

ANNUAL REPORT

March 1, 1993 to February 28, 1994

Project: Can traditional forest-dwellers self-manage conservation areas? A probing experiment in the Juruá Extractive Reserve, Acre, Brazil.

Project summary (a reminder):

This project tackles a long-disputed issue, namely whether a traditional population can effectively manage a conservation area. A pilot experiment is being conducted in the Extractive Reserve of the Upper Juruá, Acre, in which consideration is given to strengthening of local institutions, quality of life, conservation of the natural environment, and enhancement of traditional knowledge. Simple devices for monitoring biological diversity and socio-economic conditions will be produced, and local people will be trained to operate them. Institutions and their management will be developed. An Encyclopaedia of the Forest / Upper Juruá will be produced and a zoning proposal issued. New products of high market value will be researched, with intellectual rights reserved to the local population.

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SUBPROJECT 1: BIOLOGICAL DIVERSITY

I. INTRODUCTION

The Project, as originally conceived and analyzed by the MacArthur Foundation, visualized research in an extremely high-diversity region of the south-western Brazilian Amazon (the Rio Tejo Basin of the Upper Juruá River, Acre), "unique in its continuous area, history, and conservation potential" (p. 5). Under human management for many centuries (indigenous groups) and one century (rubber-tappers), its resources appeared nearly intact, though depletion of game animals and forest conversion near population centers suggested that the maintenance of diversity was dependent upon the lower levels of disturbance typical of a sparsely populated, extensive rubber estate. The area had already been transformed into an Extractive Reserve (in early 1990), but its official establishment depended upon demarcation of limits, population census, usage and management plans and norms, and a formal agreement between the government conservation agency (IBAMA-CNPT = Brazilian Institute for the Environment and Renewable Natural Resources, National Center for Traditional Peoples) and the local peoples' association (ASAREAJ = Association of Rubber-Tappers and Farmers of the Upper Juruá Extractive Reserve). As a key experiment in the stabilization of sustainable land and resource use in the Amazon through application of community property rights and natural system maintenance and management (Project, p. 3), this Extractive Reserve was attracting much attention throughout the state, the country, and the world, especially from those who wished to continue expansion of alternative, provenly non-sustainable models of land and resource use (logging, ranching, colonist agriculture) into the area. Although "...extractive reserves offer one of the few realistic alternatives for environmental conservation in the face of competing land uses" and "when compared to colonist agriculture and to cattle-raising, extractivism....offers the greatest return in the long run," present demands of a growing population insist, at times even through scientific channels, that "its stability in the future has to be demonstrated" (Project, p. 9). On the basis of the last ten years' research and action in this relatively inaccessible region, the Project recognized that "the Extractive Reserve offers a realistic possibility for both conservation and development in the Amazon" (Project, p. 11), but affirmed that this possibility requires adequate structures, tools, methods, and controls for the self-management of a conservation unit by its traditional residents.

II. OBJECTIVES

The Project thus addresses directly the questions of these structures, tools, methods and controls, proposing an intensification of a number of lines of research and action within the Extractive Reserve, with the general objective to "Strengthen community institutions for self-management" and specific objectives, within the area of biological research and action (Project, p. 16), the following four:

(A) Assessment of the biological diversity in various groups of plants, in-vertebrates and vertebrates, and of its natural division and distribution within the Reserve;

(B) Development of adequate ecological indicators and early warning systems, among the groups analyzed, in order to inventory, describe, classify, compare, evaluate, and continuously monitor the various natural systems in the Reserve;

(C) Discovery and development of methods for sustainable use and local processing of new extractivist products, from the flora and fauna of the Reserve;

(D) Conduction of training seminars and intense involvement of local residents in the research, in order to produce relevant manuals and capable monitors to aid in the continuous and sustainable self-management of the natural resources of the Reserve, in spite of (and, if necessary, divorced from) fluctuating markets and increasing pressure from development-oriented economic interests inside and outside the Reserve.

Further objectives of the Project, such as the development of strong local political and social institutions, the compendium of local information on sustainable (or sometimes unsustainable) resource use in an "Encyclopedia of the Forest," and the preparation of a Zoning Plan for the Reserve, are discussed in the following parts of this Report.

