

The Sustainable Management of Wetland Resources in Mercosur

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COORDINATORS REPORT

Introduction

The following is a short report outlining the activities conducted to date and the tasks that will be performed in the coming period for the general project and for the coordinating institution, CSGI, in particular. This report contains an overview of the general activities for each of the three principle workpackages; experimental data acquisition, ecological and economic modelling, management and monitoring tools and a description of activities conducted and problems encountered by each partner.

The participating partner institutions in the project are:

1. Consorzio per lo Sviluppo dei Grande Interfase, Dept of Chemical and Biosystem Sciences and Technology, Univ. of Siena, IT
2. Instituto de Medio Ambiente y Ecologia Universidad del Salvador, AR
3. Nucleo Consolidado de Matematica Pura e Aplicada of the Univ.Nacional del Centro de la Provincia de Buenos Aires, AR
4. Facultad de Ciencias del Mar of the Universidad de Cadiz, ES
5. Department de Ambiente e Ordenamento, Universidade de Aveiro, PT
6. Department de Matematica Aplicada , Universidade Estadual de Campinas, BR
7. Department of Environmental Economics and Environmental Management University of York, GB
8. Curso de Pos-Graduata em Matematica Aplicada of the Instituto de Matematica at the Universidade Federal do Rio Grande do Sul, BR

In the original proposal, the Department of Ecology of the Federal University of Rio de Janeiro, BR was also a partner, but due to economic and structural problems in the Federal university system in Brasil, this partner asked to be removed from the project. Formal revision of the contract was initiated in February, 1999.

The project is dedicated to the study of tools and methodologies for a management of wetland resources in the Mercosur that are socially, economically and environmentally acceptable through the study of the impacts of large scale regional modifications in economic activities, population density, transportation and energy production.

The 38 month project was initiated in October, 1998. The project brings together the approaches of a diversified team of EU and LA universities in the development of a system of management and monitoring tools for a region wide approach to the conservation of natural resources related to wetland and aquatic ecosystems. The project study site is a large wetland area in northeastern Argentina, the Esteros del Ibera.

Experimental data acquisition,

The selection and localisation of the meteorological, hydrological and hydrometric instruments for the characterisation of the chemical, physical and water quality characteristics of two lagoon areas in the wetland was immediately initiated. A localisation study was made in November 1998 by researchers from the USVID, CSGI, the Fundacion Ibera and the Laboratorio Centrale di Idrobiologia of Rome (subcontractor for CSGI) in different locations in the Esteros del Ibera. The investigation revealed that the best sampling points for instruments were the Ibera and Galarza Lagoons. The Ibera Lagoon has been under the management of the Fundacion Ibera since 1983, is the site of several small scale economic activities (rice production, tourism, small village) as well as numerous future development proposals. The Galarza Lagoon is located to the northeast of the Ibera Lagoon and has little anthropic activity in its immediate surroundings, this latter area will be used as a control for monitoring purposes. The criteria utilised for selecting these areas were; the

relative impacts from economic activities, an active control for security purposes, the similarity between ecosystems and the difficulty in arriving at the lagoon (logistics). The three meteorological stations were located: next to the Ibera Lagoon, one kilometre from the Galarza Lagoon, and in the NW area of the Esteros in the El transito bagnados area. The stations were installed in February 1999 in a coordinated effort of researchers from Laboratorio Centrale di Idrobiologia USVID, and CSGI. These stations are powered by solar panels and sample up to 11 parameters (see Table below), continuously recording hourly averages. The hydrological stations (2) are located in the Lagoons Ibera and Galarza. Both are powered from solar panels and work in continuos, making measurements every 30 minutes. The parameters measured are: water temperature, conductivity, pH, dissolved oxygen (and saturation), and turbidity. Samples are obtained at 30 cm from the water surface (depth of the lagoons 3-4 meters). There are four hydrometrographic instruments, one in each of the study lagoons, a third one accompanies the meteorological station in the NW territory. and a fourth station in the single river outlet of the Esteros, the Corrientes River. This fourth station has yet to be located and will be sited in a meeting between the local management-conservation foundation, (Fundacione Ibera), USVID and the provincial water institute. The river has wide flow variations and limited information on hydraulic sections.

Table 1. Meteorological parameters measured in the stations located in the Esteros del Ibera.

