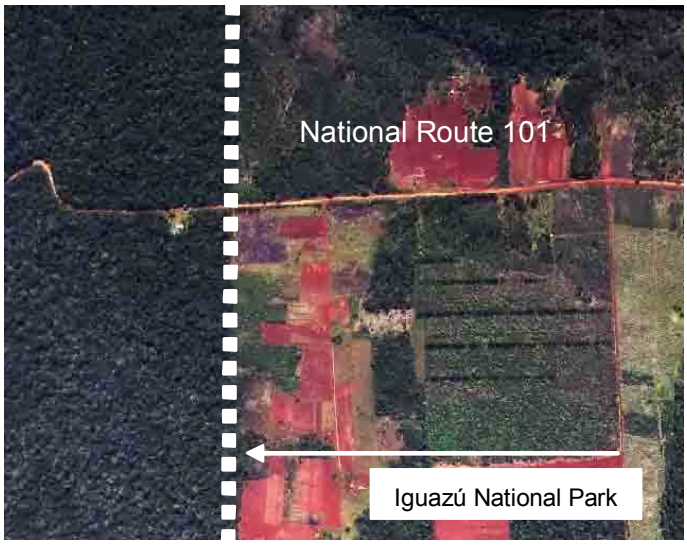


Photo 1: Cabure-í

Located on the eastern limit of the Iguazú National Park and the National Route 101. It´s a section between the protected areas and rural areas.

Photo 2: La Blanquita

Secondary forest modified by human activities with an open landscape on the side of the Iguazú River. On the opposite, the Iguaçú National Park (Brazil)

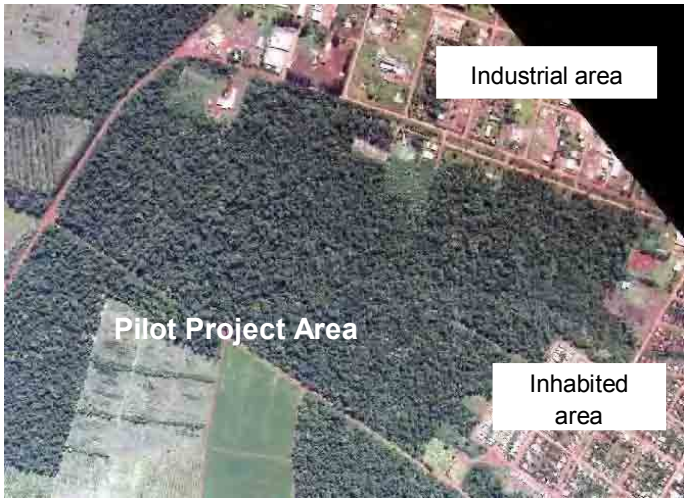


Photo 3: Andresito

About five hectares field within a 57 hectare site from IPRODHA in Comandante Andresito. It has been given by the MERNRyT to develop the Pilot Project of ecotourism. It is located between dowtonwn and the farm area.

Cabure-í Sights

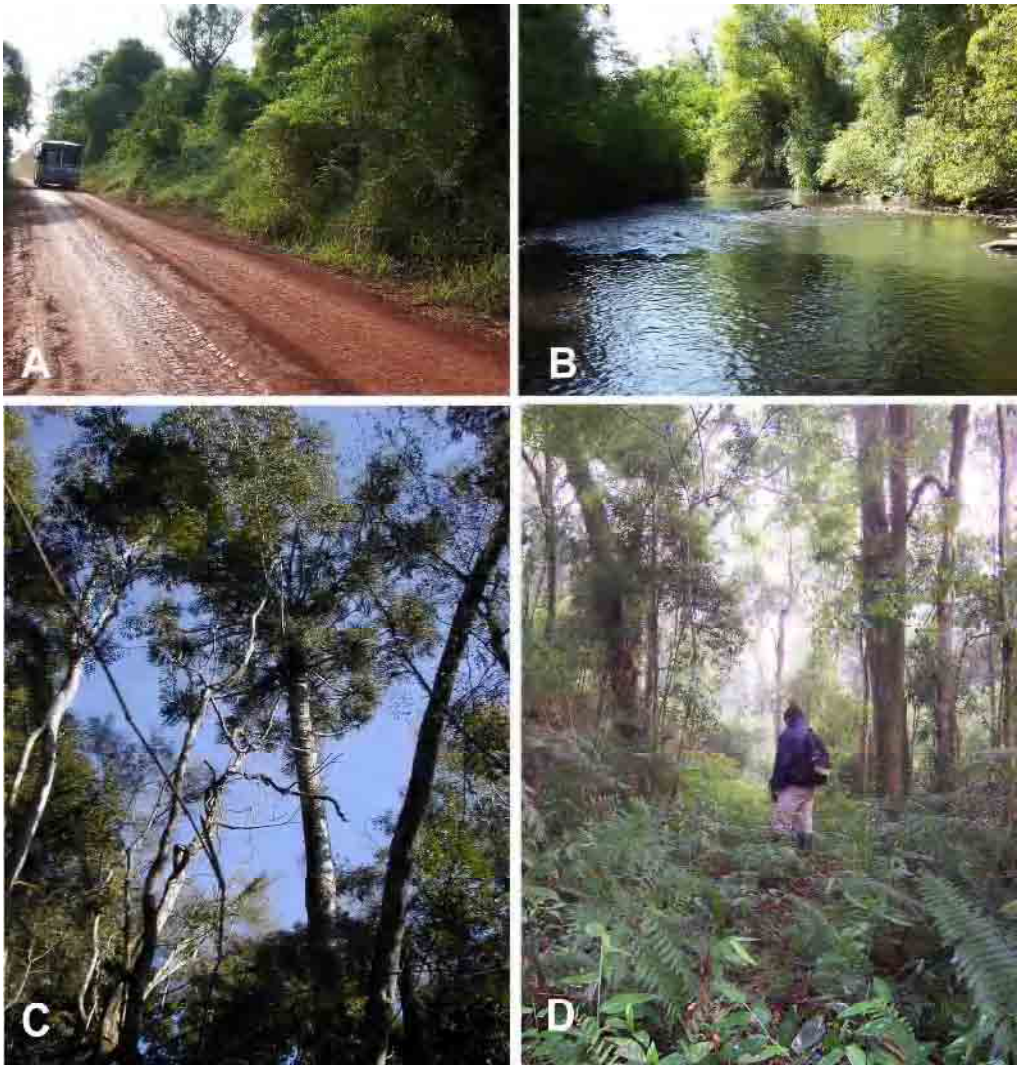


Photo 4: **A;** Route 101 which goes through the Iguazú National Park and Cabure-í, **B;** Yacuy stream with gallery forest, Trees forming the "roof of the forest" are observed in the limit of the Iguazú National Park and Cabure-í, like the Pino Paraná (*Araucaria angustifolia*), **D;** As in the area of research trees are very high and there are no branches or bushes, it is posible to walk easily on the ground.

Photo 5: The area of research has been modified by human activity, like farming and animal breeding.

A & **B:** Pasture land for animals (locally known as "parquizado") (Photo: HACH); **C:** Coast on High Iguazú River (Photo: HACH); **D:** General view of the landscape with pasture for animals (Photo: HACH); **E:** Ravine on the river (Photo: HACH); **F:** Twilight on the area of research (Photo: REB).

Photo 6: **A;** Chile Avenue on the Southern limit of the area (Photo: HACH), **B;** General sight from Chile Avenue (Photo: HACH), **C;** Sight of bamboos (Photo: HACH), **D;** Palo Rosa (*Aspidosperma polyneuron)*, one of the trees forming the roof of the forest (Photo: HO), **E;** Young tree of palmetto (*Euterpe edulis*) which lives in relation with Palo Rosa (Photo: HACH).

1. Introduction

With a surface of 29.801 km^2, and with the exception of Tucumán province, Misiones is the smallest province in Argentina. However, it is the richest province in biodiversity having about 177 families, 903 genera and 2.805 species of vascular plants, which represents about 71%, 46% and 15% of the total number of families, genera and species of the whole country (Zuloaga et al., 1999).

The locally known "Selva Misionera" is located within a subtropical area corresponding to the Provincia Paranaense (Cabrera, 1971), which belongs to the Mata Atlántica Biome. At the same time, as Misiones owns 35% of the protected areas of the region called "Florestas del Alto Paraná", it represents an outstanding conservation area.

The northern side of Misiones belongs to the district of Mixed Forests with the existence of two types of communities. The first one corresponds to the "Forest of Laurel, Guatambú and Palo Rosa", where the Iguazú Nacional Park is included; the second one corresponds to the "Forest of Laurel, Guatambú and Pino", which is located to the northeastern side of the province having a high altitude and low temperatures, where the Pino Paraná or Curí *(Araucaria angustifolia*) is found (Cabrera, 1971).

The Selva Paranaense is divided into 4 levels with different types of plants and trees. The *Upper Level* is constituted by 40 metre trees like Palo Rosa, Pino Paraná and Timbó. The following Level is called *Canopy*, and is formed by 20-10 metre trees like Lapachos, Laureles, Guatambú, Cedro misionero, Cañafístula, Guayubira, Cancharana, Aguaí, Camboatá, Palmetto and Pindó palms. The nexto level is the *Intermediate* or *Bushy level*, constituted by species being 3-10 metres in height like ferns with the shape of tress called Chachíes (*Alsophila sp.*), bushes, bamboos and climbing plants. The lower level is the one of the *Herb and Ground* with plants growing in the shadows like graminaceae, ferns, herb and orchids.

It is also posible to distinguish another level constituted by climbing plants and epiphytical species. There is a wide variety of climbing plants comprising several levels, like the families of Aristoloquiáceas, Bignoniáceas, Convolvuláceas, Pasifloráceas and Sapindáceas. Concerning epiphytes, it is possible to find ferns, orchids, cactus and bromelias, the latter with different sizes, from the large Güembé to the little ferns which cover the trees.

Within the four levels of the selva paranaense, animals find a wide variety of places to live, (from the sunlight at the Upper level, to the shadows of the lower level) and a lot of food like flowers, fruits and plants available during the whole year. It has allowed the development of a broad range of species with a high grade of speciality, as seen in pollinators (insects, hummingbirds and bats) and the ones which find their food in fruits and nectar; there is also a great quantity of animals having eye catching colors in feathers and skin. Some of them are:

Eagles, Pavas de Monte, Toucans, Parrots, Saíras, Jaguar, Margay, Ocelot, Perro Vinagre, Deers, Cayman, Water turtle, Armadillos, Oso Melero, Pecarí de Collar, Grey squirrel, Shouting monkey, etc.

