

WORKSHOP

“Biological Monitoring and its Implications in Conservation, Development, and Sustainability in the Pantanal and Surrounding Area.”

**POUSADA ARARAÚNA, PANTANAL, MS
22-24 SEPTEMBER 2006**

Report prepared by Pollianna Thomé and Ellen Wang
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Introduction

Earthwatch Institute, through the Pantanal Conservation Research Initiative (CRI) in partnership with Tyco Company, the Pantanal Research Institute (IPPAN), Pousada Araraúna, Foundation Manoel de Barros (FMB), and the University for the Development of Pantanal and Region (Uniderp), sponsored the workshop **“Biological Monitoring and its Implications in Conservation, Development, and Sustainability in the Pantanal and Surrounding Areas”** from September 22-24, 2006. The main objective was to promote a meeting among universities, NGOs and representatives from governmental organizations, as well as members of the community, to discuss how biological monitoring can be used as a strategy for conservation, development, and sustainability in the Pantanal and surroundings, with presentation of case studies.

The Pantanal CRI aims to engage and educate the local community in regional conservation issues through participation in research projects supported by Earthwatch Institute in the Pantanal. From August 22 to 30, the Pantanal CRI, together with Tyco Company, sponsored a scientific expedition with the participation of six community members in order to train them in biological monitoring in the region. These fellows were then invited to participate presenting this workshop to share their experiences and learn how monitoring programs developed by the scientific community in the Pantanal and surrounding area are being used in conservation efforts.

IPPAN aims to develop academic activities related to education, research, and extension projects, as well as other services, such as ecotourism and environmental education. It is located at the Fazenda Santa Emília in the city of Aquidauana, in the Pantanal of Rio Negro Region. The Pousada Araraúna is also on the farm, which has an area of 2,600 hectares with excellent infrastructure for research, extension courses, and environmental education.

Agenda

The event began on Friday, September 22nd with a warming welcome from Professor Pedro Chaves dos Santos Filho, dean of Uniderp. He thanked Earthwatch Institute for the initiative in promoting the event in the Pousada, strengthening the partnership between Uniderp and Earthwatch Institute. He emphasized the importance of the university participation in the conservation efforts in the Pantanal and surroundings, and offered the Pousada and IPPAN for the Brazilian scientific society as a location to hold workshops, seminars, and other scientific events. The complete agenda can be found on Appendix 1.

Following the agenda, Mr. Silvio Jacks dos Anjos Garnés, coordinator of the Uniderp Environment and Development Post-graduation program, presented the IPPAN research scope, which is supported by the Manoel de Barros Foundation (FMB) and Pousada Araraúna. He initiated the lecture showing satellite images of the farm and region and the local drainage network including neighboring farms. The farm total

area (2,618 ha) is mapped by GIS. He presented a general classification for the farm according to the aquatic vegetation and habitats. A Private Reserve area (RPPN) is being created on the farm.

The RPPN area was questioned as to which habitats it protects, because in the satellite image it was clear that the largest *cordilheira* habitat was out of the RPPN. The public participated actively and some of the general comments were: 1) the creation of a protected area restricts its use and it is IPPAN's objective to develop experiments searching for new economical alternatives for the region, and 2) the formation of a RPPN has great importance for the scientific community because in the future, there will be less protected areas in the Pantanal that meet scientific needs. This is important due to the necessity to standardize data collection so that data can be comparable across time and locations. The establishment of a protocol among the institutions was proposed.

After that, the Pantanal CRI Field Director, Ellen Wang, presented Earthwatch Institute programs worldwide with special emphasis in the Pantanal CRI and its Community Fellowship Program. She explained that the Pantanal CRI was created in 2000 as a partnership between Earthwatch and Conservation International-Brazil and it grew to form new partnerships, including Uniderp. Currently, the CRI supports eight research projects in the Pantanal and one in the surrounding Cerrado region. The Community Fellowship Program has already benefited 160 people including teachers, farmers, professionals of governmental and non-governmental agencies, bilingual tourism guides, students, local guides, cowboys, etc. This workshop is a follow-up of an expedition that took place in Fazenda Rio Negro, financed by the Tyco Company, whose goal was to promote the biological monitoring in the Pantanal and region.

Continuing the event, we had two projects presentations on biological monitoring. The summaries of all presentations are in Appendix 2. Participants names, affiliations, contacts and websites are in Appendix 3.

On Friday evening, a very productive discussion was promoted about a wounded jaguar captured in the city of Corumbá, Pantanal region, a few weeks earlier. The animal was being operated for the 4th time after it was hit by a gunshot. The participants presented their points of view and what actions should be taken about this animal.

On Saturday morning, Prof. Luis Estácio Pereira presented the two *strictu-sensu* graduate programs of Uniderp. These two programs form an interface of non-experimental and experimental scientific research, field analysis, and case studies. The institution believes that the environmental conservation must never stop economic development and vice versa.

After the end of presentations in the morning of 24th, Ellen Wang concluded the event by thanking everyone's presence and active participation. The Uniderp dean,

Prof. Pedro Chaves, thanked Earthwatch for supporting research in the Pantanal and offered the Uniderp scientific magazine, which is internationally indexed and has an ISBN number, to publish the projects presented during the workshop. The participants had agreed with the importance of publishing the projects and compromised in handing in the complete articles for publication within two months.

A traditional barbecue with live music was offered to the participants before leaving the Pousada.

Final Comments

The event provided the opportunity for many researchers to meet each other, exchange information, share experiences, and mainly, form partnerships for the future. Some results of this meeting are:

- Uniderp will finance the mixing and release of a compact disc “Bird Songs of the Pantanal” produced by Reginaldo Donatelli. The hundreds of records have been collected during five years of research in the Pantanal financed by Earthwatch Institute.
- Uniderp, through its publishing house, will diagram and publish an illustrated guide of Herpetofauna of the Nhecolândia produced by Wang *et al.*
- Uniderp will partner with the Association “Amor Peixe” developed by the woman of a fishermen community in the region of Corumbá, benefiting the marginal community, increasing their self-esteem, and improving the income of the families and their welfare
- Cibele Biondo, USP (University of São Paulo) researcher and participant on Alexine Keuroghlian’s team, was invited to integrate the professors team of Uniderp, in the Laboratory of Biotechnology
- Walfrido Tomás proposed the standardization of data collection in the Southern Pantanal following the model proposed by William Magnusson and indicated by the MCT (Ministry of Science and Thecnology - <http://www.mct.gov.br/index.php/content/view/7913.html>). The standardization will make data collected comparable along time leading to the adoption of more appropriate decisions about conservation strategies.
- The researchers all agree with the importance of having long-term projects developed in the Pantanal and following a standard protocol. The Pantanal shows natural cycles of dry and wet years causing unknown impacts to regional biodiversity. Long-term studies in the region do not mean 20 years, but at least 40 for some species because of their life cycles.