Parameter measured	Main Station	Satellite stations
Air Temperature	yes	yes
Ground Temperature	yes	yes
Humidity	yes	yes
Wind Direction	yes	
Wind Speed	yes	yes
Atmospheric Pressure	yes	
Rain	yes	yes
Global Radiation	yes	yes
PAR	yes	
UVA A	yes	
UVA B	yes	
Leaf Wetness	yes	

Biological data

The start up of the biological sampling, previously scheduled for February 1999, has been delayed due to difficulties related to instrument availability in Argentina and bank delays in the transfer of funds. Sampling should begin in May 1999. Sampling strategies and sampling locations were finalised in the on-site meeting in February, 1999.

Modelling

Bibliographic information gathering for ecological and hydrological models was initiated in February, 1999. Workshops during the February meeting were dedicated to model development. Information was exchanged between modellers and biological research team members. Local authorities (Provincial) participated in meetings and workshops and pledged to participate in model development and research efforts in recuperating historic data. For more information on individual model development, see the individual partner reports for the Univ.s of Centro, Campinas and Rio Grande that follow.

Interviews were made to select a suitable candidate to study at the University of York and develop an ecological economic model under the direction of Prof. Charles Perrings. A candidate has been chosen and the materials for his study in York for the coming October are being organised in these weeks. The creation of the eco-eco model should begin at the end of the second year of research.

Instrument development

During the February meeting, two discussion sessions, one limited to project researchers and the other with the provincial government, were dedicated to elaborating future scenarios in efforts to focus the model and instrument development. Economic trends, small local development and large provincial projects were discussed. A list of most probable scenarios was developed and potential impacts were discussed. This list will serve as the background for the development of models and instruments that will be used to predict possible impacts on the wetland ecosystem and resource quality. Monitoring programmes will be developed to assist in resource management. Input from local authorities was fundamental in the scenario development, as was the experience of visiting scientists from Paraguay (Secretaria de Medio Ambiente, Gob. Del Dept. Central). These latter scientists will continue to participate in the project, contributing with their experience from the related wetlands in Paraguay.

The development of a geographical information system has initiated and dynamic vegetation maps will be developed using satellite images obtained from the National Commission for Spatial Activities (CONAE) through the participation of project partners (UNICEN) in Mission SAC-C. Other satellite images and land use maps are being sought after presently.

The development of goal functions is underway. A workshop during the February meeting was dedicated to creating an extended trophic web with the participation of all research groups. This web will serve as a basis for the goal function evaluation, further analysis requires biological data that will begin in May 1999.

Several qualitative models are being constructed related both to the trophic web as well as to the impact of management activities on ecosystem health.

Problems related to the progress of the project.

Several phases of the initial start up of the project were delayed due to scheduling difficulties and economic problems in one of the participating countries. The economic crisis in Brazil caused a change in the partner list. The loss of the Department of Ecology of the Federal University of Rio de Janeiro in January, 1999 required that new research institutions be found to cover the responsibilities previously assigned to Rio. This was accomplished in February 1999 with the inclusion of three subcontractors, the University Nacional of Lujan (AR), the University of Misiones (AR) and the University of RomaTre (IT). All three subcontractors participated in the February meeting.

Another problem encountered was related to the importation of equipment into Argentina. Inconsistencies in the customs procedure caused several delays in the shipment of the meteorological and hydrological instruments to Argentina. These problems were eventually resolved with the assistance of National Customs Agency in Buenos Aires.

Start-up problems were also related to the differences in University schedules between the northern and southern hemisphere, the latter having exams and summer break in December and January. Other problems related to the transfer of funds from Europe to South America also occurred, primarily due to banking delays in December. These problems have since been resolved.

Conclusion

The project has initiated well with all partners starting their respective responsibilities with only a short delay. Early organisational problems have been resolved and the first meeting in February proved to be a great success both scientifically as well as meeting the objective to favour the participation and cooperation of the local communities and local actors.

The project has obtained the support of the local and provincial governments as well as attracting significant attention on the regional scale (Paraguay, Uruguay and Argentine national governments). Side projects related to increasing data availability have obtained national and provincial support and logistic support from local businesses, provincial agencies and the national army has added much to the value of the project.

International diffusion of the project is beginning with a web page, <http://www.unisi.it/wetland> and presentations at upcoming conferences and meetings.