Picture 2: Levels within the Selva Paranaense

Misiones has a Protected Area System formed by national and provincial parks and private reserves. There are also several patches of forest spread all over the province, but despite this, human activities like farming and tree exploitation represent a menace for the remaining forest (Giraudo-Abramson, 1998). The loss of the forest is already reflected in local economy as not only fauna and flora are getting scarce, but the local climate and behaviour of streams of water have been affected (floods, droughts, lifeless fishes).

The reason for the growing interest in conserving the Selva Paranaense is that although Argentina, Brazil and Paraguay had created protected areas with the aim of conserving the forest, nowadays these areas are "islands" among farms, cities and industries. From 1994 up to date, several workshops have been accomplished supported by IUCN and WWF with the goal of implementing conservation actions. One of them was developed in Hernandarias, Paraguay, and the result was the project of creating a Biological Corridor among the countries. This would include the Natural Reserve Bosque Mbaracayú and Monument Moisés Bertoni in Paraguay; the National Park do Iguacú and Provincial Park do Turvo in Brazil, and both the Iguazú National Park and Moconá Provincial Park in Argentina.

As a result, in 1999 Misiones created an "Area of conservation and sustainable development" called *Green Corridor* or *Corredor Verde,* in Spanish. This law involved actions aimed at

environmental education for local people so that they can obtain benefits from conservating the forest, always from a sustainable point of view. Within this framework the creation of “buffer zones” was proposed, which promote coexistence between farming and protected areas, but in practice it is not so simple and they are being exploited at a high rate. Another difficulty to be faced is that people in charge of managing these zones are outside parks and reserves, so they have little authority over them.

2. Methodology of research

2. 1 Flora

A surface of 1.200 meters were set and searched within the 3 areas already mentioned. In order to corroborate the identity of some species, they were collected and brought to the herbarium located at the Center for Subtropical Research (CIES, in Spanish) within the Iguazú National Park. Specific literature (Hunziker, 1984; Lorenzi, 2002; Zuloaga y Morrone, 1999), illustrations and the websites of the Missouri Botannical Garden (www.mobot.org) and the New York Botanical Garden (www.nybg.org) were also very helpful. Regular presses were used for botanical collection. (Laguerenne, 1978).

2. 2 Arthropoda

A line of 200 meters was set within the 3 areas already mentioned. The research was accomplished at similar hours of the day and during the same lenght of time. It was also made a research on the surrounding area in order to have a more accurate record of the fauna. The methodology used consisted of a written record, photos and collection of specimens to be identified. For this, fallen trunks, leaves, stones, barks and holes inside the trees were searched, using entomological pincers and nets.

Collection system were the following: Lepidoptera (butterflies), were kept in paper envelopes; culxcidae (mosquitoes) were caught trough a suction system, then killed with formalin steam and finally kept in a hermetic flask; *Euglossina* bees (from the orchids) were caught with traps made of tissue paper with essential oils attractive to the males (eucaliptol and eugenol). Other insects like coleopteron "beetles"; hemiptera "bugs"; homoptera "cicada"; diptera "flies and horseflies"; and hymenoptera "bees, ants and wasps" were kept in hermetic plastic flasks with 70% alcohol.

Specific literature, stereoscopical lens and a taxonomical guide were used for identifying the different species. Also, temperature and humidity level were recorded to have specific data of local weather conditions.

2. 3 Amphibia and Reptiles

This fieldwork was based on a random search system, during night and day. It was accomplished within aquatic and terrestrial sites, paying attention to rocks and fallen trunks. Voices of male anurian in reproduction sites were recorded by means of a Sennheiser LR 6 microphone and a Sony WM-D6C recorder. The conservation status applied was taken from Lavilla *et al*., (2000), Lavilla *et al*., (2002) and Lavilla *et al*., (2001). The collected specimen were brought to the Evolutive and Molecular Genetic Lab at the University of Misiones. English

lay terms were taken from Frank & Ramus (1995), and Portuguese lay terms from Di Bernardo (*com. pers*.).

2. 4 Birds

Misiones owns about 50% of the species found in the whole country. 985 species are known in Argentina and about 438 live within the Iguazú National Park. A surface of 1.200 meters were set and searched within the 3 areas already mentioned and all species found have been recorded. Two methods were used for identification: birdwatching with binoculars and listening to the different singings.

2. 5 Mammals

Different systems of research were used.

Nature watching: applied within a surface of 1.200 meters set in the 3 areas already mentioned. Digital cameras and camcorders were used.

Traps: in areas of great mammal activity according to the trails found.

Print traps:

1) a surface of about 1 meter length and 0,4 meter width was cleaned up and then watered as the area had suffered a deep drought; 2) Other system was to pour some flour on the trap, but this requires time and patience as animals may not appear and it is necessary to pour flour daily; 3) The third technique was using plaster to obtain the print. It was successfully used in La Blanquita. On the other hand, It was not possible to use it within the IPRODHA site because of the great quatity of roots on the ground.

Plaster preparation:

It is necessary to have the exact quantity and consistency (not too hard; not too wet) to cover the print. Before filling the print, it is important to isolate it with a plastic ring, and to sprinkle some powder so that it will be asier to separate the mould from the ground. In this way, a plaster print is obtained, which is very useful for accurate measurement and for training students about different animal prints.

3. Results

3. 1 Flora

(1) CABUREÍ

This zone of transition between selva misionera and farms is located on the eastern limit of the Iguazú National Park and the Interstate Route 101.

Within the Upper Level of the forest, a scarce number of Palo Rosa and Pino Paraná are found. On the other hand, the Canopy level is much richer in species with the presence of Pindó, Laurel Negro, Laurel Amarillo, Guatambú Blanco, Guatambú Amarillo, Camboatá, Marmelero, Guabirá, Ibiporoití, Alecrín, Cedro, and so forth. Epiphytical species (plants living on another plant without using their nutriments) are plentiful and often of great size, like the Güembé. Other species are the following: orchids, ferns, cactus and bromeliaceae like air carnations.

Within the Bushy level, *chachíes* trees living among Ñandipá, Paríparoba, Catiguá, Ortiga Brava, Ingá, Ambay, Jaborandí and Cocú, are found. It is also very common the existence of different types of bamboo like Tacuapí, Tacuarembó and Yatevó, with the peculiarity that they blossom after years of growing and then, they die. It has been observed that when the Tacuapí (*Merostachys claussenii*) blossoms, several pollinators appear, mainly bees. Lianas and climbing plants with different types of "cipó" from the *Bignoniaceae* (Peine de mono, San Juan, Uña de gato); *Convolvulaceae* (Dama de noche, Campanillas); *Cucurbitaceae* (Tayuya); *Fabaceae* (Escalera de mono); *Passifloraceae* (Mburucuyá) and *Sapindaceae families* (several Isipó timbó) were found.

Terrestrial ferns, clovers, graminaceae, araceae and orchids are plentiful within the Ground Level. They live together with typical invasive herbs like Escobaduras and Hierba Cerraja, both well known for developing "Capueras" (Martínez Croveto, 1963).

(2) La Blanquita

La Blanquita is a farm located on the Iguazú River, facing the National Park do Iguaçú (Brazil). It is observed a lack of the typical species from the Upper Level of the forest and, at the same time, the presence of a riverside flora.

In similarity to Cabure-í, the Canopy level is much richer in species with the presence.

Azota Caballo, Guatambú Blanco, Loro Negro, Loro Blanco, Anchico Colorado, Rabo Itá, Laurel Amarillo, Cedro Misionero, Ambay, Camboatá, Seibo and so forth.

Within the Bushy level, Ingá, Catiguá, Jaborandí, Palo pólvora, Paríparoba, Ñandipá, Cocú, Cancharana, Tala, and the Yatevó, Tacuarembó and Tacuapí bamboos are found.

There is also a wide variety of climbing plants and lianas comprising several levels, like Peine de Mono, Campanilla, Escalera de Mono, Mburucuyá and different types of Isipó Timbó.

Epiphytical species like Güembé, air carnations, orchids, ferns, cactus and bromeliaceae are plentiful. It is also common to find lichens on tree trunks.

The Ground Level has an important role within the area, with herbs living in the shadows like Camará, Tréboles, Gallina Gorda, Paríparoba, gramínaceae and several types of ferns. Due to the influence of the surrounding area, it is also usual to find invasive species like Bandera española, Trébol Amarillo and Tutiá which grow in farming areas.

(3) Andresito

This is a 5 hectare site were the Pilot Project will be developed. Although located near the city of Andresito, this site conserves an important surface of selva misionera.

Giant specimen of Palo Rosa and many renewable trees were found, together with a large quantity of renewable palmetto trees. A system for their conservation should be implemented.

The Upper Level is represented by the presence of very high Palo Rosa, with up to 1,5 metre width.

Within the Canopy Level it is common to find Rabo Molle, Incienso, Alecrín, Loro Negro, Laurel Negro, Guatambú Amarillo, Cedro Misionero, Camboatá and Pindó.

Within the Bushy Level Ñandipá, Pariparoba, Palmito, Yacaratiá, Pacurí, Yuquerí, Catiguá, Guabirá, Jaborandí, and Tala are found; also Tacuarembó and Tacuapí bamboos.

About climbing plants and lianas, Uña de Gato, Enredadera de San Juan, Campanilla, Escalera de Mono and Isipo Timbó, are found. Within the Ground Level there are many types of ferns, clovers and pariparoba, together with plants with a high potencial to be used as ornaments, like Achira Roja and some Araceae.

Epiphytical species like Güembé, air carnations, orchids, ferns, cactus and bromeliaceae are plentiful.

(4) Information about forest resources as an alternative to wood exploitation

Medicinal plants

Plants for therapeutic use found within the area of research (taken from Amat (2000)):

Adiantum raddianum (Culandrillo)

Allophyllus edulis (Cocú)

Anemia sp. (Doradilla)

Anemia tomentosa (Doradilla)

Apuleia leiocarpa (Grapia)

Araucaria angustifolia (Pino Paraná)

Aristolochia triangularis (Mil hombres)

Aspidosperma australe (Guatambú amarillo)

Bahuinia forficata (Pata de vaca)

Bahuinia microstachya (Escalera de mono)

Bambusa trinii (Yatevó)

Begonia sp. (Begonia)

Campomanesia xanthocarpa (Guavirá)

Casearia sylvestris (Burro kaá)

Cayaponia bonariensis (Tayuyá)

Cecropia pachystachya (Ambay)

Cedrela fissilis (Cedro misionero)

Celtis spinosa (Tala)

Chorisia speciosa (Samohú)

Chusquea ramosissima (Tacuarembó)

Conyza bonariensis (Yerba carnicera)

Cordia trichotoma (Peteribí)

Cordyline dracaenoides (Varana)

Didymopanax morototoni (Ambay guasú)

Eugenia involucrata (Cerella)

Eugenia uniflora (Pitanga)

Ficus carica (Higuera)

Guarea spiciflora (Cedrillo)

Hydrocotyle sp.