Left: Tatiana Pádua talks about Wildlife Diseases; Right: Raysildo Lôbo introduces the Uniderp Laboratory of Biotechnology. (Photos: Wagner Guimarães)



Left: Marco Costacurta shows the studies developed in Rio Sucuri, Bonito, MS; Right: Reginaldo Donatelli presents the migratory birds in the Pantanal of Rio Negro. (Photos: Wagner Guimarães)

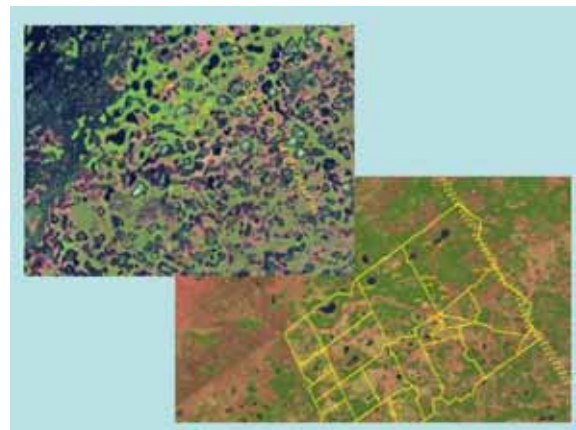


WCS R O P (Rancher Outreach Program)

Goal: Promote the Jaguar Conservation in the Pantanal

Action: Mitigate the Human-wildlife conflict in the Pantanal

Left: Lightning strike monitoring systems can help prevent losses in the field and for researchers to avoid being struck; Right: WCS Rancher Outreach Program engages local cowboys and landowners in Jaguar Conservation actions.



Left: Women from Fishing Communities in the Pantanal recycle fish skin to produce handcraft; Right: Satellite images of Fazenda Nhumirim in the past (upper left) and recently (bottom right) show the consequences of periods of dry years in the Pantanal, reinforcing the relevance of long-term monitoring programs.



Left: Ibama and Embrapa are mapping the area of occurrence of the golden mussel in the Upper Paraguay Basin; Right: Some of the damage caused by this exotic and invasive species



Left: Marcos Coutinho explains how monitoring programs changed conservation status of several crocodilian species in Brazil; Right: Don Eaton talks shows differences among aquatic habitats in the Southern Pantanal. (Photos: Ellen Wang)



Left: Bergson Sampaio, fellow volunteer on a Tyco-sponsored expedition explains the tourism activities developed in Jardim, MS (Photo: Ellen Wang); Right: Ellen Wang and Prof. Pedro Chaves finalize the workshop. (Photo: Helen Waldemarin)



Left: During the Happy-hour, musical skills are shown; Right: The barbecue on Sunday. (Photos: Ellen Wang)



Workshop participants had the opportunity to visit the Correntoso River and the Caiman Project. (Photos: Fábio Costa)



During happy hour, locals shared their musical talent with other participants. (Photo: Fábio Costa)



Workshop Participants. (Photo: Wagner Guimarães)

APPENDIX 1 - AGENDA

“Biological Monitoring and its Implications on Conservation, Development, and Sustainability of Pantanal and Surrounding Area.”

**POUSADA ARARAÚNA
22-24 SEPTEMBER 2006**

Goals:

Promote a meeting between university representatives, NGOs, governmental institutions and members of the community to discuss biological monitoring as a tool for conservation, development, and sustainability in the Pantanal and surroundings, with presentation of study cases.

SEPTEMBER 22 - FRIDAY

Departure: Bristol Exceler Hotel, Campo Grande, MS at 6:00h

Arrival at Pousada Araraúna: 12:00h

13:00 - Lunch

15:00 - Opening and welcome - Uniderp Dean **Prof. Pedro Chaves** and presentation about Uniderp Research Program - **Prof. Silvio Jacks**

15:30- 15:40 - **Ellen Wang** - Introduction to Earthwatch and the Pantanal CRI

15:40 - 16:05 - **Marcos Eduardo Coutinho** – “Monitoring Program of Brazilian Crocodilians”

16:05 - 16:30 - **Alexine Keuroghlian** – “A comparison of fruits and frugivory in two ecosystems”

16:30 - Optional tour:

Group 1 (Hiking up to the Observation Tower)

Group 2 (Boat trip at Correntoso River)

19:00 - **Happy-hour**

20:00 - **Dinner**

SEPTEMBER 23 - SATURDAY

07:00 - **Breakfast**

08:00 - 08:25 - **Tatiana Pádua** – “Evaluation of infectious microorganisms in Peccaries and Feral pigs in the Pantanal, Mato Grosso do Sul”

08:25 - 08:50 - **Marco de Barros Costacurta** – “Environmental Monitoring Program at RPPN Fazenda São Geraldo, Bonito-MS”

08:50 - 09:15 - **Raysildo Barbosa Lôbo** – “The Uniderp Biotechnology Program”

09:15 - 09:40 - **Moacir Lacerda** – “Monitoring atmospheric discharges in the

Pantanal and surrounding area”

09:40 - 10:00 - **Coffee break**

10:00 - 10:25 - **Fábio Edir dos Santos Costa** – “Fishes Biology and Conservation at Rio Negro, Pantanal”

10:25 - 10:50 - **Reginaldo Donatelli** – “Monitoring of migratory birds in the Pantanal, Mato Grosso do Sul”

10:50 - 11:15 - **Julieta Genini** – “Frugivores and Seed Dispersers in the Pantanal”

11:15 - 11:50 - **Rosana Pereira** – “Fish Monitoring in Mato Grosso do Sul- and -Controlling the dispersion of exotic species *Limnoperna fortunei* (golden mussel) in the Southern Pantanal”

12:00 - **Lunch**

13:45 - 14:10 - **Don Eaton** – “Cattle-associated impacts on aquatic macroinvertebrate and wading bird assemblages of rare, highly productive habitats in the Nhecolândia region of the Pantanal”