This part of the Report covers progress, difficulties, and future goals of the Biological Diversity sub project, under the headings of (III) Biological Diversity, (IV) Ecological Indicators, (V) Sustainability, (VI) Training Manuals, and (VII) Other Bioscientific Results, during the period III/93-II/94. Many of these results are summarized in Tables I and II. Section (VIII) brings together some of the frustrations and failures of the Biological Diversity sub project, and delineates its goals for 1994.

III. BIOLOGICAL DIVERSITY (TABLES 1 AND 2)

Preliminary inventory of the Reserve in 1989-1990, covering butterflies and anurans, suggested that it could include an even higher biological diversity in these and other animal groups than nearby areas with poorer soils, considered to be the richest in species on the planet (Tambopata, Manu and Pakitza in Peru, and Jaru and Cacaupatia in Rondônia). This was successfully used to support the creation of the Reserve and to obtain financing for further study.

The data collected in 1993 and summarized in Tables 1 and 2, though still incomplete, tend to confirm this maximum diversity in the Reserve, at least in some groups. The total for the analyzed groups of butterflies, representing about one-half of the fauna, even though based on rather few person-hours of observation concentrated in only one season (cool and dry), shows a richness above that recorded in the nearby areas, with similar or much greater sampling effort. If the additional species records in the collection of the Museu Nacional in Rio de Janeiro are included (most representing species observed but not captured or surely identified during the 1993 field work), the difference is even more evident. Two easily sampled groups (Ithomiinae and Pieridae) already equal or exceed the predicted final maximum number of species in the other areas. In addition, the genetic variability of the populations in the Upper Juruá is extremely high, with as many as four different geographical subspecies of a single species occurring together and mixing, having arrived from four sides representing all four principal southern basins of the Amazon (Ucayali - W, Juruá - N, Purus - E and Madeira (Madre de Diós) - S), all of whose tropical forest (non-Andean) headwaters occur in the hilly region just south of the Reserve in Peru. A number of mid-elevation Andean species are also present, especially in the bamboo thickets. The eutrophic and extremely heterogeneous soils of the region produce an exalted diversity of microclimates, plants, and plant communities that surely help in the long-term accommodation of any species that may arrive there, while the unpredictable mild disturbance (cold waves, long dry seasons) continually opens up new microhabitats and opportunities for further colonization.

While there is evidence (in Tables 1 and 2) that Odonata and some other groups of insects, Anura, and Primates may also prove to be the most diverse in the Reserve, other groups such as robberflies, tabanids (KB, preliminary observations), ants (WB), fishes (BA), reptiles (PM), birds, and bats (JM) may not be so diversified, for different reasons in each case (often reflecting the vegetation height and structure, macroclimate, and flooding regimes). Whether the Project should pursue this question further will therefore depend on priorities still to be determined, among theoretical, academic, educational, practical, and economic options for research and action in the coming year; perhaps the present data on butterflies, frogs and monkeys (Table 2) can be considered sufficient for the

"biodiversity/heterogeneity argument" in favor of conservation and extrativism-oriented resource use in the region. The goal of assessing the natural diversity in the system, though not fully attained, may have reached an optimal point for utility in supporting its conservation. Further information, that could be collected with much additional effort in 1994-1995, might not greatly change the patterns revealed here.

IV. INDICATOR GROUPS (TABLE 1)

Besides indicating over-all values of biological diversity, the presence and abundance of different groups of plants and animals can faithfully reveal many other factors in the environment, from climate, soil fertility, vegetation type, flooding regime (and the variations and extremes of these) through specific resources (such as obligatory host plants, pollinators or soil elements) to degree of disturbance, stage of succession, and hunting intensity (for example, the scarcity of small-mammal seed-dispersors indicated by the abundance of seedlings under nut-trees). Many of these indications are well known to residents of the Reserve, while others are evident in the research done in 1993. The codification of these into a "meaning manual" awaits adequate consensus between scientists and local peoples, still in progress; in principle, this should be a primary goal for 1994, since many patterns are evident in the biological inventory (Table 1).