Jacaratia dodecaphylla (Jacaratiá)

Lantana camara (Cambará)

Luehea divaricata (Azota caballo)

Myrocarpus frondosus (Incienso)

Nectandra lanceolata (Laurel amarillo)

Nectandra saligna (Laurel negro)

Ocotea puberula (Laurel guaiká)

Parapiptadenia rígida (Anchico colorado)

Patagonula americana (Guayubira)

Peltophorum dubium (Caña fístula)

Pilocarpus pennatifolius (Jaborandí)

Piper sp. (Parí parova)

Plantago tomentosa (Llantén)

Rhipsalis lumbricoides (Pëngue poá)
Sebastiania brasiliensis (Lecherón)
Solanum granuloso-leprosum (Fumo bravo)
Solanum sisymbriifolium (Tutiá)
Syagrus romanzoffiana (Pindó)
Tabernaemontana catharinensis (Horquetero)
Urera baccifera (Ortiga brava)

Fragances

An additional important resource from the forest which is an alternative to wood exploitation is represented by aromatic plants. They are the basis for producing the essential oils which are used within the cosmetic industry. These essential oils are constituted by a mixture of chemical products formed by the plant, with the goal of promoting pollination or to avoid being eaten.
According to Abalos-Romero (2001), as native aromatic plants have been collected from their natural habitat, some of them are facing conservation problems. The following list describes native species with aromatic properties:

Allophylus edulis (Cocú)
Aspidosperma polyneuron (Palo rosa)
Cedrela fissilis (Cedro misionero)
Cordia trichotoma (Peteribí)
Eugenia uniflora (Perilla)
Fagara hyemalis (Tembetare)
Lantana camara (Lantana)
Myrocarpus frondosus (Incienso)
Nectandra saligna (Laurel negro)
Ocotea puberula (Laurel guaica)
Pilocarpus pennatifolius (Jaborandí)
Ruprechtia laxiflora (Marmelero)

Dyeing

The species having dyeing properties are *Cabralea oblongifolia* (Cancharana, usage of crust, red color), *Inga sp.* (Ingá, usage of crust, red color), *Rapanea lorentziana* (Canelón, usage of crust, orange) and *Trichilia catigua* (Catiguá, usage of crust, red color).
At the same time there are some species wich produce *tannin* (a vegetable product used in different industries), like *Acacia polyphylla* (Yuquerí-guazú, fruit and crust), *Allophylus edulis*

(Cocú, crust), *Cupania vernalis* (Camboatá, branchs and crust), *Parapiptadenia rígida* (Anchico Colorado, crust) and *Patagonula americana* (Guayubira, leaves) (Abalos-Romero, 2001).

Ornamental plants

There exist a wide range of plants with potencial ornamental use, like orchids. Different types of orchids both epiphytical and terrestrial were found during this research, where the *Miltonia flavescens* was in blossom. Also, a large variety of ferns with different sizes and shapes were plentiful within the Ground Level.

Photo 7: There is a wide range of epiphytical (on the trees) and terrestrial species of orchids. **A**, **B, C y G**, **D**, **E y F**, epiphytical orchids. **A;** terrestrial orchid, **B;** *Aspidogyne kuczynsky*, **C;** *Corymborkis flava*, **D** y **E;** *Miltonia flavescens*, **F;** *Campylocentum ulaei*, **G;** *Cyclopogon congestus.*

Photo 8: A wide range of ferns are found on the ground of the forest.

A; *Dryopteris sp.*, **B;** *Adiantopsis radiate*, **C;** *Dryopteris sp.*, **D;** *Doryopteris pedata*, **E;** *Sellaginella sp.*, **F;** *Polypodium sp.*, **G;** *Anemia sp.*, **H;** *Asplenium sp.*

3. 2 Arthropoda

Three types of arthropoda were recorded: Arachnida (quelicerata), Insecta and Miriapoda (unirrameos).

Arachnida was represented by 4 orders; Miriapoda was represented by Diplopoda and Chilopoda orders; insects happened to be the best type represented, by 13 orders.

Some of these orders (Coleóptera, Diptera, Hymenoptera y Lepidoptera) had a higher quantity of species recorded, which reflects the variety among them. Many orders and families are present with several species in every site, as can be seen in pictures.

During the second fieldwork accomplished in springtime, it was observed a greater quantity of insects in a latent state (eggs, larvae, nymphs, and pupae) in relation to the first fieldwork made in August (Winter), which reveals both an increase in variety of species and in population. It indicates that the most suitable period for fieldwork is from spring to the beginning of fall.

Pictures were taken from insects in latent state and in most cases it is not possible to make an accurate identification of them, as the patterns are based on adult individuals. So, it would be necessary to take the material recorded to an insectarium, in order to follow the differet growing stages of the insects.

The great variation in types and amount of species recorded within the 3 areas of research may be due to different reasons: the ecological diversity of each site (gallery forest, pasture land, riverside ecosystem, selva and farms) and the changing weather conditions occurred during fieldwork (rain, wind, temperature and humidity).

It is also important to highlight that some of the species found during fieldwork are very significative from the point of view of tourism, business, education, health and conservation.

In the case of arthropoda, many species are studied in relation to human, fauna and flora health; that is why these species are known as “sanitary outstanding”. Some groups have been already mentioned above, however it is necessary to mention some species recorded during fieldwork, and other species which presence should be corroborated as sanitary prevention for local people and tourists.

Photo 9: Arthropoda: **A;** Arachnida (Aranae), **B;** Miriapoda (Diplopoda), **C;** Ortoptera, **D;** Blattariae, **E;** Mantoidea, **F;** Lepidoptera (*Doxocopa serafina*), **G;** Homoptera (Cicadidae), **H;** Hemiptera (Reduviidae), **I;** Coleoptera, **J;** Diptera, **K;** Hymenoptera.

Photo 10: There is a wide range of coleoptera within the selva paranaense, showing variety in shapes and colos. Some of them represent a problem for certain crops like the *Picudo Algodonero*, which attacks cotton farming.

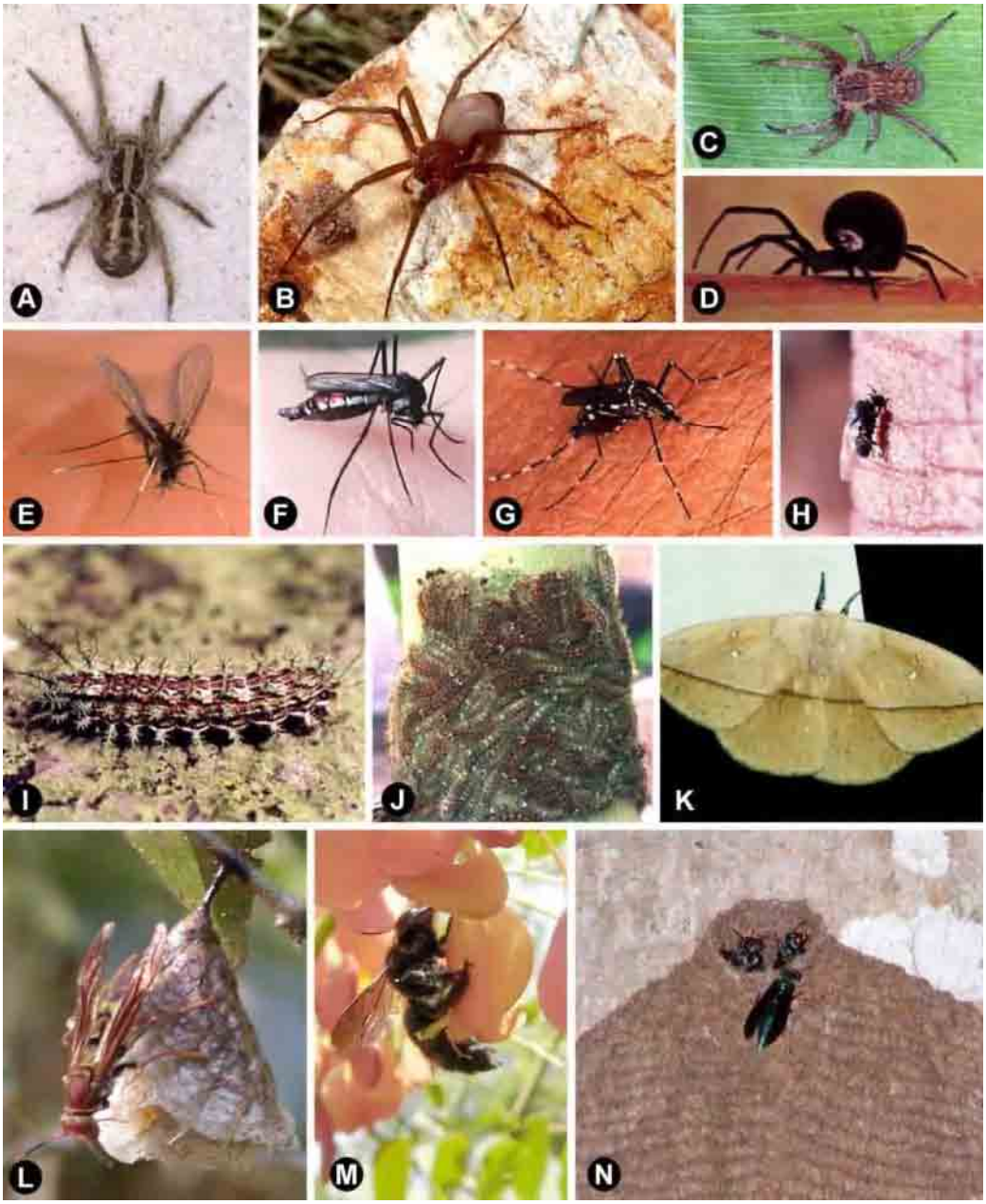


Photo 10: **A**, **B**, **C** and **D** Spiders (Aranae); Photos **E, F, G** and **H:** arthopoda which carries diseases for humans. **E:** *Lutzomyia sp.* Phlebotominae; **F:** *Haemagogus sp.* and **G:** *Aedes albopictus* (Culicidae); **H:** Ceratopogonidae; some butterfly larvae are covered with urticant hair and may cause fatal hemorrhages like Taturana. **I-K:** *Lonomia obliqua* (Lepidoptera); **L:** Polistinae (Vespidae); **M:** Bombina (Apidae); **N:** Poliibinae ? (Vespidae).