14:10 - 14:35 - **Christine Strussmann** – “Learning to monitor amphibians and reptiles: pioneering studies in the Upper Paraguai Basin: distinct perceptions and the necessity of protocols ”

14:35 - 15:00 - **Grace Ferreira da Silva** – “Hyacinth Macaw Project - An example of monitoring and conservation”

15:00 - 15:25 - **Helen Waldemarin** – “Effects of seasonality on Giant River Otters (*Pteronura brasiliensis*) and Neotropical River Otters (*Lontra longicaudis*) habitat use in the Pantanal, MS”

15:25 - 15:50 - **Ricardo Boulhosa** – “WCS Ranchers Outreach Program (ROP) in the Brazilian Pantanal”

16:00 - Optional Tours:

Group 1 (Boat trip at Correntoso River)

Group 2 (Hiking up to the Observation Tower)

19:00 - **Happy-hour**

20:00 - **Dinner**

21:00 - **Traditional Pantaneiro Music**

SEPTEMBER 24 - SUNDAY

7:00 - Breakfast

08:00 - 08:20 - **Samuel Duleba** – “Monitoring the environmental impacts of tourism activity at RPPN Cabeceira do Prata”

08:20 - 08:40 - **Bergson Romero Sampaio** – “History and Tourism operations at Buraco das Araras Ecoturismo”

08:40 - 09:00 - **Vivian Assunção** – “Environmental monitoring as an education tool”

09:00 - 09:20 - **Elson Borges dos Santos** – “Wildlife Rehabilitation Center - CRAS

- The results of wild bird releases in ranches at Mato Grosso do Sul”

09:20- 09:45 - **Elaine Pinto** – “Monitoring threats to biodiversity in the Pantanal and Biodiversity Corridors”

09:45 - 10:00 - **Coffee break**

10:00 - 10:45 - **Walfrido Moraes Tomás** – “The importance of long-term monitoring projects in the Pantanal: aspects of the ecosystem and case studies”

10:45 - 11:00 - **Ellen Wang** - Balance of the Meeting and Wrap-up

12:00 - **Pantaneiro Barbecue**

15:00 - Return to Campo Grande

APPENDIX 2 – SUMMARIES

Workshop: Biological Monitoring and its Implications on Conservation, Development, and Sustainability in the Pantanal and its Surroundings.

Name	Alexine Keuroghlian
Affiliation	UNIDERP/FMB
Title	A comparison of fruits and frugivory in two ecosystems
<p>Local extinctions of white-lipped peccary, due to habitat fragmentation and hunting, have been reported throughout its vast geographical range. Recent studies have shown that their role as fruit predators and dispersers affects the biodiversity of certain forest habitats. Fruits may be reduced in habitat fragments, so documenting fruit availability and use is critical to peccary conservation efforts and forest biodiversity. We compared fruit census data gathered in two different Brazilian ecosystems, i.e. the highly fragmented Atlantic Forest and the natural forest mosaics of the Pantanal wetlands. In addition to providing baseline information about the fruits and frugivores of the ecosystems, we gained insights about diet, habitat preferences, and the vulnerability of peccaries to habitat fragmentation. Fruit availability, diversity, and peccary frugivory during dry and wet seasons differed between the Atlantic Forest and the Pantanal. Hill's diversity indices indicated that the Pantanal had a greater diversity of fruits. However, overall fruit abundance was lower in the Pantanal. Seasonal differences in fruit abundance were greater in the Pantanal compared to the Atlantic Forest. In the Atlantic Forest, the top 5 fruits consumed by white-lipped peccaries (on foraging trails) represented over 70% of their diet in both the dry and wet seasons. The top 10 fruits consumed made up more than 90% of their diet. In the Pantanal, white-lipped peccaries consumed a much greater diversity of fruits (especially in the wet season), their diets showed greater seasonal variation, and their dependence on dominant fruit species was less pronounced. Extreme fruit scarcity periods and a more open landscape portend even more serious consequences for Pantanal peccary populations if ongoing deforestation and habitat fragmentation of the region continue.</p>	
Key-words (5)	Habitat fragmentation, Frugivory, Atlantic Forest, Pantanal, Peccaries.

Name	Bergson Romero Sampaio
Affiliation	Buraco das Araras Ecoturismo
Title	History and Tourism operations at Buraco das Araras Ecoturismo
<p>Buraco das Araras (Macaws Hole) is located in the municipality of Jardim, in southern Serra da Bodoquena (Pantanal bordering hills), in the southwestern corner of the state of Mato Grosso do Sul. The area has suffered from deforestation and other human-related impacts that have reduced the presence of macaws. Nowadays, Buraco das Araras is an ecotourism destination with the aim to promote respect for the environment so that the next generations may enjoy the local natural and cultural resources. To protect the area, it will soon become a Private Reserve (RPPN). The family that owns the area wants to increase the service quality and reduce the environmental impacts caused by ecotourism. A booklet with information on</p>	

<p>geology, fauna and flora, and tourism guidelines was created in order to support guides and environmental monitors who would like to operate according to ecotourism and sustainable development concepts. Such actions include: 1) Practice of low impact activities; 2) Ecotourism as an education tool; 3) Prohibition of hunting and logging; 4) Restoration of vegetation in disturbed areas; 5) Proper garbage disposal; and 6) Increased job opportunities in the region. Through improved monitoring and organization of tourist activities, which provided safety and protection to the area and its visitors, both the macaws and other animals have returned to Buraco das Araras. This is an indication that conservation actions and sustainable use of this unique environment are leading to positive results.</p>	
Key-words (5)	Monitoring, Biological Corridor Cerrado/Pantanal, Private Reserves.