V. SUSTAINABILITY

The implicitly sustainable use of natural resources, revealed in a stable human population within the Reserve, is still an untested assumption, that in any case loses its meaning in a market-oriented economy or under growing population pressure - both of which are fundamental and present threats to the Reserve. Because sustainability cannot be directly measured on a short time scale, it must be indirectly inferred through indications of subtle changes in the system - more than that caused by natural disturbance, but less than that seen in obvious conversion to agroecosystems. Such indicators may be found in various plants (secondary, invading, expanding, or contracting), insects (using such plants or others as hosts, or preferring new microhabitat, or in delicate balance with their resources and enemies), and vertebrates (likewise, or subsisting on the changing insect populations). Within the defined research sites in Boca do Tejo, Alegria, and Restauração (including the Project Base) are various new treefalls (including both natural and those that furnished wood for the construction of the Base), new and old (abandoned) regrowth areas, edges of different sorts, areas subject-ted to various degrees and schedules of flooding, and natural degradation and aggradation areas along rivers and smaller streams. A series of these, both natural and related to human action, must be designated for systematic investigation,

before confident indicators of unsustainable use of resources and resulting system degradation can be established.

Based on the results of 1993 (Table 1), some good and reliable indicators should be found by careful comparison, among sites of known disturbance regime, of various groups of native and invading plants, ants, parasitic wasps, deep-forest butterflies (Ithomiinae, Satyrinae, Riodininae), dragonflies, and damselflies, fish, anurans, rodents, and non-human primates, though direct fishing, and hunting of the latter two groups, may confuse the signal or its interpretation. A systematic and standardized inventory of these groups will be necessary for the development of "sustainability indices" for various human actions in the Reserve.

VI. TRAINING MANUALS (TABLE 1)

While almost all members of the biological team prepared lists of organisms, and many involved local residents in their work, the only practical manual prepared was that by Luis Carlos Bernacci, explaining how to take Gentry's 10-line (2 x 50 m) 0.1-ha samples of trees and vines. The method was taught to two residents, neither of whom continued to apply it as had been agreed upon; one was vetoed by the ASAREAJ, and the other had more pressing tasks.

Adão Cardoso has worked regularly with Pedrinho Mason (Restauração) on anurans, and Chico Ginu (Boca do Tejo) has accompanied various members of the team in field work, without any formal results or field manuals being produced yet. Three rubber-tappers are collecting and measuring production from their trees, in collaboration with Laure d'Empereira. Among the priority activities for 1994, should be the placement of reference and identification collections or guides in the hands of the Association, along with specific methods for inventory, study, sampling and monitoring of diverse organisms in the Reserve. The Project acquired a variety of identification manuals for plants and animals which have been extensively used in conversations between research personnel and local residents; these important training tools are available to the Association members in Restauração.

VII. OTHER BIOSCIENTIFIC RESULTS (1993) (TABLE 1)

In interaction with the Geosciences/Zoning group (subproject 4), the biologists took GPS measurements in many parts of the Reserve (possible only in large clearings or open river, due to the very low declination of all but one of the satellites tracked), verifying appreciable discrepancies among the GPS-determined coordinates and those of the official satellite images, as well as unacceptable variations (up to 800 m in the horizontal plane) in the former. The harmonization of these discrepancies may be possible with the two additional GPS devices presently undergoing experimental use by residents of the Reserve.

Various members of the biological team provided extensive ground-truthing data to the Zoning group, in an attempt to improve the classification criteria used by their algorithm to rationally compact the 256 gray categories present in the digital images used.

Much of the data obtained in interviews, interactions, and conversations with residents will be useful in the Encyclopedia (subproject 3), while other questions are directly applicable in the Sociology subproject (2).

Various medicinal and other potentially useful plants were collected and extracted in the Chemical Ecology Laboratory at UNICAMP, and will be investigated chemically either there or by the USP chemistry group.

New species have appeared, of dragonflies, damselflies, butterflies, ants and frogs, that will be described in the primary literature in due course. Many new insect-plant interactions have been recorded, as well as unusual processes and interactions in agroecosystems.