The work of the next six months should include:

- Continued meteorological and hydrological data gathering
- The localisation of the hydrometric instrument on the Corrientes River
- The start up of biological sampling (May) by the Univ.s of Cadiz, Lujan and Misiones
- Continued exchange between biological-ecological partners and the modelling groups
- Continued bibliographic research and the start up of ecological and hydrological models
- USVID student to begin his/her study period in York, October 1999
- Development of GIS and the acquisition of a series of satellite images for analysis
- Development of qualitative models examining trophic relationships and potential impacts
- Publication and circulation of scenario analysis performed during the second meeting
- Determination of second meeting/workshop, most probably June 2000.
- Continued development of a biosensor
- Sampling and analysis for chemical physical parameters and pollution (pesticides)
- Continued development of environmental education programmes for the local schools

In the following pages, the 6 month reports from each partner are presented.

UNIVERSIDAD DEL SALVADOR (Partner 2)

PROGRESS REPORT (1)

USVID/IMAE / Fundacion Reserva del Ibera - Project "Biodiversity at Ibera Marsh, Province of Corrientes

Biological-ecological monitoring/hydrological/meteorological stations

Participating researchers

Genoveva de Mahieur – responsible scientist

Ing. Gustavo Sabio - coordinator general

Marcelo D. Beccaceci

Silvina Gerhart

Alejandra Norniella

Manuel Trujillo

Tomas Waller

Introduction

The following is the first brief report on the activities carried out since the beginning of the project in October, 1998. The report is divided into two sections; Biological-ecological monitoring carried out by Dott. Beccaceci and Waller and the hydrological-meteorological monitoring conducted by Dott. Norniella and Trujillo.

Biological-ecological monitoring

A final document for the project was drafted including objectives, justification, general methodology and work programme. A compilation of bibliography related with the region was started. This information is being incorporated in a database for easy handling and sharing with partners. By the end of March a list of references will be available to be distributed to other research partners.

A compilation of available cartographic material for the study site was done, mainly from the Instituto Geográfico Militar (IGM) published library. We have obtained a published topographic and satellite chart coverage for the whole system and particular study sites (i.e. Ibera - Luna) at 1:100,000 and 1:250,000 scales. Also from the Instituto Geográfico Militar we get a complete aero-photographic coverage of Laguna Ibera and neighbours at 1:50,000 scale.

Workplan

Our work plan was presented and discussed in relation with that of the other partners. We defined that the scope of our main field work will be to study specific aspects of the feeding ecology and population biology of two key species: common yacare, *Caiman yacare* and, marsh deer, *Blastoceros dichotomus*.

We discussed the availability of information on other key species (i.e. capybara, otter, yellow anaconda, piranha) and whether would be feasible to obtain more field information on these species considering available time and resources. We concluded that due to practical constraints we will not carry out field work on these species, and that our cooperation on these taxons will be limited to a bibliographic search and general consultancy. During the meeting we also have the opportunity, among other results: a) to share information and bibliography with other partners, b) to analyse and discuss the location of our study sites, c) to identify major zoological groups and discuss their specific role in the trophic chains, and d) to analyse and discuss potential future development scenarios for the area.

Interaction with other institutions

By our request, Fundaciòn Reserva del Ibera invited two professionals from the Secretar'a de Medio Ambiente, Gobernaciòn del Departamento Central, Paraguay, in order to maximize the regional impact of the project: Lic. Emilio Bungeremini Palumbo (Biologist) and Lic. Silvia Spinci (Human ecologist). Both persons assisted two days to the February meeting at Ibera. We have received confirmation that Mr. Buonghermini would be able to cooperate with the field work of our project as a guest researcher. Dra. Susana Gonzàlez (Genetist), Instituto Clemente Estable (Montevideo, Uruguay) was also invited by the project to explore the

feasibility of carrying out studies on the conservation genetics of some vertebrates (i.e. marsh and pampas deer). Dra. González was present during one day of the February meeting at Virasoro. Her cooperation was formally included in the project but depends on the future availability of financial support.

The coming months will be dedicated to generate scientific data on vertebrate diversity, ecology and conservation, to be utilised in the design of a management and conservation strategy for wetland systems.