3. 3 Amphibia and Reptiles

(1) CABUREÍ

Seven species of amphibia anura were recorded: 1 toad with lines, 2 leptodactyl and 4 hylidae. Two species of reptile: amphisbaenidae and chelidae; these are not endangered but their conservation status should be corroborated within the national scope (Lavilla *et al*., *op. cit.*).

A reptile to be highlighted is *Phrynops hilarii* (water turtle) as it has a wide regional distribution within the basins of Paraná and Uruguay rivers up to Buenos Aires province. It also inhabites Uruguay, the south of Brazil and Paraguay. This reptile is carnivorous and catches fishes, amphibia, snails and insects carriers of dangerous diseases for human.

(2) La Blanquita

Seven species of amphibia anura were recorded: 2 leptodactyl, 1 micro hylidae, 4 hylidae and 3 species of reptiles from Colubridae, Teiidae and Leptotyphlopidae families. Only one amphibian found is endangered; about the other their conservation status should be corroborated within the national scope (Lavilla *et al*., *op. cit.*).

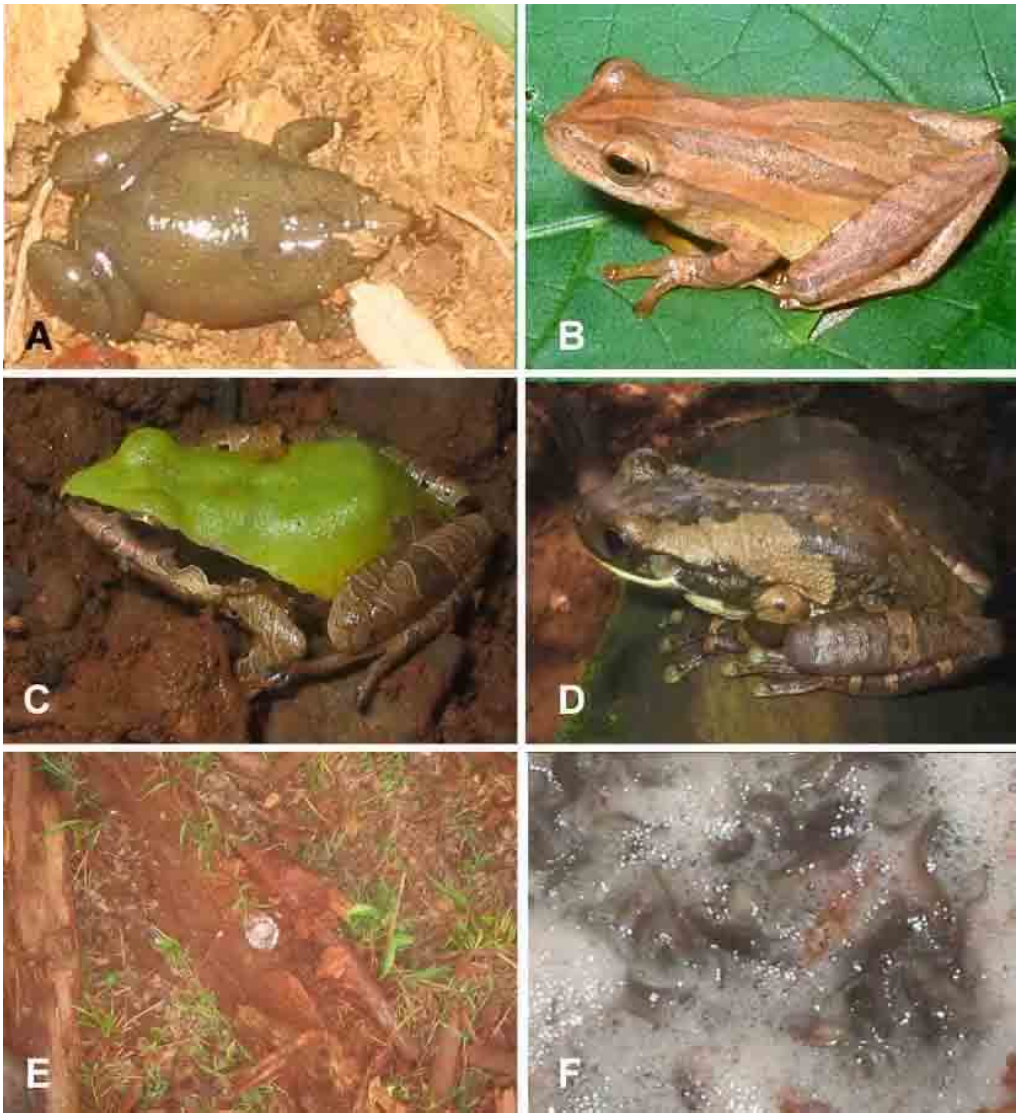
The reptile *Tupinambis merianae* locally called “Lagarto Overo” lives in subtropical areas, in coincidence with the basin of De la Plata river. Its habitats vary from pampas to the forests and has a good adaptation to weather conditions. With up to 1,4 metres of length, the male has wider neck and tail. It has been hunted because of its meat (traditionally consumed by native people and now by farmers), its skin and grease with supposed medical properties. Some people take them as pets, however wild alligators may be pretty aggressive.

(3) Andresito

Three species of amphibia anura were recorded: 1 hylidae and 2 leptodactyl. Conservation status of 2 species is not accurately determined, while the third one is commercialy endangered. (Lavilla *et al*., *op. cit.*).

As the largest native amphibious (130 grammes), the *Leptodactylus ocellatus* has a high market value because its tasty meat and good appearance. The skin is bright and olive green colored with darker spots; the belly is plain white. The male enlarges the limbs within the reproductive season.

Amphibia (La Blanquita)



P. 9. A: *Elachistocleis bicolor* ; **B:** *Hyla minuta*; **C:** *Physalaemus cuvieri;* **D:** *Phrynoyas venulosa*; **E** y **F:** Amphibia larvae.
(Photos: DA y MP)

3. 4 Birds

(1) CABUREÍ

Within the bordering sector of the Iguazú National Park with the farms, 37 species were found during the first fieldwork made in August and 40 species during the second period. This area and the Interstate Route 101 are good places for birdwatching, although noise from planes and cars could spoil the experience.

(2) La Blanquita

30 species were recorded during the first fieldwork. One of them is the Pato Real, which is mentioned within the Red Book of endangered birds and mammals in Argentina.

In this area there are 3 types of habitats: the river with its own birds; the forest with species as found in Cabure-í or Andresito, and the pasture area, with its own birds like the Pecho Colorado.

At dawn and twilight, it is usual to see flocks and as it is a very quiet place with high visibility, birdwatching could be done with binoculars or telescope of 10 X 10 magnifying lens.

(3) Andresito

The area of research is located on an elevated land with a wide variety of fruits that represent food for birds.

Despite the reduced size of the area (56 hectares) and the proximity of the village, a wide range of species from the forest was found; nevertheless, it is not easy to see them.

During the first filedwork, only 18 species were found because of the season (winter) and weather conditions (rain and cold). During the second fieldwork 33 species were found.

3. 5 Mammals

Mammals living within the region are the following:

Mono Caí (*Cebus apella*):

It is the most popular monkey in Argentina and South America. People take them like pets, although it is illegal. This species owns 11 subspecies, 2 of them living in Argentina within the selva misionera (*Cebus apella vellerosus)* and the mountain forest in Jujuy and Salta provinces (*Cebus apella paraguayanus)* (Fauna Argentina, 1983).

They have diurnal habits and a restless behaviour, together with a great curiosity and hand skills. Although they live in the Upper and Canopy levels of the forest, they find food on the Ground level also. (Fauna Argentina, 1983).

They eat seeds, fruits, larvae, insects and spiders; occasionally small bats, eggs, bird broods, lizards, frogs and other. (Fauna Argentina, 1983).

As in winter fruits and insects are scarce, they eat bamboo (*Chusquea ramosissima*) buds, which are abundant. (Di Bitetti M. S).

Conservation category:

SAREM-LR-nt: Almost endangered accoding to SAREM (Argentine Society for Mammals Study) (APN-SIB, 2004). Protected by National Law 22421 for fauna conservation and Decree 666/97 -(APN –Recognition system for wild animals)

Zorro de Monte *(Cerdocyon thous*):

Similar to a dog, with sharpened muzzle, big ears and clever eyes, foxes live within the whole country. They are plentiful on the northern and northeastern areas like the forest in Salta and Tucumán, the savannas in Chaco and pasturelands in local Mesopotamia, including the Paraná islands.

They have nocturnal habits but it is not inusual to see them at daylight; they live near the forest and sorrounding areas, where they find food: birds and small rodents.

Conservation category

CITES II: Appendix II according to CITES_A (Convention on International Trade in Endangered Species).

SAREM-LR-nt: Almost endangered accoding to SAREM (Argentine Society for Mammals Study) (APN-SIB, 2004). -(APN –Recognition system for wild animals)

Tapir - Anta - Danta Tapir *(Tapirus terrestris*):

They are the biggest mammals of the country and they are distributed in Salta, Jujuy, Tucumán, Formosa, Corrientes, Chaco and Misiones provinces. They live in humid forests with water streams and in hills up to 2000 metres. With nocturnal and solitary habits, their food is constituted by buds, fruits and leaves.

Conservation category

CITES II: Appendix II according to CITES_A (Convention on International Trade in Endangered Species).

SAREM-EN: Endangered according to SAREM Argentine Society for Mammals Study) (APN –Recognition system for wild animals)

Carayá Negro o Aullador *(Alouatta caraya*) (Monkey):

These restful monkeys live in Salta, Formosa, Chaco, Corrientes, Misiones and the northern side of Santa Fe province. With up to 90 centimeters they are the biggest monkeys in America and they use their tail, (which is as long as the body), as an extra hand to grab the trees.

Their main characteristic is that they shout in groups (there comes the name of ´shouting monkey´). Normally a male begins with the howl (that works as warning) and then other males start to shout in group. In case of danger, female and young shout, or hide within the upper branches while male adopt a menacing attitude. (Fauna Argentina, 1983).

Nowadays, monkey populations have been decimated due to the disparition of their habitat. Youngs are usually captured and then sold near the routes, but mostly of them die because of bad treatment or in captivity. (Pérez Jimeno, G. 2003).