In November, members of the biological team participated directly in the first training session held in the new (and still very incomplete) Project Base, with explanation of their research goals and salutary interaction with members of the Association from all over the Reserve. A new trail had been opened up from the Base to Restauração in July and was in regular use in November: the reason for the prohibition of hunting or tree-felling along this trail (to keep it "virgin" for baseline data) was explained to the Association and accepted by its members, not without some resistance.

VIII. FRUSTRATIONS IN 1993, AND GOALS FOR 1994

The work in 1993 proceeded more or less as planned, achieving most of the initial goals of the Biological Diversity subproject and not encountering any major unexpected barriers, reversals, or contradictions in the biological sector. The subproject was greatly reduced in efficiency, leading to unexpected levels of stress, frustration and disappointment, however, by four factors in the parallel sectors of infrastructure and sociopolitical structures:

(1) Difficulties in transportation, especially between Cruzeiro do Sul - Boca do Tejo and within the Reserve, strongly modulated by river levels, boat conditions and availability (see below for measures taken).

(2) Large deviations from schedules in the construction of the Base (still not ready), reducing its level of utility .

(3) A general lack of defined position of the biological subproject with relation to the Association, IBAMA and the local residents.

(4) As a result, conditions for research, eating, sleeping, and data analysis in the field were unsatisfactory, affecting personal health and safety. The first team (in May 1993) managed to devote only 4 of its 14 days in Acre to its work. The health of all members of the team was affected by the difficulties in November, to the point of impeding daily routine and other work on the Project.

Generally speaking, there was continued pressure from elements both outside and inside the Reserve, and uncertainties concerning priorities, activities, daily routine, backup resources and local administration. While most of the difficulties were expected and even considered as normal by the subproject 2 team, and all are gradually being resolved, it is evident that the biological research will continue to face problems in the foreseeable future.

At the same time, the participating biologists will need to work ever more closely with the Association in the coming period, in the planning, development, execution, analysis, reporting, and meaningfulness of all their activities while in the Reserve. IBAMA, Association and scientific team will interact closely (as countervailing powers), a procedure natural and easy for some, less so for others. Responsibilities for coordination of the biological work have now been transferred to Dr. Cardoso.

The coming years must be dedicated to combining the tasks of biological inventory and understanding of the roots of the hyperdiverse system with other, perhaps more urgent tasks:

- (A) Stabilization of the Project infrastructure (Base and transportation);
- (B) Completion of the Management Plan and Zoning Map of the Reserve;
- (C) Development of simple and efficient monitoring methods;
- (D) Development of manuals and programs for popular education, and the training of local monitors;
- (E) Rationalization and diversification of extractivist production;
- (F) Implantation of effective enforcement of norms for sustainable use;
- (G) Resistance to the ever stronger outside pressure for alternative and option-destroying land and resource use models; and

(H) Effective integration of all subprojects to achieve these goals.

The program, projects, and results of Dr. Laure d'Emperaire are excellent models for all members of the team, closely approximated by the agroecology and fisheries groups; these need to be adapted to the other research lines in order to address these goals in 1994.

Thus, the inventories should be streamlined, simplified, standardized, applied uniformly in carefully chosen experimental sites (see V), and conducted with adequate indicator groups to evaluate tendencies in the extractive, agricultural, and other systems. Local residents must be effectively involved, trained, and coordinated, to be able to provide continuity to this effort. A permanent Brazilian field director should be placed in the Base: an experienced scientist (be it in ecology, agronomy, forestry or other relevant area) with a firm commitment to sustainable management and conservation of the natural systems present. Team members not familiar with community work and education should receive orientation in order to participate actively in these areas, through their respective biological channels and knowledge. Finally, local residents should assume an increasing responsibility for both the infrastructure and the ongoing activities of the Project, in their own interest, with the same firm commitment to, and understanding of, the roads to achieve wise use and conservation of their resources for the future.