Name	Carolina Ferreira Santos
Affiliation	UFMS
Title	Effects of fire on bat communities at Fazenda Nhumirim
<p>Bats play an important role in the maintenance and conservation of tropical environments due to their great abundance, richness, and diversity of food habits. They act as pollinators, seed dispersers and controllers of other animal species. The knowledge regarding bat communities allows inferences regarding environmental health. In some regions, fire is one of the factors leading to strong environmental changes. The fire transforms the vegetation, many times eliminating it and, as a consequence, affecting the local fauna. Phytophagous animals and those that use the vegetation as shelter, like birds, ants, and some bats, seem to be affected by forest fires. On the other hand, insectivores can often be benefited by this situation. Small mammals studies have shown that some species are more abundant in areas that had been burnt, whereas other populations declined. Despite important advances in ecological research, the fire effect in some environments such as the Pantanal, and on some animal communities are almost unknown. We present here data about fire effect on the bat community at Fazenda Nhumirim, Pantanal. A comparison between burnt and non-burnt areas shows there was a shift of frugivore to insectivore bats, due to fire-caused environmental change. However, a period of two months was enough for the bat community to recover, becoming equal in burned and not burned areas.</p>	
Key-words (5)	Chiroptera, Fire, Pantanal, Burnt areas, Regeneration.

Name	Christine Strussmann
Affiliation	Universidade Federal de Mato Grosso / UFMT
Title	Learning to monitor amphibians and reptiles: pioneering studies in the Upper Paraguay Basin, distinct perceptions and the necessity of protocols
<p>Construction operations in Brazil with a potential for environmental impacts need an operation license as required by Brazilian legislation and environmental agencies. Monitoring populations of key-species of amphibians and reptiles to inform these impact assessments have been performed by private organizations in the past. However, the government is now responsible for the monitoring, due to increased competition over remaining natural areas, the necessity to define and implement management plans of protected areas, the alarming population decline of these animals, as well as the need for defining protocols that have little standardization. Results from studies carried out in</p>	

distinct localities and biomes in the Upper Paraguay Basin can be used to define strategies for herpetofauna monitoring. Around the Manso and Guaporé dams, the former in Cerrado habitat and the latter in the transition between the Cerrado and the Amazon, the monthly monitoring of amphibian and reptile populations allowed researchers to record the presence of species with limited geographical distribution, fast decline or local extinction of some of these species. Monitoring after the dams lakes were formed increased capture and observation rates of habitat-generalist species (particularly *Leptodactylus chaquensis*, *Chaunus paracnemis* and *Hypsiboas raniceps*), etc. In Manso, amphibians and reptiles captures were high in the beginning but it tended to stabilize 18 months after water filled up the lake. In the southern Pantanal, studies in progress have shown less habitat specificity, especially among amphibians, possibly due to great population displacements towards residual water bodies or reproductive sites. The use of permanent parcel sampling, according to the model suggested by the Program of Research in Biodiversity (PPBio/MCT), offers an accomplished chance for monitoring with higher scientific rigor and comparisons between distinct areas. Support: PROBIO-MMA; CNPq; CAPES (PRODOC); CPP-MCT

Key-words (5)	Amphibians and reptiles, Monitoring, Protocols, Upper Paraguai Basin.
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Name	Donald P. Eaton
Affiliation	UNIDERP/FMB
Title	Cattle-associated impacts on aquatic macroinvertebrate and wading bird assemblages of rare, highly productive habitats in the Nhecolândia region of the Pantanal

The Pantanal is an endorheic system created by a hydrologically complex network of river and groundwater channels flowing through a vast alluvial plain with highly seasonal rainfall. An incredible array of aquatic habitats is formed by this system, and the landscape biodiversity is spatially and temporally complex. *Salinas*, along with a diverse range of less saline lakes called *baias*, and seasonally flooded grassland drainages called *vazantes*, are characteristic of the Nhecolândia ecoregion. *Salinas* are rare, covering approximately 1% of the Nhecolândia landscape, and they present extreme environmental conditions related to their hydrologic isolation. Salinities range from 2 to 45‰ of seawater, and because the dissolved ions are predominately sodium carbonates, pH typically ranges from 9 to 10. We compared assemblages of aquatic macroinvertebrates and wading birds in “salina” (soda lake) habitats from cattle-free and cattle-exposed sites in the southern Pantanal. Despite the low intensity nature of traditional ranching in the Pantanal, we observed dramatic differences in species composition, richness, abundance, and biomass for both macroinvertebrates and birds at cattle-exposed sites. Results stress the importance of rare, highly productive, aquatic habitats to resident and migratory birds and regional conservation.

Key-words (5)	Pantanal, Aquatic biodiversity, Wading birds, Macroinvertebrates.
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Name	Elaine Cristina Teixeira Pinto
Affiliation	Conservação Internacional – CI-Brasil
Title	Monitoring threats to biodiversity in the Pantanal and the Corridors of Biodiversity

Conservation International - CI-Brazil has been working in the Pantanal since 1997. Its main goal is to prevent species extinction, concentrating efforts in establishing biodiversity corridors. A biodiversity corridor is defined as a territorial space that congregates protected areas (legal reserves, permanently preserved areas, indigenous territories, and private and public conservation units) and lands with different uses, in order to integrate land production with biodiversity conservation. The protected areas represent the core areas of the corridor, and we try to stimulate the adoption of environmental and socially friendly economic practices there. The integration of these actions, involving main social actors, is only possible through an engagement strategy and social articulation, a role that CI-Brazil achieves through several partnerships. Monitoring the threats to biodiversity is one of the actions that CI-Brazil performs in the corridors, nowadays with a focus on the deforestation process and increasing mining activities in the region of Corumbá, the hidrovía Paraguay-Paraná and the advance of agriculture over the Pantanal and the Cerrado. In December 2005, a report estimated about 45% loss of original vegetation cover on the Upper Paraguay Basin. In Corumbá, CI-Brazil together with other NGOs has kept a constant dialogue with the companies that intend to establish operations or extend its activities in the region, searching for location alternatives and ways to reduce the impacts. The hidrovía project is directly related to the establishment of the industries, as it would be the main way to transport the production. Regarding the advances of agriculture, CI-Brazil stimulates the creation of private reserves, adding value to the properties and adjusting the behavior of the landowners, who are often unaware of their legal obligations.