They are protected by National Law 22421 for fauna conservation and Decree 666/97 - (Recognition system for wild animals).

Mammals

Photo 13: **A;** Carayá *(Alouatta caraya*) (Photo: AGG), **B;** Agutí Print (*Dasyprocta azarae*) (Photo: AGG), **C;** Deer print (*Mazama sp*) (Photo: AGG), **D;** Tatú cave (*Dasypodidae sp*) (Photo: AGG).

Mammals

Photo 14: **A;** Cave on upper Iguazú riverside (Photo: AGG), **B;** Aguará popé print (*Procyon cancrivorus*), **C;** Hole in fallen tree used by mammals, **D;** Weasel fur (*Didelphis albiventris*), **E;** Agutí (*Dasyprocta azarae*) print, **F;** Armadillo traces. (Photos: AGG).

Bibliography

Flora

Abalos-Romero, M. (2001). Productos forestales no madereros en América Latina. FAO, Santiago de Chile. 198 págs.

Amat, A.G. (2000). Farmacobotánica y farmacognosia en Argentina (1980-1998). Ediciones Científicas Americanas, La Plata. 258 págs.

Cabrera, A.L. (1971). Fitogeografía de la Republica Argentina. *Boletín de la Sociedad Argentina de Botánica* 14(1-2): 1-50.

Chebez, J.C. (1994). Los que se van. Especies argentinas en peligro. Ed. Albatros, Buenos Aires. 604 págs.

Di Bitetti, M.S; Placci, G.; Dietz, L.A. (2003). Uma visão de Biodiversidade para a Ecorregião Florestas do Alto Paraná. Bioma Mata Atlântica: planejando a paisagem de conservação da biodiversidade e estabelecendo prioridades para ações de conservação. World Wildlife Fund, Washington, D.C. 152 págs.

Hunziker, A. T. (1984). Los géneros de Fanerógamas de Argentina. Claves para su identificación. *Bol. Soc. Argent. Bot.* 23: 1-384.

Laguerenne, A. (1978). Como hacer un herbario. Compañía editorial continental, S.A. México.

Lorenzi, H. (2002). Àrvores Brasileiras. Manual de identificação e cultivo de plantas arbóreas nativas do Brasil. Vol. 1 y 2. Instituto Plantarum de estudos da Flora Ltda, SP. 384 págs.

Lot, A.; Chiang, F. (1986). Manual del herbario. Administración y manejo de colecciones, técnicas de recolección y preparación de ejemplares botánicos. Consejo Nacional de la Flora de México, A. C.

Martinez Croveto, R. (1963). Esquema fitogeográfico de la Provincia de Misiones (República Argentina). *Bonplandia* 1(3): 171-223.

Zuloaga, F.O.; Morrone O.; Rodríguez, D. (1999). Análisis de la biodiversidad en plantas vasculares de la Argentina. *Kurtziana* 27: 17-167.

Arthropoda

Almeida, L. M. de; Ribeiro-Costa C.; Marinoni L. (1998). Coleção, montagem e identificação de insetos. Série Manuais práticos em biologia. Holos Editora, Riberão Preto

Brisola Marcondes, C. (2001). Entomología (Médica e Veterinaria). Atheneu (Ed)

Buzzi, Z.J.; Miyasaki, R. (1999). Entomologia Didática. UFPR (Ed) 306 págs.

Carrera, M. (1991). Insetos de interesse médico e veterinario. CNPq-UFPR (Ed)

Consoli, A.G.B; Rotraut, R.L. de Oliveira (1994). Principais mosquitos de importancia sanitária do Brasil. Editora Fiocruz. 225 págs.

Coscarón S.; Coscarón-Arias C.L. (1998) Capítulo 29: Simuliidae. pp 304-313. En Biodiversidad de Artrópodos Argentinos. Una perspectiva biotaxonómica. Sur (Eds.)

Da Costa Lima, A. (1945). Insetos do Brasil. Tomo 5º. Capítulo XXVIII. Lepidópteros, 1ª parte. Escola Nacional de Agronomia. Serie Didática Nº 7. 133 págs.

Gibson, W. W. (1958). Como hacer una colección útil de insectos; colectarlos, matarlos, montarlos, conservarlos, exhibirlos. Folleto Misceláneo Nº 8. Oficina de estudios especiales. México. 73 págs.

Lane, J. (1953). Neotropical Culicidae, Vol. I y II. Universidade de Sao Paulo (Ed.) 1112 págs.

Mielke, O.H.H. & M.M. Casagrande.(1998). Papilionoidea e Hesperioidea (Lepidoptera) do Parque Estadual do Morro do Diabo, Teodoro Sampaio, São Paulo, Brasil.Revta bras. Zool. 14 (4)**:** 967-1001**.**

Paggi, A. C. (1998) Capítulo 31: Chironomidae. pp 327-337. En Biodiversidad de Artrópodos Argentinos. Una perspectiva biotaxonómica. Sur (Eds.)

Pastrana, J. A. (1985). Caza, preparación y conservación de Insectos. El Ateneo (Ed.) 227 págs.

Richards, O.W.; Davies, R.G. (1994). Vol. I y II. IMMS´General Textbook of Entomology. Chapman & Hall (Ed.) 1354 págs.

Service, M.W. (1993). Mosquitoes (Culicidae). Chapter V. Medical Insects and Arachnids. Lane. R. P.& R. W. Crosskey (Eds). The Natural History Museum. Chapman & Hall. 120-240

Service, M. (1993). Mosquito Ecology: field sampling methods. Elsevier Applied Science (Ed.). págs.

Spinelli, G.(1998) Capítulo 30: Ceratopogonidae. pp 314-326. En Biodiversidad de Artrópodos Argentinos. Una perspectiva biotaxonómica. Una perspectiva biotaxonómica. Sur (Eds.)

Sutherland, W.J. (2000). The Conservation Handbook: Research, Management and Policy. Blackwell 278 págs.

Amphibia and Reptiles

Frank, N. & E. Ramus. (1995). A Complete guide to Scientific and Common Names of Reptiles and Amphibians of the World. N G Publishing Inc., Pottsville, PA., 377 pp.

Giraudo, A. R.; H. Povedano; M. J. Belgrano; E. Krauczuk; U. Pardiñas; A. Miquelarena; D. Ligier; D. Baldo & M. Castelino. (2003). Biodiversity of the Interior Atlantic Forest of Argentina. In Press. Galindo-Leal, C. and I. G. Camara. The State of Mata Atlantica. Island Press. Washington, D.C.

ICPB. (1992). Putting biodiversity on the map: global priorites for conservation. ICPB, Cambridge, UK.

Laclau, P. (1994). La conservación de los recursos naturales renovables y el hombre en la selva Paranaense. Bol. Técnico Fund. Vida Silv. Arg. (20). 139 pp.

Lavilla, E. O.; J. M. Cei. (2001). Amphibians of Argentina. A Second Uptdate, 1987-2000. Monografie XXVIII, Museo Regionale di Scienze Naturali Torino, 2001.

Lavilla, E. O.; J. S. Barrionuevo & D. Baldo. (2002). Los anfibios insuficientemente conocidos en Argentina. Una reevaluación. Cuadernos de Herpetología, 16(2): 99-118.

Lavilla, E. O.; E. Richard y G. J. Scrocchi (Eds.). (2000). Categorización de los Anfibios y Reptiles de la República Argentina. AHA, Edición Especial, San Miguel de Tucumán, 2000.

Martínez-Crovetto, R. (1963). Esquema fitogeográfico de la Provincia de Misiones (República Argentina). Bonplandia, 1: 171-223.

Morello, J. & F. D. Matteucci. (1999). Biodiversidad y fragmentación de los bosques en la Argentina. Pp: 463-499, en: Matteucci, F. D.; Solbrig, O.; Morello, J. & G. Halffter (eds.). Biodiversidad y uso de la tierra. Conceptos y ejemplos en Latinoamérica. Colección CEA 24. Eudeba, Buenos Aires, Argentina.

Sick, H. (1984). Ornitología brasileira. Uma introdução. Vol. 1 y 2. Ed. Universidade de Brasília. Pp. I-XVII + 1-828.

Stotz, D. F.; Fitzpatrick, J. W., Parker III, T. A. & D. F. Moskovits. (1996). Neotropical birds. Ecology and conservation. The University Chicago Press, Chicago and London. 478 pp.

Birds

Chebez, J.C. (1994). Los que se van. Especies argentinas en peligro. Ed. Albatros, Buenos Aires. 604 págs.

Chebez, J. C. (1996). Fauna Misionera. Catálogo Sistemático y zoogeográfico de los vertebrados de la provincia de Misiones. (Argentina). Ed. L.OL.A. 318 pp.

Narosky, T; e Yzurieta, D. Guía para la identificación de las aves de Argentina y Uruguay

Saibene, C. A; Castelino, M. A.; Rey R. N.; Herrera, J.; Calo, J. (1996). Inventario de las aves del Parque Nacional Iguazú (Misiones, Argentina). Monografía 9. Edit. LOLA, 70 pp. Buenos Aires.

Mammals

www.damisela.com/zoo/mam/carnivora/canidae/nombres.htm.

Administración de Parques Nacionales, Sistema de Información de Biodiversidad, actualizado en Octubre de 2004.

Di Bitetti, M.S.; Departamento de Ecología y Evolución de la Universidad Estatal de Nueva York, Stony Brook (EE.UU.); Laboratorio de Investigaciones de las Yungas (LIEY), Universidad Nacional de Tucumán. Revista "Ciencia Hoy"; Vol. 9. Nro. 53.

Fauna Argentina. Especies misioneras: El mono carayá (Alouatta caraya). Centro Editor de América Latina S.A. Bs.As. 1983.

González, J.C., 1992. Los Zorros. Museo Dárnaso A. Larrañaga Almanaque del Banco de Seguros del Estado 1992 (http://www.mundomatero.com/Florayfauna/zorros.html).

Hickman, C.P.Jr.; Roberts, L.S.; Parson, A.1998. Principios Integrales de Zoología. Ed. McGraw-Hill, Interamericana. 10ª Edición. Pág. 602-603.

López-Rojas, J.; Coutiño Ramos, T.A. México un país megadiverso: El caso de los mamíferos terrestres http://www.monografias.com/trabajos12/divmamif/divmamif.shtml#RESUM

http://www.minag.gob.pe/rrnn_s_mamiferos.shtml

http://www.puce.edu.ec/Investigacion/fatima/Tapir1.htm

Pérez Jimeno, G., 2003. Colaborador veterinario especializado en fauna silvestre Santa Fe, Rosario. E-mail: tamandua@arnet.com.ar. http://www.fnaweb.com.ar/MonosCaraya.htm.