IX - TABLES

TABLE 1

Summary of Important Results of the Biological Diversity Subproject, 1993

<u>Organisms</u>	<u>Studied by</u>	<u>Period, Methods</u> ¹	<u>Diversity</u>	<u>Indicators</u>	<u>Manual, Other</u>
Woody plants and vines > 2.5 cm	M.Sc. Luiz Carlos Bernacci (UNICAMP) Francisco Bezerra (ASAREAJ)	X-XI/93; 0.1-ha plots using 10 x [2 x 50 m] lines (3 done) XI/93, not continued	Near maximum possible ² (still under analysis)	Present, mostly still being analyzed	Prepared; Phytosociological basis for Zoning (subproject 4)
All useful plants (by local people)	Dra. Laure d'Emperaire (ORSTOM/INPA)	V/92 (pre-project), IV/93, IX/93 Interviews and collections	List of > 300 species, mostly identified	To be analyzed	Full list prepared; basis and suggestions for new products
Rubber-trees (<i>Hevea</i>) (two species + varieties)	Dra. Laure d'Emperaire various rubber-tappers	IV/93, IX/93; Weekly measurements of productivity (3 areas)	Full census of lines and individual productivity	Useful for general environment	Results passed on to tappers; permits use of high-quality
Invading plants in cropped fields	Dr. Thomas Lewinsohn, Dra. Maria Alice Garcia	V-VI/93; Interviews with residents, direct census in fields	Diverse, with varying effects	Indicate soil, seed banks, practice	Some used to protect crops, others for medicine
Crop plants in fields (all sorts)	Drs. Lewinsohn and Garcia (UNICAMP), Osmildo Gomes, José Teixeira, Augusto Albuquerque, Nenda Pereira (ASAREAJ)	Interviews, direct observations, secondary information also	High genetic diversity in crops, diverse soils	Short fallow cycle shows rapid recovery on eutrophic soils	Lists made; relations with soil and water availability, including beach crops at low water; usual practices catalogued
Natural plant communities	Thomas Lewinsohn, Luiz Bernacci, Osmildo Gomes	V-IV/93; consideration of vegetation density and flooding; X-XI/93	Very similar to those of Pakitza ³ , more divided	Not easily recognized but may be promising	Being prepared; needs much more quantitative study
Insects in general, on crops and in forest	Drs. Garcia and Lewinsohn (UNICAMP)	V-VI/93; Pitfall traps, sweep net samples, interviews with residents	Very diverse, poorly known, esp. in mandioc	Certain taxa indicate a complex stable system	Lists made; most pests are vertebrates, edible; bees on beans
Odonata: dragonflies and damselflies ⁴	Dr. K.S. Brown Jr. (UNICAMP)	VII/93, X-XI/93; sampling of adults with aerial net in moist areas	Very high, especially specialized forest spp.	Many are indicators of rich aquatic systems	List prepared; Andean species and new species present
Hymenoptera, Formicidae (ants)	Dr. W.W. Benson (UNICAMP)	X-XI/93; Lines of 20 baits spaced at 10-m intervals, collections	Intermediate, less than in Manaus (AM)	Very different in forest types or varying land use	Under analysis; many new ant-plants; <i>Atta</i> rare
Lepidoptera (diurnal): butterflies ⁴	Dr. K.S. Brown Jr. (UNICAMP)	1989-1992; VII/93, X-XI/93; Baits, transect samples, field identification	Highest known anywhere in world, incl. genetic	Ithomiinae, Riodininae, Hesperidae, others	Lists prepared; Andean species, New species, genetic mixtures
Fish (general, ecology, ethnoecology and use by local populations)	Dra. Alpina Begossi (UNICAMP), M.Sc. Benedito F. Amaral (UNESP)	(UNI-VII/93, II-III/94: Throw-nets, donations, interviews all along Rios Juruá and Tejo, to headwaters	47 species recognized 30 used in culture	Greater in Juruá>Tejo> smaller tributaries More imp. in dry season	Lists made; migration studied in July; much still to study; Methods evaluated for fishing
Amphibians ⁴ (Anura)	Dr. A. Cardoso (UNICAMP), Moisés B. Souza (UFAC)	1988-1992; X-XI/93, II-III/94; photos, recordings, juveniles sought, collection	Very high (68 species recorded, 16 endemic)	<i>Dendrobates</i> spp. show stability	List made, much information on spp.; educational structures
Reptiles	M.Sc. P.R. Manzani (UNICAMP)	VII/93; interviews, field work	13 species recorded	Lizards useful for habitat	Information left, list made
Mammals (general), bats (Chiroptera)	Dr. Jader Marinho Filho (Univ. Brasília)	V-VI/93; Interviews, tracks, pitfall traps, mist nets, work in field	More than 60 species recorded (high number)	Many useful for resource inference & environment	List prepared, hunting data, preferential use of 25 spp.
Small mammals and primates	Dra. Eleonore Z.F. Setz (UNICAMP)	II-III/94; tracks, egg-bait lines, interviews, observations	At least 15 primate spp. (maximum known in Amazon)	Threatened species known	(not back before report deadline)