Specific objectives:

Vertebrate diversity

- To compile an inventory of vertebrate richness for the whole Ibera system based primarily on available information.
- To reinforce the inventory of vertebrate richness with data gathered from the field.
- To analyse the richness spatial variation for some taxons comparing different areas of the Ibera system.

Vertebrate ecology

- To study the diet of Marsh Deer (*Blastoceros dichotomus*) in different areas of the Ibera system, and in relation with other vertebrates, exotics (i.e. cattle) and natives (i.e. capybara).
- To determine the relative density and population structure of the common yacare in the Ibera system.
- To study the diet of the common yacare (*Caiman yacare*) in different habitats.
- To compile the available published information on the ecology and social organisation of other key species yet to be determined.
- To analyse the information gathered in order to identify habitat requirements for the key species.

Vertebrate conservation

- To analyse the conservation status and genetics of marsh deer populations in different areas of Ibera system.
- To monitor yacare population trends (*C. yacare* and *C. latirostris*) in Ibera system.
- To follow up the conservation status of pampas deer (*Ozotoceros bezoarticus*).
- To evaluate possible impacts on other key species due to human activities.

The following time schedule and work programme covers the first 15 months of the project, it is tentative and could be modified during its execution. The work programme for this first stage will involve 8 field campaigns to the study sites. The in between campaign period will be devoted to bibliographic search, inter-consulting with partners, data analysis, lab work, supplies acquisition, reporting, and next campaign planning.

a) February, 1999: Bibliographic search. Meeting in Corrientes: visit to research areas, logistic analysis, coordination with other partners: work programme presentation, schedule analysis, potential human-induced impacts scenario analysis, project mass-media presentation.

b) March/April, 1999: Bibliographic search, inter-consulting with other partners, campaign planning, material and equipment acquisition. Reporting. 1st Campaign: April 5th to April 14th. Field tasks: marsh deer sampling (i.e. scats, bones - Luna lake), interaction between marsh deer and capybaras (Ibera lake), herpetological sampling, yacare census, yacare diet sampling (Ibera, Luna).

c) May, 1999: Bibliographic search, inter-consulting with other partners, lab work, data analysis, supplies acquisition, campaign planning. Reporting. 2nd Campaign: May 10th to May 19th. Field tasks: marsh deer sampling (i.e. scats, bones - Luna lake & Ea. San Juan Poriahu-SJP), marsh deer census (Ibera & Luna), interaction between marsh deer and cattle (SJP), herpetological sampling, yacare census & population structure, yacare diet sampling (Ibera, Luna & SJP).

d) June, 1999: Bibliographic search, consulting with other partners, lab work, data analysis, campaign planning. Reporting. 3rd Campaign: June 21st to June 30th. Field tasks: marsh deer sampling (i.e. scats, bones - Luna lake), interaction between marsh deer and capybaras (Luna lake), herpetological sampling, yacare census & population structure, yacare diet sampling (Luna, Ea. El Transito -ET & SJP).

e) July/August, 1999: Bibliographic search, inter-consulting with other partners, lab work, data analysis, supplies acquisition, campaign planning. 4th Campaign: July 26th to August 4th. Field tasks: Pampas deer survey (Galarza area), yacare census & population structure (Luna, SJP & ET). PROGRESS REPORT.

f) September, 1999: Inter-consulting with other partners, lab work, data analysis, campaign planning. 5th Campaign: September 6th to September 15th. Field tasks: marsh deer sampling (i.e. scats, bones - SJP, ET), interaction between marsh deer and cattle (SJP), pampas deer survey (ET), herpetological sampling, yacare census, population structure and diet sampling (SJP, ET).

g) November/December, 1999: Inter-consulting with other partners, lab work, data analysis, supplies acquisition, campaign planning. Reporting. 6th Campaign: November 22nd to December 1st. Field tasks: marsh deer sampling and census (i.e. scats, bones - Luna, Ibero), interaction between marsh deer and capybara (Luna, Ibero), herpetological sampling, yacare nesting sampling and diet sampling (Luna, Ibero, SJP).

1) Brief reports will be presented between campaign periods.

2) A progress report will be presented after the 4th campaign by the end of August, 1999.

3) A final report with conclusions of the I Stage will be presented at the end of this stage by May, 2000.