Sistema de Reconocimiento de Fauna Silvestre- (http://www.medioambiente.gov.ar/sian/pan/buscar/default.htm).

Vida Silvestre Uruguay, 2004. www.vidasilvestre.org.uy

Aerial photo

Oscar Gauto.

Photos by

JAB: Juana Angela Bruera, Sebastián Najle and Juan Urdampilleta.

REB: Rosana Elizabeth Bubillo.

AGG:Alberto Gabriel Goñi.

HACH: Hugo A. Chaves.

DA: Diego Andino.

MP: Martín Pereyra.

HO: Hiromoto Osaki.

II. **Environmental Education Program**

March, 2006

Summary

North region of Misiones Province holds many protected areas such as the Iguazú National Park, provincial parks and private reserves; all of them playing an important role in the conservation of the Paranaense Forest and its high biodiversity. However, due to the expansion of the agricultural frontier, the illegal tree felling, etc., the continued forest fragmentation between protected areas is increasing. In addition, illegal situations such as illegal hunting and run over animals also occur within protected areas. Furthermore, the negative influence for the local ecosystem of the improper use of agro toxic substances in zones close to protected areas is a worrying issue. Therefore, the diverse values of the Paranaense Forest (economic, scientific and patrimonial values) are being lost.

One of the causes for this situation is that local people or tourists have little interest on protected areas or natural resources and also, an indicator is the slight awareness in natural environment conservation issues. Thus, it becomes necessary that the employees of the involved institutions responsible for the natural environment conservation contribute to the increasing of the local people or tourists interest on protected areas or natural resources and to the promotion of a change in the people attitudes and activities towards the conservation and sustainable use of the natural resources of the Paranaense Forest. Environmental Education is considered a useful tool to change this situation.

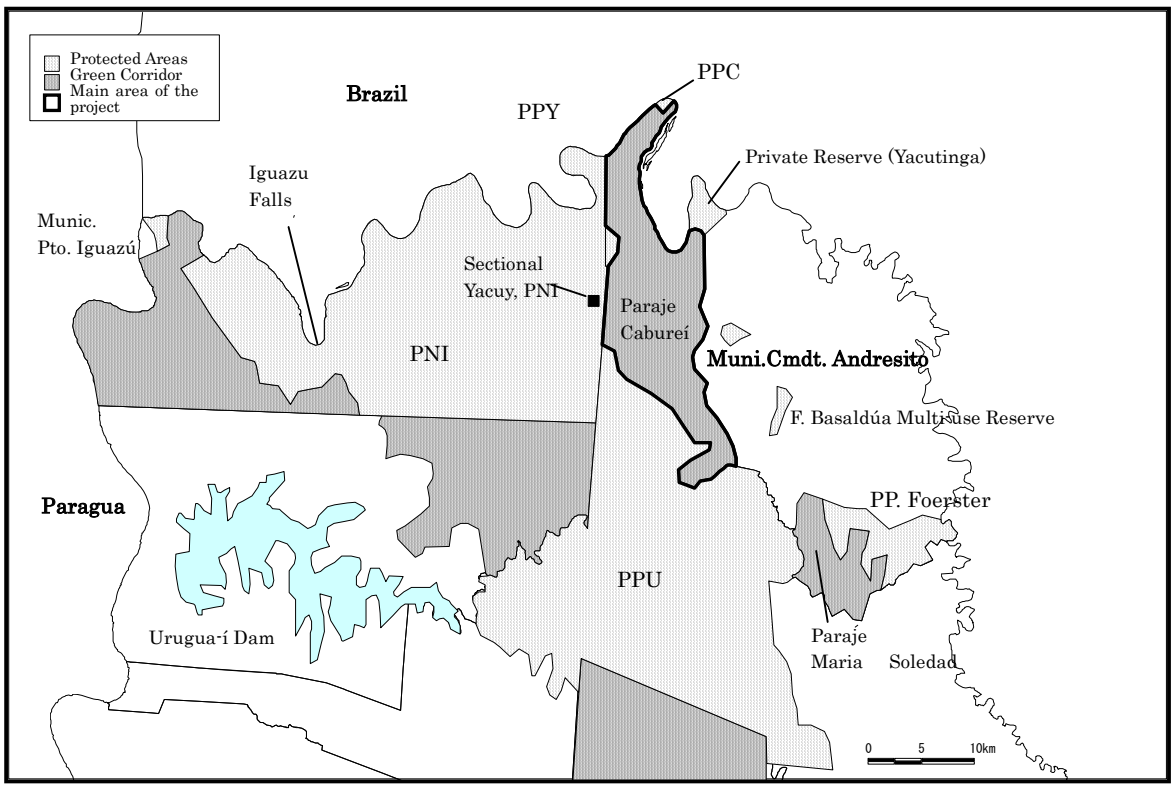
The Environmental Education objectives are different according to each country, organization and people; however, the worldwide known Belgrade Charter (1975), defines the conceptual framework of the objective, which is "*To develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.*"

The objective of the Natural Environment Conservation Project in the Iguazú Region (Cabure-í Project) is "*To develop the capacity of the employees of the National Parks Administration (APN), provincial government (MERNRyT) and Municipality of Comandante Andresito, to manage the natural environment in the project area*". In this sense, Environmental Education is a necessary tool for the employees to manage the natural environment, in order to solve and prevent the problems mentioned above, emphasizing on the employees of the involved institutions for the development of the Environmental Education Programs.

1. Program area

The Environmental Education program area is within the north sector of the Green Corridor of Misiones province, protected areas and buffer-zones. That is, the Iguazú National Park, the Cametti Provincial Park, the Yacuí Provincial Park, the Urugua-í Provincial Park and the Isla Grande Provincial Park.

The special zone for the Environmental Education is Cabure-í and Península within the Municipality of Comandante Andresito. The zone has an area of near 20.000 ha, 364 landowners, 433 lots (farms) and 7 school districts. However, landowners and related people do not always live in the zone, therefore, the Environmental Education activities will be carried out in different areas of the Project.



2. Three (3) Environmental Education programs

Employees of the involved institutions (counterparts) are in charge of the Environmental Education Programs, which target local people and tourists. Therefore, the Environmental Education of the project is structured in three (3) programs according to the target group.

Local people are the landowners and the related people of the zone (involved family and relatives). Related people are those who influence the environment conservation (politicians, teachers, religion counsellors, etc) and the kids are the ones who will participate in the activities and the decisions in the future. However, because determining target people is highly complex, the programs are elaborated for employees and teachers (mainly, teachers that work within the

project area) because they play the role of message multipliers among the local people. Teachers are employees of the provincial government of Misiones and daily work on educative activities, therefore they are considered appropriate actors for being in charge of the Environmental Education of the project.

Tourist group includes Argentinian and foreign people who visit the project area. Employees of the involved institutions are in charge of the Environmental Education for tourists; thus, the Environmental Education Program for tourists will be elaborated in such a way that employees would be able to implement it.

- Program for employees
- Program for teachers
- Program for tourists

3. Aim

In order to reach the aim of the Environmental Education, the Belgrade Charter states 6 goals for each stage – (1) Awareness , (2) Knowledge, (3) Attitude, (4) Skills, (5) Evaluation ability, (6) Participation.

Taking into account the duration of the project – 3 years -, the Environmental Education programs will be elaborated in 3 stages – (1) Awareness, (2) Knowledge and (3) Skills for the management of protected areas (protection and public use) and natural environment conservation in the Green Corridor zone (beyond the protected areas)

Target	Goal for each Stage			
	Previous condition	Awareness	Knowledge	Skills
Employees	There is awareness	→	○ →	○
Teachers	There is interest	→ ○ →	○	
Tourists	There is no interest	→ ○		

4. Environmental Education programs and materials

The goal of the environmental education aspect of the project is to gain the skills to plan, elaborate and specifically execute programs and didactic materials

Activities that tend to be related to nature or the environment, in order to go deeper into its understanding, are considered as environmental education program. Exhibitions or self-guided walks, that do not require a person as an intermediate and that meet the objectives of the stages “Interest”, “Awareness” and “Attitude”, are considered as procedures. These activities should not only be related to the natural environment, but also to themes such as life and environment,

social environmental themes; summarizing, themes about the region and the personality of the counsellors that could be useful

The environmental education program of the project are referring to a group of activities with individual goals, defined target people, timetable and programmed content. In order to reach these goals, programs will be elaborated and improved to be implemented in the 3 groups, that are employees of the involved institutions, teachers and tourists. Each program must be focused on the increasing of interest in protected areas and natural resources, resorting to the understanding and changes in the attitudes and activities towards a sustainable conservation of the Paranaense Forest.