Key-words (5)	Pantanal, Conservation, Threats, Corridors, Biodiversity.
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Name	Elson Borges dos Santos
Affiliation	Wildlife Rehabilitation Center - CRAS
Title	Wildlife Rehabilitation Center – CRAS – The results of wild birds release in ranches at Mato Grosso do Sul
<p>The Wildlife Rehabilitation Center (CRAS) is responsible for the reception, selection, rehabilitation and destination of native animals apprehended during fiscalization activities, ran over, or donated by the population, as well as to propose and execute actions that promote conservation of native fauna in its natural habitat all around Mato Grosso do Sul State. Animals are released in areas where the species are recorded, hunting pressure is absent, and there is good environmental quality, among other criteria. Since 2005, CRAS has been partnering with properties that develop ecotourism and are committed to conservation. Farmers and workers assist in monitoring the animals that in turn become attractions for tourists. Farmers build acclimatization shelters where the animals, mainly toucans and all sorts of parrots, macaws, and parakeets remain for at least two days, which varies according to the species and degree of domestication. After this period, the shelter doors are opened and the animal slowly returns to the wild. The use of shelters before release increased the reintroduction success in natural environment. Death is mainly caused by aggressive behavior among animals. A few accounts of wild predators' attacks were registered. In previous releases when animals did not remain in acclimatization shelters, only 30% of the animals that arrived in CRAS very young survived. Long term monitoring of released animals is crucial to evaluate the animals' adaptation to its natural habitat.</p>	
Key-words (5)	Rehabilitation, Wild animals, Release, Reintroduction.

Name	Fábio Edir dos Santos Costa
Affiliation	FUNDECT / UEMS
Title	Fishes Biology and Conservation at Rio Negro, Pantanal
<p>Our research group examines biological and fishery studies of the reproductive and feeding habitats of the main fish species from the Negro river sub-basin ictiofauna in the Pantanal - particularly migratory, large-bodied, and species of economic interest. The studies are developed in the Middle Negro river, where the river is very winding and has a dense riparian forest, up to the beginning of the swamp. Preliminary results indicate that fish show reproductive activity in this region, however, not as intense as observed in other sub-basins of the Paraguay River Basin, as in the Miranda river. The preliminary results, as well as conversation with local fishermen and researchers reveal the hypothesis that the Negro river acts as a great nursery for the Pantanal, sheltering a great amount of young migratory species making it an important area where species grow and feed. This hypothesis is corroborated by the significant amount of young individuals found, especially of migratory species. If this hypothesis is correct, we will look forward to learning how those young individuals enter the region, if there is a significant reproductive activity of big migratory species, and where and how it occurs.</p>	
Key-words (5)	Negro River, Fishes, Biology, Conservation, Migratory species.

Name	Grace Ferreira da Silva
Affiliation	Instituto Arara Azul
Title	Hyacinth Macaw Project – An example of monitoring and conservation
<p>The Hyacinth Macaw Project was developed to study the hyacinth macaw (<i>Anodorhynchus hyacinthinus</i>) in its natural habitat. Studies on its ecology, biology, behavior, genetics, conservation, health, and feeding behavior have been conducted, and hundreds of artificial nest boxes have been set up. Recently, we developed techniques for natural and artificial nest management, as well as the management of eggs and nestlings in order to increase the species reproduction success. After the project started, the hyacinth macaw was used as a flagship species for biodiversity conservation resulting in positive answers. When the project started, the population was estimated to include 1,500 individuals. Nowadays, there are more than 5,000 individuals in the wild. The population is not only increasing in number but also in distribution, occurring in areas where it has not been recorded the last few years. Landowners are interested in preserving the nestling sites as it benefits other psittacids such as <i>Ara chloroptera</i>, <i>Primolius auricollis</i>, and other 17 bird species that use the same nests. The project engages the community not only in fieldwork but also in environmental issues, so the locals are aware of the importance of protecting the avifauna against poaching. The project distributes informative material (folders), advertises in magazines and periodicals, and produces videos and scientific lectures for the general public. The Instituto Arara Azul has received several national and international volunteers that were trained in the field and now run other projects in their own countries. Several papers have been published in books, journals and congress in Brazil and other countries. Our partners are Uniderp, Toyota of Brasil, R. E. Caiman, Bradesco Capitalização, T. Bracher, Brasil Telecom, Parrots International, WWF and FMB.</p>	

Key-words (5)	Hyacinth Macaw, Biology, Conservation, Pantanal, Management.
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Name	Helen Francine Waldemarin
Affiliation	Associação Ecológica Ecomarapendi
Title	Effects of seasonality on Giant River Otters (<i>Pteronura brasiliensis</i>) and Neotropical River Otters (<i>Lontra longicaudis</i>) habitat use in the Pantanal, MS
<p>The Neotropical river otter (<i>Lontra longicaudis</i>) and Giant river otter (<i>Pteronura brasiliensis</i>) are semi-aquatic carnivore and sympatric species in the Pantanal, an ecosystem with strong seasonality with marked dry and wet seasons, which affect the water level. This study is part of the project “Ecology and Conservation of Otters in the Rio Negro Basin,” developed since 2002. In order to study the patterns of different aquatic habitats (river and oxbow lakes) use by otters, we looked for vestiges from both species on the shore of nine oxbow lakes, along 16 km on the Negro River and 19 km along the Correntoso river. We calculated for each year, the proportion of oxbow lakes and river edges used during both the dry and wet seasons. The results suggest that the rivers are more used by both species during the dry season, when otters give birth. This is probably related to the highest availability of riverbanks and food during the dry season, when the water level is lower. The species seem highly dependable on the water level variation and presence of riparian forest, which shows the importance of soil management in order to guarantee seasonality and preservation of riverbanks. It is also important to adopt proper tourism practices as more tourists visit the area in the dry season.</p>	
Key-words (5)	Neotropical River Otter, Giant River Otter, Pantanal, Habitat Use, Ecology.

Name	Julieta Genini
Affiliation	UNESP - Rio Claro
Title	Frugivores and Seed Dispersers in the Pantanal
<p>This project evaluates the phenology and production of fruits for the vertebrate frugivores in distinct habitats in the Pantanal (gallery forest, <i>capões</i>, and <i>cerrado</i>). We are particularly interested in understanding how fruit seasonality affects the community of frugivores, especially birds, mammals, and fishes. We study the dispersion patterns and tree phenology of selected fleshy fruits in these different types of habitat. Simultaneous to the focal observation of target tree species, we have installed camera-traps to record the terrestrial and nocturnal fruit consumers. Most of the species studied in the phenology produce fleshy fruits concentrated in the rainy season. We studied the morphology of 88 species of fleshy fruits and verified that the majority have large size, green, brown, or yellow coloration, and a strong smell, characteristics of mammal-dispersed fruits. The project also recorded important interactions such as the dispersal of palms by the fish <i>pacu</i>, the relation between toucans and hyacinth macaws, and the importance of feral pigs in the dispersion of fruits with big seeds. Other mechanisms contribute towards the maintenance of other interactions in the Pantanal, such as the dispersion by water, humans and exotic animal species, and the capacity of some sprouting plant species. The results of the project increase the information on the natural history of both frugivore vertebrates and its resources, justifying the need of species protection in primary ecosystems and in human-disturbed areas.</p>	