Meteorological/hydrological/hydrometric instrumentation

The activities started with the arrival of the group from CSGI and Laboratorio di Idrobiologia on February 10, 1999. Numerous days were required to transport, set up and test run of the meteorological and hydrological stations. Some data downloading was performed by the end of February. During the same period, equipment for the biological analysis was ordered and the laboratory at the Virasoro campus was prepared for the partner researchers from the Universities of Cadiz, Laboratorio di Idrobiologia and Lujan research groups.

All researchers from the USVID Virasoro campus dedicated large amounts of time to the organising and functioning of the February meeting, including setting up press conferences, public meetings transportation (provided by the National Army of Argentina) and meetings with local authorities. All researchers participated in the workshops and discussions of the meeting. A full breakdown of the activities of the Virasoro researchers can be found in progress reports included on the project web page.

Problems were observed related to:

transportation to and from the study sites, requiring several hours on roads that are strongly affected by weather conditions

difficult data transmission by internet, due to long distances and low quality transmission lines

difficulty in ordering some laboratory equipment, delays, etc..

UNIVERSIDAD NACIONAL DEL CENTRO DE LA PROVINCIA DE BUENOS AIRES (Partner 3)

Scientific Coordinator: Dr. Graciela Ana Canziani

The group at UNCPBA is formed by members of NUCOMPA:

Dr. Graciela Canziani, Professor, Mathematics and Mathematical Ecology,

Ing. Rosana Ferrati, Engineer in Hydric Resources and Graduate student in Mathematics,

Lic. Paula Federico, Graduate student in Mathematics,

Ing. Ana Canónica, Engineer, Computer and Systems Engineering.

And also by Faculty members who devote part of their research time to the project:

M.V. Fernando Milano, Professor, Natural Resources and Sustainability, Facultad de Ciencias Veterinarias,

Dr. Marcelo Gandini, Professor, Ecology, Remote Sensors, Facultad de Agronomía,

Dr. Roberto Sánchez, Professor, Environmental Management, Facultad de Ciencias Humanas.

As previously assigned, this group will participate in the development of several different tools and models to be used by other project partners:

- i. Hydrological models
- ii. Dynamic vegetation maps
- iii. GIS to organize in systematic form data provided by previous and present studies on the region
- iv. Population models for several species of macrovertebrates that are particularly important relative to management of resources.

The hydrological models to be constructed will be three. Firstly, the construction of a hydric balance model with monthly time step will be attempted. So far only yearly hydric balance models have been done. Possible difficulties could be due to insufficient or unprecise data on precipitations caused by isolation of the region and distance to meteorological stations. Also no information about underground water flows seems to be available. Secondly, the construction of a model for flows within the system will be attempted. Again possible difficulties could arise from the huge area of the system and the fact that studies performed cover only a reduced portion of it. Finally, a model for the estimation of effects on water levels from the extraction of water for irrigation purposes by rice growers, using the results of the other two models will be undertaken. The two initial models will be done with the collaboration of Ing. Héctor Currie and his group from Instituto Correntino del Agua (ICA), and they will be in charge of the third model.

The dynamic vegetation maps will be developed using satellite images obtained from the National Commission for Spatial Activities (CONAE) through our participation in Mission SAC-C. These together with on site sampling will allow the Regional environment characterization:

Homogeneous zones within the Iberá macrosystem will be defined based on Reca and Pessina (1983), Images of satellites Landsat 5 TM and NOAA-AVHRR 11 and 12, field Data and of Land use/Land cover data for South America (USGS, 1996). The environmental associations described by Reca and Pessina (1983) will be defined with best spatial accuracy, and discrimination between “bañados”, “esteros”, “lagunas” and “embalsados” will be attempted, supported by field data (GPS polygons) provided by Thomas Waller (Foundation Reserva del Iberá) and Patricia Gantes (UNLU). This will serve as a basis for the calculation of total area covered by each type of environment. These data will be entered as ground truth for the classification of Landsat TM imagery, and a validation of low human intervention zones will be attempted, based on the variation of the greenness index (NDVI) at 1Km resolution during 1 year (March '95 - February '96). This variation, correlated with field data, will serve as estimate of the primary productivity of macrophytes.

Both the hydrological models and the vegetation map will be used to generate a Geographic Information System to be used as a basis for the population models with spatial structure (heterogeneity of habitat, habitat quality, etc.). The interface between the GIS and the models through scenario simulations will generate a visual output for easy interpretation by the user/manager.