NOTES: ¹ All specimens belong to the ASAREAJ, on loan (for identification) to UnB, UNESP, UNICAMP. Duplicate voucher specimens may be deposited in these.

² Maximum = Every individual encountered in a transect is new.

³ See Erwin (1991).

⁴ See Table 2 for more data on these groups.

TABLE 2

Comparison of Biological Diversity in Indicator Groups in the Upper Juruá Extractive Reserve with that in other adjacent high-diversity SW Amazon sites

GROUP	Number of species:	REAJ (350 p/h) ¹		Tambopata (1000 p/h) ^{3,4}		Pakitza ⁵ (600 p/h)	Jaru, RO (300 p/h) ³		Ariquemes, RO (1000 p/h) ⁶
		recorded	expanded ²	recorded	expected ⁴		recorded	expected ³	
LEPIDOPTERA									
NYMPHALIDAE									
Morphinae		12	12	11	(14)	4	11	(12)	11
Brassolinae		19	26	21	(30)	9	23	(25)	8
Satyrinae		91	91	77	(107)	58	92	(96)	56
Charaxinae		18	25	30	(44)	11	24	(30)	18
Danainae		4	5	3	(6)	1	2	(4)	3
Ithomiinae		80	86	40	(70)	44	57	(65)	46
Heliconiinae		25	34	24	(31)	16	25	(28)	25
Nymphalinae		110	145	118	(158)	58	108	(120)	108
TOTAL NYMPHAL.		359	424	324	(460)	201	342	(380)	275
PIERIDAE		32	33	25	(32)	18	26	(32)	29
PAPILIONIDAE		24	33	25	(36)	8	23	(30)	18
LYCAENIDAE									
Riodininae		177	188	193	(380)	135	196	(300)	200
TOTAL LEPIDOPTERA ANALYZED		592	678	567	(908)	362	587	(742)	522

ODONATA ⁷	(totals)	(totals)	ANURAN AMPHIBIANS	
ZYGOPTERA			AREA	SPECIES(ONLY)
7 small forest families	14	16	Rio Tejo	68 (18)
Protoneuridae	5	4	Cruz.do Sul	50 (6)
	(19)	(20)		
Coenagrionidae	18	35	Rio Branco	56 (8)
	(37)	(55)		
ANISOPTERA				
Aeshniidae	6	19		
Gomphiidae	0	6		
	(6)	(25)		
Libellulidae				
8 small forest genera	13	15		
<i>Perithemis</i> ⁸	8	5		
<i>Uracis</i>	5	4		
	(26)	(24)		
3 large field genera	15	31		
11 small genera	0	16		
	(15)	(47)		
	(47)	(96)		

NOTES:

¹ Includes 250 p/h in 1993.

² Includes records in the MNRio.

³ Data from Brown (1984).

⁴ Data from Lamas (1985).

⁵ Data from Lamas et al. (1991)

⁶ From Emmel & Austin (1990).

⁷ Tambopata data: Paulson (1985).

⁸ Typical forest genera.

IX. BIBLIOGRAPHY (TABLES 1 AND 2)

Brown Jr., K.S. (1984) Species diversity and abundance in Jaru, Rondônia (Brazil). *News Lepid. Soc.*, 1984 (3): 45-47.