Key-words (5)	Frugivores, Seed dispersers, Pantanal, Phenology, Mammals.
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Name	Marco de Barros Costacurta
Affiliation	Associação de Proprietários de Reservas Particulares do Patrimônio Natural de Mato Grosso do Sul - REPAMS
Title	Environmental Monitoring Program at RPPN Fazenda São Geraldo, Bonito-MS
<p>The RPPN (Private Reserve) Fazenda São Geraldo receives around 20,000 tourists each year to participate in floating tours, which has caused a considerable pressure on the fragile Sucuri river. Our goal is to obtain data for environmental monitoring at a low cost and create opportunities for undergraduate and graduate students to develop their monographies or thesis in the Private Reserve. Nowadays, there are three graduate students collecting data monthly at the RPPN, and after November 2006, a fourth graduate student will start studies in the area. We have already implemented: 1) Monitoring of the water quality from the Sucuri river, with <i>in loco</i> and laboratorial analyses of 17 parameters; 2) Monitoring the impact on aquatic macrophytes and on terrestrial trails; 3) Monitoring impacts on birds (areas with tourism x no tourism). By the end of this year, we will start to monitor the impacts of tourism on the mastofauna. All these activities intend to evaluate the tourism impacts on the ecosystem components, obtain data to diagnose the actual degree of disturbance and what can be supported by the environment, and to collaborate with tourism capacity studies and to prevent future environmental problems.</p>	
Key-words (5)	Monitoring, Bio-indicators, Sucuri river; Private Reserves.

Name	Marcos Eduardo Coutinho
Affiliation	IBAMA/RAN
Title	Monitoring Program of Brazilian Crocodilians
<p>Since 2003, IBAMA's Reptiles and Amphibians Conservation and Management Center (RAN) has managed a program called, "Biology, Conservation, and Management of Brazilian Crocodilians". Some of the program actions involve local capacity building, the establishment of monitoring techniques, and the management of natural populations of crocodilians in different regions of Brazil. The biological knowledge and the understanding of the relationship between environmental conditions and productivity of natural population has supported the elaboration of this strategy, whose application will be obligatory due the Normative Instruction, regardless of the management strategy to be used ("ranching" or "harvesting"). This study is particularly worthy for species of the natural population commercially used such as the Paraguayan Caiman (<i>Caiman yacare</i>), Spectacled Caiman (<i>Caiman crocodiles</i>), Black Caiman (<i>Melanosuchus niger</i>), and Broad-snouted Caiman (<i>Caiman latirostris</i>). This study presents the main characteristics of the Monitoring Program of Brazilian Crocodilians being implemented in Brazil.</p>	
Key-words (5)	Monitoring, Brazilian Crocodilians, Pantanal, <i>Caiman yacare</i> .

Name	Maria Antonietta Castro Pivatto
Affiliation	Hot Spot Brasil
Title	Bird Monitoring in three touristy sites in Bonito and Jardim, MS
<p>Tourism practices in Bonito are regulated by an Operational License given by the State Environment Department (SEMA), which requests an environmental monitoring program that indicates the maintenance of environmental quality in the area. To meet this requirement, landowners have hired consultants or biologists to develop these programs in order to follow the legislation at low budgets, which frequently make more detailed studies impossible. Between March 2002 and June 2004, an experimental monitoring program was implemented in three tourist sites in Bonito and Jardim, MS, in order to test non-expensive methodologies. The parameters analyzed were: trail conditions, erosion, waterways conditions, number of tourists/month, rainfall, degree of conservation of terrestrial and aquatic flora, and presence of medium and large-sized mammals and birds. Herein, we present general data obtained in the program, highlighting bird results.</p>	
Key-words (5)	Environment Monitoring, Birds, Ecotourism, Conservation, Bodoquena.

Name	Moacir Lacerda
Affiliation	UFMS
Title	Monitoring atmospheric discharges in the Pantanal and surrounding area
<p>Lightning strikes have caused lots of damage and loss of human lives. These losses have not been calculated yet but it is estimated in hundreds of million dollars, and that hundreds of people are hit annually. Lightning strikes produce fires in forests and fields, electrocute cattle, destroy precious human lives and industrial installations, and essential public services, hospitals, and scientific experiments, etc, are interrupted. This paper presents preliminary results on the development and implementation of a Storm Localization System (SLT in Portuguese) in Mato Grosso do Sul, where the ceraunic index reaches critical values ranging from 8 to 12 lightning km⁻²/year. This system is composed of antennas sensitive to discharges in the electromagnetic field. This allows the detection of areas affected by discharges, as well as the active centers of convective and frontals systems, and the polarity and intensity of electrical current discharges. On other hand, lighting strikes are an important source of NO_x, maintaining the activity of the global electric circuit, and are affected by pollution and connected to meteorological parameters important to forecasting storms. In addition to the scientific research of discharge characteristics, this system will allow the creation of systems that provide alerts for the formation of storms, preventing harm to rural populations, researchers, aircraft, animals, etc, that are exposed in the open environment from damage. Therefore, the SLT not only helps forecast the weather, but is also a tool for civil defense, firemen, and other agencies.</p>	
Key-words (5)	Lightning, Monitoring, Pantanal, Fire.