The modeling efforts of populations of macrovertebrates will be concentrated on two species: capybara or carpinchos (*Hydrochaeris hydrochaeris*) and marsh deer or ciervo de los pantanos (*Blastocerus dichotomus*) which represent a valuable attraction for ecotourism. The former species will require a size structured model

while the latter, due to their very low numbers, will require an individual-based model. Capybara reproduce very fast and might require some harvesting in order to keep the populations free from the threat of epidemics, so that a model of population dynamics with harvesting will also be developed in order to analyse the validity of this option. The integration between groups of modelers is assured by a partition of tasks covering different aspects of a single population in order to produce simulation scenarios that could answer the questions proposed by the users/managers. As an example, UNCEN will develop the capybara structured population model with and without harvesting, UFRGS will develop the epidemics models, and Unicamp will analyse the dispersion of epidemics through the system. Marsh deer require models that take into account habitat quality on one hand, and their complex social structure and behavior on the other, so that individual-based models seem appropriate for this purpose. Potential difficulties might arise from the need of very detailed data, but the studies previously and presently performed by researchers of Fundación Reserva del Iberá seem appropriate and deep enough. Modeling groups will maintain intense interactions with them.

Work done until this date is centered in the collection of bibliographic material and data from previous studies, the purchase of computational equipment, and the setup of computational tools. Collection of bibliographic material and data is a difficult task due to the restrictions to the access to them. Only few copies exist and public institutions are reluctant to show them and to lend them for photocopying. So far we have been quite successful, but it takes an awful lot of time.

The startup meeting in the town of Virasoro, Corrientes, gave us an extraordinary opportunity for exchanging ideas and analyzing together the future development of joint work. We greatly appreciated the participation of government officials in the formulation of questions for simulation scenarios and the discussion of aspects that will be analysed in the future. Research groups involved in the project are very complementary and so far interaction between groups has been very positive. Tasks have been organized in a way that every group requires collaboration or input from someone else and the results become input to other group. Accurate timing will become very important in the future.

As a general comment, we feel that differences in the academic calendars of European and Latin American universities will need to be taken into account by authorities of the European Commission. These have slowed down the startup of this project. In South America, December is devoted to exams and the closing of the academic activities, while January is vacation time and all public institutions are closed or keep only emergency personnel. Under those conditions, any bibliographic or data search becomes impossible.

UNIVERSITY OF CADIZ (Partner 4)

PROGRESS REPORT (1)

A) Activities conducted and progress with respect to the Technical Annex

-Coordination by frequent e-mail information exchange with USVID (local university) and CSGI (coordinator) to elaborate a complete list of the specific equipment needed *in situ* for biological data monitoring (plankton and trophic status of water) to be acquired by the local university.

-First survey on Ibera and Galarza lakes to localize biological sampling stations. This task has been done in coordination with the different partners responsible for experimental data acquisition and the location of the installed hydrological stations has been taken into account.

-Attendance at the first workshop held in Corrientes-Misiones (Argentina, 14-21 February 1999) of two researchers and a graduate student of our group. This workshop has permitted to conclude the tasks above expressed, as well as a discussion on historical data, potential scenarios, modelling, work programme and overall coordination.

B) Plans for the next 12 months

-Short term objectives:

- To complete facilities for sampling and samples analysis.
- Water sampling (plankton and trophic status) programme start up.
- Samples and data analysis (early samplings of the programme).

-Work programme:

-Sampling: Ibera and Galarza lakes. Monthly periodicity from May 1999.

-Samples and data analysis of the early samplings of the programme:

-Trophic status: chlorophyll a, nutrients, light attenuation, particulate matter, dissolved organic matter.

-Plankton: size structure-analysis and basic taxonomical information by flow cytometry, epifluorescence microscopy, inverted microscopy and stereomicroscopy.

C) Data status (Results to date)

As the sampling programme will be begun in May we can not show results to date. Historical plankton data have been reviewed.

D) Dissemination

Public presentation to regional and local media and authorities of the role of University de Cadiz in the context of the project has been performed at the conclusion of the first workshop above mentioned (Gobernador Virasoro, Corrientes, Argentina, 20 February 1999).