Emmel, T.C. and Austin, G.T. (1990) The tropical rain forest butterfly fauna of Rondônia, Brazil: species diversity and conservation. *Tropical Lepidoptera*, 1: 1-12.

Erwin, T.L. (1991) Natural history of the carabid beetles at the BIOLAT Biological Station, Rio Manu, Pakitza, Peru. *Rev. Peruana Entom.*, 33: 1-85.

Lamas, G. (1985) Los Papilionoidea (Lepidoptera) de la Zona Reservada de Tambopata, Madre de Dios, Peru. I. Papilionidae, Pieridae y Nymphalidae (en parte). *Rev. Peruana Entom.*, 27: 59-73, 2 plates.

Lamas, G.; Robbins, R.K. and Harvey, D.J. (1991). A preliminary survey of the butterfly fauna of Pakitza, Parque Nacional del Manu, Peru, with an estimate of its species richness. *Publ. Mus. Hist. Nat., U.S.N.M.S., A (Zoologia) (Lima)*, 40: 1-19.

Paulson, D.R. (1985) Odonata of the Tambopata Reserved Zone, Madre de Dios, Peru. *Rev. Peruana Entom.*, 27: 9-14.

See also, for further information on Tambopata:

Dressler, R.L. (1986) Euglossine bees (Hymenoptera: Apidae) of the Tambopata Reserved Zone, Madre de Dios, Peru. *Rev. Peruana Entom.*, 27: 75-79.

Erwin, T.L. (1985) Tambopata Reserved Zone, Madre de Dios, Peru: History and description of the Reserve. *Rev. Peruana Entom.*, 27: 1-8.

Fisher, Eric M. (1985) A preliminary list of the Robber Flies (Diptera: Asilidae) of the Tambopata Reserved Zone, Madre de Dios, Peru. *Rev. Peruana Entom.*, 27: 25-36.

Pearson, D.L. (1985) The Tiger Beetles (Coleoptera: Cicindelidae) of the Tambopata Reserved Zone, Madre do Dios, Peru. *Rev. Peruana Entom.*, 27: 15-24.

Wilkerson, R.C. and Fairchild, G.B. (1985) A checklist and generic key to the Tabanidae (Diptera) of Peru with special reference to the Tambopata Reserved Zone, Madre de Dios. *Rev. Peruana Entom.*, 27: 37-53.

For information on species and diversity of various groups of plants and animals in the Parque Nacional del Manu area, in comparison with three other Neotropical forest sites, see various chapters in the following book:

Gentry, A.H. (ed.) (1990) *Four Neotropical Rainforests*. New Haven: Yale University Press, xiii + 627 pp.

SUBPROJECT 2: SOCIO-ECONOMIC RESEARCH AND MONITORING

I. INTRODUCTION

The project summarized frequent criticisms addressed to the concept of Extractive Reserves. Instead of rejecting flatly these criticisms, it was maintained that they lacked a firm empirical basis, in all of their three main dimensions of ecological sustainability, economic viability and social equity combined with institutional stability. Furthermore, it was argued that some of the problems involved in the Extractive Reserve concept could be addressed by a combination of scientific and technical support, adequate economic policies and strong institution-building.

The project proposed to contribute to these two areas, in collaboration with the resident population. Subproject 2 stated as its goals the development, testing and application of monitoring methods for economic and social sustainability (to assess changes in the access to natural resources; in income distribution and generation and in the structure of power and authority). The Subproject 2 also proposed to support the "establishment of new systems of access to resources, of distribution of wealth and power within the Reserve areas so as to guarantee fairness and equity, incorporating traditional practices when advisable".

II. INSTITUTIONAL ISSUES

a. The "traditional institutions".