Name	Reginaldo José Donatelli
Affiliation	Unesp - Bauru
Title	Monitoring of migratory birds in the Pantanal, Mato Grosso do Sul
<p>Climate change has affected bird reproduction, food, and migratory behavior worldwide. There are only a few studies on migratory birds in the Pantanal, though this region is the</p>	

biggest floodplain in the world and is home to a large number of visitors during the wet and dry season, which is a very important characteristic of this ecosystem. The monitoring of migratory birds in the Pantanal has been conducted since 2000 in several sites in the Pantanal of Mato Grosso do Sul. The main goal is to document, in broad scale and long-term, the periods of the year and seasons when these species arrive and depart the Pantanal. We used the absolute counting methodology to obtain the number of individuals per species present in six distinct habitats in the Pantanal: riparian forest, *cerradão*, *cerrado*, grasslands, *salinas* and in several rivers during the dry and wet periods. We checked each habitat by foot or boat during four hours (subdivided in two hours on distinct days) during each of the 21 expeditions conducted in the Pantanal between 2000 and 2005. We recorded a total of 30 migratory species, nine of these in the summer (wet season), such as: *Ara ararauna*, *Crotophaga major*, *Hirundo rustica*, *Petrochelidon pyrronota*, *Riparia riparia*, and 21 of these in the winter (dry season), such as: *Tachybaptus dominicus*, *Coscoroba coscoroba*, *Tringa melanoleuca*, *Tringa flavipes*, *Tringa solitária*, *Calidris melanotus*, *Dendrocygna viduata*, *Dendrocygna autumnalis*, *Rhynchops niger*, *Phimosus infuscatus*, *Plegadis chihi*, *Pyrocephalus rubinus*, *Myiodinastes maculates* among others. The summer species arrive in the Pantanal in the beginning of the rainy season (mid November), and the winter species start arriving in April.

Key-words (5)	Migratory birds, Mato Grosso do Sul, Pantanal, Wet and Dry Seasons.
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Name	Ricardo Luis Boulhosa
Affiliation	WCS/Pró-Carnívoros
Title	WCS Ranchers Outreach Program (ROP) in the Brazilian Pantanal
<p>The Brazilian Pantanal is one of the largest floodplains in the world, with an approximate area of 140,000 km², and is considered one of the most preserved areas in Brazil. Because 95% of this ecosystem belongs to cattle, any conservation program should consider this economic activity. The main threats to jaguar (<i>Panthera onca</i>) conservation are the loss and fragmentation of natural areas and direct persecution as a result of attacks on the livestock. The ROP aims to promote jaguar conservation in the Brazilian Pantanal – considered the most important jaguar conservation region by the Jaguar Conservation Program (JCP) of WCS. The philosophy that guides this program is based on the premise that farmers decide what are the best alternatives to minimize the conflict between jaguar and livestock. One of the functions of the ROP is to encourage the farmers to look for solutions for a more harmonious coexistence, mediating the farmers’ decisions and helping with the program’s implementation, which will benefit jaguars both directly and indirectly. It is necessary to have a clear knowledge of the problem in entirety in order to find appropriate solutions. It is also our role to understand all variables involved in jaguar conservation in the Brazilian Pantanal, such as the areas where the species occur and the characteristics of the properties that suffer from predation. Therefore, to reach these objectives, many questions will have to be considered: improvement of cattle management and of pasture conditions, increased productivity, new markets for cattle products, minimization of predation, perceptions of the environment, characterization of the properties that have predation problems, and surveying of significant areas for conservation.</p>	
Key-words (5)	Pantanal, Jaguar, Conservation.

Name	Rosana Cândido Pereira
Affiliation	IBAMA, Corumbá-MS
Title	Fish Monitoring in Mato Grosso do Sul
<p>In the Pantanal and in the Upper Paraguay Basin, both professional-artisan and sport fishing have social-economic importance, but the percentage caught by each category has changed throughout the years. In 1984, out of the estimated 2,800 tons of fish caught, 75% was by professional-artisan fisherman and 25% by sport fisherman. After the 80's, the situation changed and professional-artisan fishermen started to compete with sport fishermen. Between 1994 and 1999, data from SCPECSA/MS showed that the average of total fish caught was 1,415 t/year, being 1,086 t/year captured during sport fishing and only 330 t/year (24%) by professional-artisan fishermen. In order to meet sport-fishing demand, the live-bait fisherman ("isqueiros" or "teladores") became more popular, increasing this activity after the 90's. Because of this demand, management of fishing resources must be organized by the community in a participative model that outlines procedures that assure economic and social welfare of the fishermen and other professionals benefiting from this production. Whilst engaging the community, those involved in the fishing activity must become co-responsible for the use and conservation of fishing resources and operate according to their own regulations. In addition to managing the sustainability of fish resources in Mato Grosso do Sul and elaborating regulatory procedures and patrolling, IBAMA also executes projects in partnership with institutions such as Embrapa Pantanal and ECOA, and supports sustainable use projects for fish sub-products like the "Love-Fish Association", which uses fish skin for handcraft.</p>	
Key-words (5)	Fish, Monitoring, Mato Grosso do Sul, Participatory Management, Fish stock.

Name	Rosana Cândido Pereira
Affiliation	IBAMA, Corumbá-MS
Title	Controlling the dispersion of exotic species <i>Limnoperna fortunei</i> (golden mussel) in the Southern Pantanal
<p>The golden mussel, <i>Limnoperna fortunei</i> (Dunker, 1857), an invasive exotic species, was brought from the rivers of China to South America through the "ballast water" of ships after 1991. It is carried in both larval and adult stages, in the ballast and water captation systems of ships. The species was recorded in the Upper Paraguay Basin (BAP)/Corumbá-MS in 1998, and in the Paraná River in 2003 and 2004, including the dams of Porto Primavera, Jupia, Ilha Solteira and Barra Bonita (Tietê River), dispersed through aquatic and terrestrial means. Present studies in the BAP are mapping the area colonized and the dispersion patterns. The species was also found in the Paraguay River (1998-2004) up to Bela Vista do Norte, in the lower Miranda River (2003), up the estuary in the Vermelho River (2004) and Apa River. It has the potential to invade rivers Aquidauana, Salobra, Formoso, including Bonito, Jardim, and Bodoquena. As a response, the Ministry of Environment created a national task force (FTN), which is implementing an Emergency Action Plan and is engaging state and local institutions to control the species. In Mato Grosso do Sul, the task force was supported by IBAMA, CESP, MMA, IDATERRA, ANVISA, Brazilian Navy, ACERT, IMAP, SANESUL, CEUA/UFMS, Trade Association of Corumbá, Agricultural Union of Miranda,</p>	

<p>Program GLOBALLAST, PELD/CNPq, FUNDECT, Urucum Mining, and AHIPAR. After the FTN had finished the work, local collaborations for the Paraguay and Paraná basins and for Guaíba Lake were created. The general coordination at BAP is run by IBAMA/Corumbá, which elaborated a work plan to spread the information, monitor the dispersion, train for patrolling, and create sanitary barriers with the purpose of preventing golden mussel dispersion in the state of Mato Grosso do Sul and other localities.</p>	
Key-words (5)	Golden Mussel, <i>Limnperna fortunei</i> , Control, Dispersion, Southern Pantanal.