DEPARTMENT DE AMBIENTE E ORDENAMENTO, UNIVERSIDADE DE AVEIRO (Partner 5)

Scientific Coordinator: Carlos Borrego

Researchers:

Cristina Boia

Jose Martins

The meeting of February in Argentina was very important for the Portuguese group because it was the first direct contact with the Esteros del Ibera and their real potential and problems, and also with the partners, their individual expertise and the potential of the group. During the meeting we were able to better understand the relevance of the work we can do with our scientific background, and to identify the details of the general proposals of our group to this project, with the budget and the equipment / persons we can use.

Four main areas of intervention were considered:

- Study of the potential impacts of some anthropogenic growing activities around the Esteros, on the Esteros del Ibera ecosystem, due to potential water contamination. These include rice production (use of pesticides (A)) and ecotourism (wastewater and solid waste production and management (B); hydrocarbon spills from boats (C)).
- Evaluation of the effects on the Esteros of contaminants due to medium and long distance transport of air pollutants, from heavy industries in southern Brazil (D) and from wood related industries in Argentina (E);
- Study of the local winds over the Esteros, due to convection related with temperature gradients between water masses and land (breezes), that can affect local meteorological measurements and disturb (F);
- Development of a biosensor, if possible using a species with local ecological relevance, for future use as an alert system of pollution in the Esteros (G).

The prosecution of these purposes implies interaction with other partners. The following table summarizes data exchanges expected during 1999.

A	Input of more data about pesticides used (from local partners). Interaction with Cadiz for results on nutrients. Interaction with modelers for compartments contamination with pesticide.
B C	Input of data on present resident and tourist population (from S.Salvador or Fundacion Ibera). Output of pollutant loads produced (to mathematical modelers).
D E	Control of air pollutants indicator parameters, namely on rain water and deposition (by local partners). If pollutants detected, input of emission data to our air pollution dispersion models (from Brazilian and local partners). Input of meteorological data and land cover (from other sources).
F	Input of data on land cover 1x1 km (from other sources).
G	Input of information on trophic chains, and key species (from Lujan).

During 1999, the detailed actions we expect to perform in each subject are the following:

A.1 Clearly understand and describe the pesticides use in the rice production around the Esteros (in course).

A.2 Identify their main characteristics, especially in what concerns persistence and toxicity. Identify those who can more seriously affect the Esteros (in course).

A.3 Through multimedia (fugacity) models, identify the potentially more contaminated environmental compartments, in order to define a correct sampling collection plan. (to be started in April / May)

A.4 Selection of methods of analysis and negotiation of equipment use (in course)

A.5 Training on pesticide analysis in the Portuguese agronomy institute (ISA), environmental national agency (DGA) laboratory and our labs. (Cooperation of ISA accorded) (Training to be started in June / July until the end of the year) (Samples from the Esteros del Ibera to be collected in 2000).

B.1 Calculation of the wastewater and solid waste production in the reference (present) situation. (To be done as soon as we receive data on present population).

- B.2 Calculation of emissions from different scenarios of population growth and waste management.
- C.1 Simulation of emissions with different scenarios.
- C.2 Identification of potential problems associated with hydrocarbons used.
- D.1 Definition of relevant parameters and analytical techniques to measure air contaminants (in course).
- D.2 Identification of pollutant sources, both in type and general location.
- E.1 Collection of information on regional air pollution sources and on meteorology, namely for periods coinciding with the detection of pollution (D.1).
- E.2 Modeling of large scale flow and regional dispersion of pollutants.
- F.1 Collection of information on land cover and meteorological typical conditions around the Esteros (in course).
- F.2 Modeling of the breeze effects on the local atmospheric circulation.
- G.1 Selection of a local species (of the Esteros) to be used for the biosensor development (after May).
- G.2 Study of the ecology of the selected species and identification of parameters that can be used as good indicators of stress due to the pollutants potentially present in the Esteros, in the future (after May).
- G.3 Study of existent biosensors (in course since January) and visit to producers and installations (first visit on April, Holland).
- G.4 Beginning of the development of the biosensor (in September).

DEPARTMENT DE MATEMATICA APLICADA , UNIVERSIDADE ESTADUAL DE CAMPINAS (Partner 6)

Scientific Coordinator : João Frederico da Costa Azevedo Meyer

The meeting in Gob. Virasoro in Corrientes, Argentina provided the Modeling Group with the opportunity of establishing the way in which specific cooperations would be continued. In this sense, the researchers had several meetings both with the whole group as well as only with the Modeling team, in which it was decided to maintain the original project distribution in the general of tasks, assigning the UNICAMP group its two main previously established efforts. Besides, the specific tasks were discussed in the sense that cooperation efforts and communication aspects were reaffirmed.