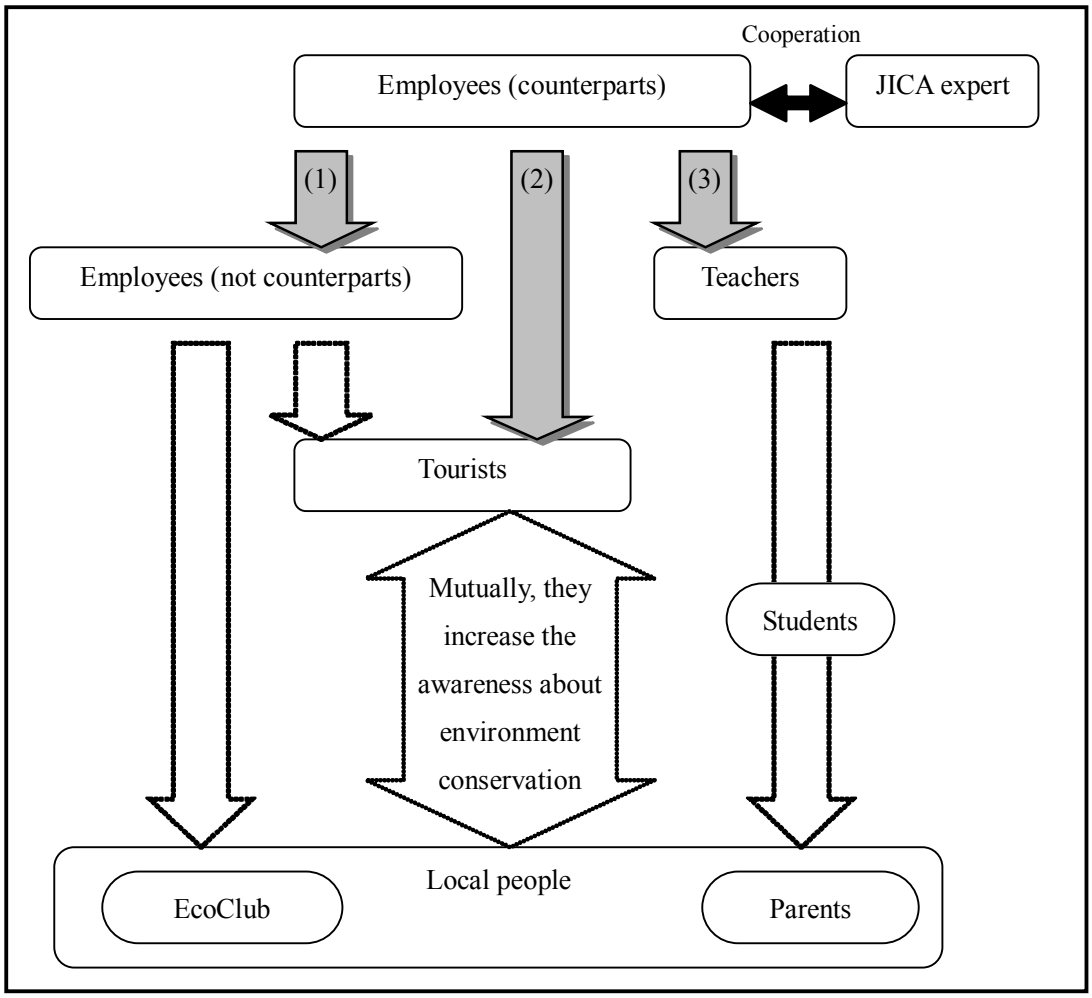
Environmental education materials are related to documents and the necessary materials for the execution of the environmental education program. In order to carry this out, the creation of an audio visual (video tape, slides) and a booklet or guide are planned to be developed in phase 3 (fiscal period 2006). Two kinds of audio visual material will be created, one to be used by the employees of the involved institutions with tourists or local people, and another to be used by teachers with school students. The booklet or guide will be used mainly with tourists. A herbarium, plaster casts of mammals tracks, board with pictures, puppets, brochures, etc. will be created as supporting materials for the implementation of the programs.

5. Environmental Education programs structure

In order to properly transmit the Environmental Education message, the program will be carried out taking into account the following structure, centering the activities on employees of the counterpart institutions. The stages that will be the goals are, Arrow 1: “Awareness” and “Skills”, Arrow 2: “Awareness” and Arrow 3: “Awareness” and “Knowledge”.

Regarding the Environmental Education for tourists, it should be considered the relationship between tourists and local people, who should reciprocally increase the knowledge about the environment conservation. For example, regarding rubbish and hygienic conditions in the protected areas and surrounding areas, generally tourists are highly aware of these issues while local people awareness is poor. On the contrary, tourists awareness about issues such as annoying noise, run over animals and dust generation when vehicles go through unsealed roads, is considerable low.. For these reasons, with the exchange between both groups, it is expected that the awareness will mutually increase. Moreover, to assist the implementation of the Environmental Education for local people, it will be carried out with the cooperation of the Ecoclub, which was founded in phase 2 of the project.

.



6. Program for employees

The Environmental Education program for employees is structured in 3 sub-programs. Since this program is for employees, it can be implemented outside the schools for local people and also for the tourists that visit the protected areas in the project area..

6. 1 Nature observation sub-program

This sub-program consists on executing activities mainly in the trails of the protected areas. These activities can be implemented separately or jointly, according to the objective.

- ► Flora training course (Activity 1)
- ► Insects training course (Activity 2)
- ► Amphibious and reptiles training course (Activity 3)
- ► Bird training course (Activity 4)
- ► Mammals training course (Activity 5)

6. 2 Awareness sub-program

This sub-program consists on executing activities mainly in schools and public buildings.

- ► Recycling training course (Activity 6)
- ► Others

6. 3 Environmental knowledge sub-program

This sub-program targets local people and tourists in the protected areas or public buildings (library, schools, etc) and consist on activities that offer the necessary knowledge for the protected areas management and the natural environment conservation.

- ► Protected areas and their functions (seminars, dissertations)
- ► General knowledge about the environment (seminars, dissertations)

7. Program for teachers

The Environmental Education program for teachers is structured in 3 sub-programs. Since this program is for teachers, it can be implemented in schools or in public buildings as part of a scholar event. It can also be implemented for local people (mainly students and their tutors)

7. 1 Nature observation sub-program

This sub-program consists on activities that can be executed within schools or in the trails during a visit to a protected area, as part of a scholar event. These activities can be implemented separately or jointly, according to the objective.

- ► Flora training course (Activity 7)
- ► Insects training course (Activity 8)
- ► Amphibious and reptiles training course (Activity 9)
- ► Bird training course (Activity 10)
- ► Mammals training course (Activity 11)

7. 2 Awareness sub-program

This sub-program consists on activities that can be executed within schools or, as part of a scholar event, in public buildings

- ► Recycling training course (Activity 12)
- ► Puppet shows
- ► Others

7. 3 Environmental knowledge sub-program

This sub-program consists on activities to be implemented within schools or, as part of a scholar

event, in public buildings. It is also for local people (students and their tutors) because it consists on activities that offer the necessary knowledge for the protected areas management and the natural environment conservation.

- ► General knowledge about the environment (seminars, dissertations) (Activity 13)
- ► Protected areas and their functions (seminars, dissertations)

8. Program for tourists

The Program for tourists is structured in 2 sub-programs. It can be implemented for tourists that visit the protected areas or public buildings in the project area. These activities will be responsibility of the employees of the involved institutions and the local people, who will be instructed through the Environmental Education program.

8. 1 Nature observation sub-program

This sub-program consists on executing activities mainly in the trails of the protected areas.

- ► Nature observation (Activity 14)

8. 2 Environmental knowledge sub-program

This sub-program consists on activities that offer the necessary knowledge to value the importance of natural resources. It can be implemented within the protected areas or in public buildings

- ► General knowledge about the environment (seminars, dissertations) (Activity 15)
- ► Others (Tree plantation, etc.) (Activity 16)

9. Environmental Education Activities

These Environmental Education activities were carried out during phases 1 and 2 of the project.

Activity 1

Program	Focused on employees
Activity	Flora training course
Objective	・ Through flora (plants) observation, to understand the relationship among protected areas, ecosystem and man. ・ To understand the methodology for plants observation and research techniques
Duration/Date	14 Hs. / October 9th and 10th, 2005
Venue	Urugua-í Provincial Park and pilot project Ecolodge
Target Group	National and provincial park rangers
Contents	・ Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) ・ To receive a summarized explanation about the Flora of Misiones Forest (Paranaense Forest) ・ Going out to the observation points with the guidance of counsellors to observe the flora ・ To include species, quantity, etc of the observed flora on a record table
Materials to be prepared	Binoculars, magnifying glass, illustrated guide, stationary, digital camera, Portable microscope, etc.
Progress	・ To acquire skills for transmitting the knowledge related to flora to local people and tourists. ・ To study the information related to plants with thorns or toxic substances and measures to be taken. ・ To take samples of leaves and seeds that can be extracted and to elaborate a simple sample book and to exhibit it. ・ To make use of the samples of leaves and seeds that can be extracted or the wood that is not used in the sawmills, to create carved wood signs or identification signs for trees. ・ To take the advantage of the pictures taken with the digital camera to create a comment sheet or an illustrated guide of the flora.

Activity 2

Program	Focused on employees
Activity	Insects training course
Objective	• Through insects observation, to understand the relationship among protected areas, ecosystem and man. • Insects observation, to understand the research techniques
Duration/Date	8 Hs. / November 5th, 2005
Venue	Pilot project Ecolodge
Target Group	Provincial park rangers
Contents	• Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) • To receive a summarized explanation (classification, collection methods) about arthropods and insects • Going out to the observation points with the guidance of counsellors to observe insects • As necessary, to collect insects • To elaborate a sample book with the collected insects
Materials to be prepared	Magnifying glass, illustrated encyclopedia, stationary, digital camera, Portable microscope, etc
Progress	• To acquire skills for transmitting the knowledge related to insects to local people and tourists. • To study the information related to bees or other insects that represent a risk and measures to be taken. • To include in a map the areas in which insects were observed and to elaborate a proportional distribution map. • To take the advantage of the pictures taken with the digital camera to create a comment sheet or an illustrated guide of insects

Activity 3

Program	Focused on employees
Activity	Amphibious and reptiles training course
Objective	・ Through amphibious and reptiles observation, to understand the relationship among protected areas, ecosystem and man. ・ Amphibious and reptiles observation, to understand the research techniques
Duration/Date	2~3 Hs., Nocturnal activity (It is proper to start this activity at sunset) / Except during winter season (May ~ July)
Venue	Urugua-í Provincial Park surroundings
Target Group	National and provincial park rangers
Contents	・ Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) ・ Going out to the observation points with the guidance of counsellors to observe amphibious and reptiles ・ To record species, quantity, etc. of observed amphibious and reptiles on a record table ・ To include in a map amphibious and reptiles of the observed areas
Materials to be prepared	Torches, gum boots, illustrated guide, record table, stationary, digital camera, maps, etc
Progress	・ To acquire skills for transmitting the knowledge related to amphibious and reptiles to local people and tourists. ・ To study the information related to poisonous snakes and measures to be taken ・ To take the advantage of the pictures taken with the digital camera to create a comment sheet or an illustrated guide of amphibious and reptiles

Activity 4

Program	Focused on employees
Activity	Birds training course
Objective	・ Through birds observation, to understand the relationship among protected areas, ecosystem and man. ・ Bird watching, to understand the research techniques
Duration/Date	8,5 Hs. / November 13th, 2005
Venue	Urugua-í Provincial Park
Target Group	Provincial park rangers
Contents	・ Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) ・ To receive a summarized explanation (origin, morphology, physiology, classification, etc.) about birds. ・ To learn the method for utilizing the net for catching birds and the way indicators are placed on birds. ・ To learn how to use tools, such as binoculars, record table, etc. ・ Going out to the observation points with the guidance of counsellors to observe birds
Materials to be prepared	Binoculars, illustrated guide, record table, stationary, digital camera, maps, etc.
Progress	・ To acquire skills for transmitting the knowledge related to birds to local people and tourists. ・ To record species, quantity, etc. of the observed birds on a record table ・ To include in a map the areas in which birds were watched and to elaborate a proportional distribution map. ・ To take the advantage of the pictures taken with the digital camera to create a comment sheet or an illustrated guide of birds

Activity 5

Program	Focused on employees
Activity	Mammals training course (Search for animals traces and to make plaster casts of the tracks)
Objective	• Through mammals observation (traces), to understand the relationship among protected areas, ecosystem and man. • Mammals observation (traces), to understand the research techniques
Duration/Date	6 Hs. / November 26th, 2005
Venue	Urugua-í Provincial Park surroundings
Target Group	National and provincial park rangers
Contents	• Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) • To receive a summarized explanation (classification, habitat) about the mammals of the Misiones Province • To learn about the research methods to study mammals • To learn how to make plaster casts of the tracks as one of the research methods to study mammals • To make plaster casts of each of the different kinds of tracks
Materials to be prepared	GPS, plaster, vinyl bags, recipient to make plaster casts of the tracks, water, illustrated guide, digital camera, etc.
Progress	• To acquire skills for transmitting the knowledge related to mammals to local people and tourists • To add explanations to the plaster cast of the tracks and to exhibit them • To create a comment sheet of tracks, an illustrated guide of tracks, a block of tracks, etc.