Name	Samuel Duleba
Affiliation	RPPN Cabeceira do Prata
Title	Monitoring the environmental impacts of tourism activity at RPPN Cabeceira do Prata
<p>The natural resources of any conservation area visited by tourists are subject to several impacts, depending on the visitor's activity. People walking along trails, for example, cause vegetation and soil changes. The main objective of this monitoring activity is to identify and evaluate the level of impacts resulting from tourist visitation in the RPPN Cabeceira do Prata, to provide information on the factors that influence the conservation, preservation, and degradation status, and the capacity to recover. The methodology is based on the study of the terrestrial environment, specifically the trails used by tourists, and the aquatic environment used in flotation activities in the rivers Olho d'água and da Prata. The parameters are classified into three categories: social, physical, and biological. To assess the fauna, we used methods of visual observation and auditory records, vestiges (scats, tracks, etc) and transects, i.e, the frequency of occurrence of species recorded. After monitoring all these variables, we concluded that the physical condition of the environment does not present great variations. Regarding the biological conditions, data collected so far did not indicate relevant negative environmental impacts caused by tourism. The presence of some key animal species in places where the tourist visitation occurs indicates the local preservation status. Certain areas still lack better care and periodic monitoring, but in general, the trails used by tourists are in good conditions. More specific studies will be carried out during the monitoring months.</p>	
Key-words (5)	Environmental monitoring, Impacts, Conservation, Private Reserve, Ecotourism.

Name	Tatiana Pádua Tavares de Freitas
Affiliation	Fundação Manoel de Barros - FMB
Title	Evaluation of infectious microorganisms in Peccaries and Feral pigs in the Pantanal, Mato Grosso do Sul
<p>This study aims to evaluate the presence of microorganisms responsible for causing three important diseases: Brucellosis, Leptospirosis, and Aujeszky's disease, found in white-lipped peccaries (<i>Tayassu pecari</i>), collared peccaries (<i>T. tajacu</i>), and feral pigs (<i>Sus scrofa</i>), captured at Fazenda Santa Emília in the Pantanal of Aquidauana, MS. Blood samples are collected from these animals through venopunction and submitted for laboratorial diagnosis (Iagro, MS). The diseases were briefly presented, along with their clinical symptoms, in domestic animals affected like cattle, pigs, and horses, in an attempt to predict the impact of</p>	

wildlife (Peccaries) and introduced animals' (Feral pigs) exposure to these diseases. Some results obtained in another area in the Pantanal (Fazenda Rio Negro), which has a different landscape and use, were shown. The data obtained there will be very useful in the future for comparative analyses with Fazenda Santa Emília. Epidemiological monitoring of certain diseases is an important strategy from the ecological point of view as it represents an alert mechanism and provides constant monitoring.	
Key-words (5)	Infectious microorganisms, Peccaries, Feral pigs, Pantanal.

Name	Vivian Assunção
Affiliation	UFMS
Title	Environmental monitoring as education tool
<p>The proposed use of environmental monitoring as an educational tool will be developed at schools and communities located in the <i>Cerrado</i> areas, targeting children and teenagers ranging from 7 to 15 years old. They will produce educational games related to plants and their fruit-dispersers found in the region. The goal is to show them the importance of biodiversity, and how recycling products can be used to make games (in this case, the memory game). The activities will be different according to age classes and will be done in groups. Samples will be collected seasonally. Plants will be identified with the help of books and locals' knowledge. Students will record the scientific and common names, as well as identify their seed disperser. They will need cameras, a color printer, glue, scissors, and Tetra Pak® boxes to produce the memory cards in different difficulty levels. For example, children between 7 and 9 years old will produce memory cards with plant's scientific and common names; children between 10 and 12 year-old will add information on plants medicinal use; teenagers between 13 and 15 years old will add the information on plants morphological characteristics and seed dispersers. It is an educational initiative that can be used by primary school teachers during science classes.</p>	
Key-words (5)	Education, Monitoring, Phenology, Recycling, Educational games.

Name	Walfrido Moraes Tomas
Affiliation	Embrapa Pantanal
Title	The importance of long-term monitoring projects in the Pantanal: aspects of the ecosystem and case studies
<p>Ecological research and monitoring in a highly diverse ecosystem such as the Pantanal need to be developed over long periods of time. The Pantanal presents substantial climatic variations, with periods of both dry and intense flooding years. This implies substantial variations in the distribution and the abundance of some species populations, influencing even considerable changes in the landscape. These can be observed for a long time, in some cases over decades, affecting the performance of populations. On the other hand, one should consider the complex interactions between main abiotic and biotic factors, as well as strong seasonal ecological processes: flooding, precipitation, forest fires, nutrients decomposition and cycling, migration, predator-prey interaction, seed dispersion, etc. Therefore, achieving sustainability in an ecosystem such as the Pantanal requires complex studies, involving a multidisciplinary integrated team and resources that are usually not available. Pinpoint studies help little in solving problems and questions related to ecological sustainability. That</p>	

is why networked and articulated projects at several levels are necessary as they are representative of a larger geographical area. Some research results that illustrate the effects of variations in the Pantanal ecosystem will be presented, especially the fluctuation in the number of caiman nests (*Caiman yacare*), the density of jaburu active nests, distribution of “manduvi” trees (*Sterculia apetala*) into age class and the effect of extreme dry periods and fire on the population, and an example of changes in the landscape due the multi-annual periods of flooding and drought. Lastly, the scientific approach adopted for networked projects in the Pantanal, as coordinated by the Pantanal Research Center (CPP), Embrapa Pantanal, UFMS, and UFMT, was presented. This approach is based on PPBIO protocols and has been adopted within institutional projects developed by Embrapa Pantanal and several partners, and is also articulated by CPP/MCT (Ministry of Science and Technology).

Key-words (5) | Monitoring, Sustainability, Seasonality, Protocols, Modeling.



Working time: Pollianna took notes throughout the event (left), and researchers attended several presentations (right). (Photos: Ellen Wang)



The workshop was a great opportunity for old friends to meet (left) and to make new ones (right). (Photos: Ellen Wang)

APPENDIX 3 - PARTICIPANTS

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