The group in the Applied Mathematics Department (DMA) of the Mathematics, Statistics and Scientific Computing Institute (IMECC) in the State University at Campinas that is involved in the project is made up of:

Claudia Maria Jacobi, Ph.D., from the Federal University at Minas Gerais;

Geraldo Lúcio Diniz, M.Sc, from the Federal University at Mato Grosso, in Cuiabá;

Mateus Bernardes, M.Sc., from the Federal University at Paraná;

Renata Sossae, M.Sc. and Sílvia de Alencastro Pregnolato, M.Sc, both from UNICAMP.

The two main research activities the Project assigned the this group were:

1. To cooperate in the study of the *Capybara* or *Carpincho* studies producing Dispersal Models integrated in the SIR Models for the *Mal de las Caderas* periodical disease, producing a scenario in which migrating infected individuals arrive in the studied region, and there is a spatial distribution as well as in time. The main objective here is to integrate the species characteristics in movement and reproduction with the social behavior of the disease which greatly affects this population. This program will be used to validate contagion and population control hypotheses and data collected by other groups.
2. To produce an integrated model in which circulation models are calculated for the studied lagoons, and with this collection of calculated data, to produce a diffusion-advection-decay model. The purpose of this initial model would be to produce a scenario in which possible pollutants from local, regional or continental sources would have their presence simulated. Some of these possibilities will be studied by other groups, since forestry, rice and cattle agroindustrial efforts are being studied in regional circles, and macroscale effects from industrial centers in Argentina and Brazil are present. The numerical results would be used for computational simulations of the effects upon key species which interact. The chosen species would be, on one scale, snails, crabs or bivalves, while on the other hand, competition between otters and the yacaré (*Caiman crocodylus yacare*) will be modeled, integrating the spatial variation of the presence of pollutants upon the former, and the consequent effects upon the latter.

DEPARTMENT OF ENVIRONMENTAL ECONOMICS AND ENVIRONMENTAL MANAGEMENT UNIVERSITY OF YORK (Partner 7)

Scientific Coordinator: Charles Perrings

Researchers: to be selected

The research of Partner 7 will begin with the arrival of the student from the USVID in October 1999. Candidates are presently being considered for the position. This student will follow courses and work with Department researchers directed at creating an ecological economic model based on the ecological modelling work of the other partners and hydrological model. Scenarios will be examined to study costs and effects on the principle functional compartments of the wetland.

Timetable of activities

- 10/99 – 5/00 training and study at the Univ. of York
- 6/12 – 12/00 data gathering and collaboration with project modellers
- 2/01 – 8/01 model development and validation
- 8/01 – 10/01 report writing

UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL (Partner 8)

Scientific Coordinator : Jacques A. Loureiro da Silva

The work distribution between the partners has assigned to UFRGS the responsibility for modelling two macrovertebrate populations. The yacaré (*Caiman crocodylus yacare*) is a top predator of the Ibera system and also a charismatic species and therefore very important for the system maintenance. Moreover its presence is fundamental for the development of ecotourism in the region. The other species we will be in charge of modelling is the large rodent capybara or carpincho (*Hydrochaeris hydrochaeris*). The initial approach will be the use of an epidemiological model since this species is susceptible to a contagious disease (sarna) that seems to be responsible for the control of the population density of capybara in the Ibera system.

Fruitful discussions on the modelling approaches and exchange of information between partners have resulted from this meeting. One of the difficulties we predict to encounter is the lack of some biological data and information (birth rates and size and / or age dependent mortality, geographical dependent densities, etc) since just a few studies in this direction have been done in the Ibera system. Acquiring such data would require expenses that would go beyond the project budget. Also regarding financial matters, we have to point out the difficulty in transferring the funds reserved for UFRGS to a Brazilian bank account which caused a great amount of preoccupation and prevented the presence in Virasoro of the graduate students assigned to work in the project.

Finally we would like to note that besides the problems mentioned above, the exchange of ideas and cooperation within this multidisciplinary group is very promising.