Activity 6

Program	Focused on employees
Activity	Recycling training course
Objective	・ To understand the methods for recycling daily used materials.
Duration/Date	12 Hs. / November 20th and 21st, 2005
Venue	Popular Library of Andresito
Target Group	National and provincial park rangers and technicians
Contents	・ Explanation of recycled crafts ・ Crafts using cardboard boxes (frogs puppets) ・ Crafts using plastic bottles (puppets) ・ Creation of a story ・ Discussion about posibility of coraboration between related organizations for the task.
Materials to be prepared	Plain stage, puppets, musical instruments, material for recycling (fabric, cardboard, plastic bottles, sponges, sticks, etc.), bookshop elements (glue, scissors, cutter, tempera, paints, etc.)
Progress	・ Through the created puppets, to acquire the skills to increase the knowledge about natural environment conservation among local people ・ According to the story, to create different puppets (including animal and plants) and stages ・ To carry out the exhibition of the works of art

Activity 7

Program	Focused on teachers
Activity	Flora training course
Objective	・ Through flora observation, to understand the relationship among flora and human beings ・ To understand the methodology for plants observation
Duration/Date	7 Hs. / October 9th, 2005
Venue	Pilot project Ecolodge
Target Group	Teachers of primary schools and high schools located near the protected areas
Contents	・ Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) ・ To receive a summarized explanation about the Flora of Misiones Forest (Paranaense Forest) ・ Going out to the observation points with the guidance of counsellors to observe the flora ・ To include specie, quantity, etc of the observed flora on a record table
Materials to be prepared	Binoculars, magnifying glass, illustrated guide, stationary, digital camera, portable microscope, etc.
Progress	・ To understand the techniques for transmitting the knowledge related to flora to students ・ To study the information related to plants with thorns or toxic substances and measures to be taken ・ To create a sketch of the most interesting flora ・ To make use of the samples of leaves and seeds that can be extracted or the wood that is not used in the sawmills, to create carved wood signs or identification signs for trees.

Activity 8

Program	Focused on teachers
Activity	Insects training course
Objective	• Through insects observation, to understand the relationship among insects and human beings • To understand the methodology for insects observation
Duration/Date	8 Hs. / November 5th, 2005
Venue	Pilot project Ecolodge
Target Group	Teachers of primary schools and high schools located near the protected areas
Contents	• Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) • To receive a summarized explanation (classification, collection methods) about arthropods and insects • Going out to the observation points with the guidance of counsellors to observe insects • As necessary, to collect insects • To elaborate a sample book with the collected insects.
Materials to be prepared	Magnifying glass, illustrated guide, stationary, digital camera, portable microscope, etc
Progress	• To understand the techniques for transmitting the knowledge related to insects to students • To create a sketch of the most interesting insects • To create a work of art with insects as the topic.

Activity 9

Program	Focused on teachers
Activity	Amphibious and reptiles training course
Objective	・ Through amphibious and reptiles observation, to understand the relationship among amphibious and reptiles and human beings ・ To understand the methodology for amphibious and reptiles observation
Duration/Date	2~3 Hs., Nocturnal activity (It is proper to start this activity at sunset) / Except during winter season (May ~ July)
Venue	Urugua-í Provincial Park surroundings
Target Group	Teachers of primary schools and high schools located near the protected areas
Contents	・ Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) ・ Going out to the observation points with the guidance of counsellors to observe amphibious and reptiles ・ To record species, quantity, etc. of observed amphibious and reptiles on a record table ・ To include in a map amphibious and reptiles of the observed areas
Materials to be prepared	Torches, gum boots, illustrated guide, record table, stationary, digital camera, maps, etc.
Execution points	・ To decide the target area for the observation and places. ・ Counsellors will carry out a previous research
Progress	・ To understand the techniques for transmitting the knowledge related to amphibious and reptiles to students ・ To create a sketch of the most interesting amphibious and reptiles ・ To create a work of art with amphibious and reptiles as the topic.

Activity 10

Program	Focused on teachers
Activity	Birds training course
Objective	・ Through birds observation, to understand the relationship between birds and the natural environment that surrounds them ・ To understand the methodology for birds observation
Duration/Date	8,5 Hs. / November 13th, 2005
Venue	Urugua-í Provincial Park
Target Group	Teachers of primary schools and high schools located near the protected areas
Contents	・ Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) ・ To receive a summarized explanation (origin, morphology, physiology, classification, etc.) about birds ・ .To learn how to use tools, such as binoculars, record table, etc. ・ To learn the method for utilizing the net for catching birds and the way indicators are placed on birds. ・ Going out to the observation points with the guidance of counsellors to observe birds
Materials to be prepared	Binoculars, illustrated guide, record table, stationary, digital camera, maps, etc.
Progress	・ To understand the techniques for transmitting the knowledge related to birds to students ・ To draw the most interesting birds ・ To take the advantage of the pictures taken with the digital camera to create a simple illustrated guide of birds

Activity 11

Program	Focused on teachers
Activity	Mammals training course
Objective	・ To understand the habitat of the wild mammals of the region ・ To understand the methodology for mammals observation and research
Duration/Date	6 Hs. / November 26th, 2005
Venue	Urugua-í Provincial Park periphery
Target Group	Teachers of primary schools and high schools located near the protected areas
Contents	・ Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) ・ To receive a summarized explanation (classification, habitat) about the mammals of the Misiones Province ・ To learn about the research methods to study mammals ・ To learn how to make plaster casts of the tracks as one of the research methods to study mammals ・ To make plaster casts of each of the different kinds of tracks
Materials to be prepared	Plaster, vinyl bags, recipient to make plaster casts of the tracks, water, illustrated guide, digital camera, maps, etc
Progress	・ To understand the techniques for transmitting the knowledge related to mammals to students ・ To draw the most interesting mammals ・ To add explanations to the plaster cast of the tracks and to exhibit them

Activity 12

Program	Focused on teachers
Activity	Recycling training course
Objective	・ To understand the methods for recycling daily used materials.
Duration/Date	12 Hs. / November 20th and 21st, 2005
Venue	Popular Library of Andresito
Target Group	Teachers
Contents	・ Explanation of recycled crafts ・ Crafts using cardboard boxes (frogs puppets) ・ Crafts using plastic bottles (puppets) ・ Creation of a story ・ Discussion about posibility of coraboration between the related organizations for the task.
Materials to be prepared	Material for recycling (fabric, cardboard, plastic bottles, sponges, sticks, etc.), common natural materials (little sticks, leaves, stones, etc.), bookshop elements (glue, scissors, cutter, tempera, paints, etc.)
Progress	・ Through recycling, to understand the techniques to increase the knowledge about natural environment conservation among students ・ According to the story, to create different puppets. ・ Taking the advantage of the created crafts, to carry out a puppet show and an exhibition

Activity 13

Program	Focused on teachers
Activity	Environmental training course
Objective	・ To know and understand the environmental problems and their relationship with the laws, etc. ・ To understand the procedures to gain knowledge about environmental problems.
Duration/Date	32 Hs. / September 28th and 29th; November 8th and 9th , 2005
Venue	Meeting room in Andresito, schools near to protected areas
Target Group	Teachers
Contents	・ Introduction, problem approach, problem resolution, conclusion
Materials to be prepared	Digital projector, booklets, maps, etc.
Progress	・ To understand the techniques for transmitting the knowledge related to natural environment conservation to students. ・ To create and use supporting didactic materials for knowledge transference.

Activity 14

Program	Focused on tourists
Activity	Nature observation
Objective	・ Through nature direct observation within protected areas, to know the importance of nature conservation
Duration/Date	2~3 Hs. / Opportunities found all the year round
Venue	Urugua-í Provincial Park
Target Group	Tourists
Contents	・ Flora and fauna observation with the guidance of park rangers all along the trails of protected areas
Materials to be prepared	Binoculars, magnifying glass, illustrated guide, stationary, digital camera, maps, etc
Progress	・ Park rangers include on the record table species and quantities, etc. of the observed flora and fauna. ・ Reactions of tourists towards trails within protected areas are registered and the information is useful for future improvement.

Activity 15

Program	Focused on tourists
Activity	Dissertation (seminar, explanation)
Objective	・ To know the role of protected areas, their importance and relationship with the society (tourism, recreation, headwaters and formation of water bodies, research, etc.)
Duration/Date	Approximately 1 hour / Opportunities found all the year round.
Venue	Uruzú Office in the Urugua-í Provincial Park, Yacuy Office in the Iguazú National Park, Pilot project Ecolodge
Target Group	Tourists
Contents	・ Slideshow (PowerPoint) explanation (Refer to the Appendix of Environmental Education Program) ・ Introduction, problem approach towards problems resolution, conclusion
Materials to be prepared	Maps, slides, photographic presentation, videos, digital projector, booklet, brochures.
Progress	・ Gathering and organizing information for tourists ・ To make available the information gathered from tourists to other tourists. ・ Make a formation a network with tourists.

Activity 16

Program	Focused on tourists
Activity	Tree plantation
Objective	・ To know the importance of conservation and restoration of the Paranaense Forest
Duration/Date	3~4 Hs. / November 22nd, 2005
Venue	Urugua-í Provincial Park periphery
Target Group	Tourists
Contents	・ To get an explanation of the current situation of the Paranaense Forest and its natural processes ・ To choose the seedlings to plant ・ In order to interconnect the existing protected areas, to carry out the tree plantation activity within the private lands located between those areas.
Materials to be prepared	Tools necessary for planting trees, etc.
Progress	・ To study the combination with the system of Tree Sponsoring. ・ To study the combination with the system of private natural protected areas.