"Traditional systems" in the Reserve may be divided into institutions that were part and parcel of the century-old *seringal* system (1890s-1989 in the area) and local institutions linking families. Two major examples of institutions belonging to the *seringal* system were: the land-property system of "rubber-tree trails" and the trade-system of the *barracão*. The land-property system could ideally ensure the sustainability of the rubber trees and other natural resources by means of a combination of recognized property rights (a single "owner" of all trails rented individual trails to household heads) and of a set of recognized rules, monitored by professional inspectors ("mateiros") and enforced municipal policemen. Under the *barracão* trade system, household heads kept accounts at the trade post (*barracão*), which advanced supplies to be paid with the rubber collected along the year. Both the land-use system ("rubber-tree trails") and the trade system ("barracão") were discontinued in 1969 by the creation of the Reserve. The main significance of the Reserve is for many that it ended the

obligation to pay the "rent" and the trade monopoly. Other, less visible arrangements linking families among themselves remained in action after the creation of the Reserve. Examples of such practices are the sharing of a "colocação" among a few related families, the practice of pooling manioc-processing equipment, the sharing of all game in fixed proportions, and the cooperative work to maintain rubber trails. Another importante case is the customary allocation of opposite river banks into agriculture and cattle raising so as to avoid conflict. Some of the conflicts among neighbours (e.g. when pigs owned by one resident invaded another resident's manioc plantations) were resolved locally, sometimes with the help of the trade-union. There existed a local network of trade operated by the so-called "marreteiros" (resident retail traders) or by the "regatões" (itinerant boat-traders).

b. The institutional-building process

The Association of Rubber Tappers and Agriculturalists (ASAREAJ) was created before the formal establishment of the Extractive Reserve, leading a cooperative movement to replace the monopoly-trade of patrons, representing the resident's demands to land rights. After the Reserve was created by an act of the federal government, and after the government exerted its authority at the local level, it fell upon the Association the responsibility to replace the old patron-governed institutions (dealing with allocation of trails and with trade), and to organize local practices in an orderly way. The solutions attempted were a tentative combination of old practice and new and yet shifting concepts (grass-root monitors to replace the former paid inspectors, cooperative headquarters and credit to replace the storehouse). The Association, however, faces serious problems to complete this process of institution-building. There is a crisis in the resource management system, and in the organization of trade and commerce (this does not imply that before the Reserve these systems were working properly under the patrons, who were in fact moving towards non-sustainable timber exploration). Although local allocation and trading practices remain, they are insufficient to cope with the existing difficulties.

While land and authority have been legally transferred from private owners to the Union, the Association has been left to its own to cope with the local routine problems of resource allocation among residents and rule-enforcement, lacking however material means, skills and legal authority to do so. This has resulted in friction with the local municipal authorities and frustration among the residents who are ideologically "Reserve-oriented." Foremost areas that must be

addressed are the "property regime" (who has which rights to what) and the "rule-enforcing system" (who has the authority to enforce which rules over whom).¹

Much frustration has arisen from the fact that while the Association was encouraged to conduct (under an agreement with IBAMA) an inventory of residents (the "cadastro"), having requested formally that IBAMA issues use-concession titles, no measures were taken towards the institutionalization of land rights.² Thus, the Association has since 1991 taken the resident's inventory to informally recognize the existing local arrangements for land use, but lacks means to enforce its rulings and its authority is accordingly undermined.³ Another source of frustration is that while the Association has elaborated (again under agreement with IBAMA) a detailed Use Plan, having in addition recruited e, recruiting 48 "fiscais de base"(grass-root monitors) to monitor it, both rules and personnel are falling into discredit due to lack of legal recognizance of the Use Plan and legal and material support to the fiscalizing action.⁴ Even worse is the fact the now the IBAMA personnel who visits the area (at the request of the Association to help the enforcement of conservation rules) belongs to a Conservation Area divisions based in the State Capital, acting in ways which are contradictory with the Extractive Reserve division (a separate body) based in the federal capital. At the same time, local politicians try to de-incentive the Reserve idea.

The cooperative issue illustrates some of the problems faced by the institution-building activity. This system has failed due to lack of training, monitoring and adequate administration, combined with a drastic fall in rubber prices in recent years. Although the very existence of the Associação resulted

¹. See Silberling 1992. Sociologist Louise Silberling will look at indicators for institutional strength to deal with issues of this kind, typical of the so-called "common-property regimes".

². Rubber trails, now under IBAMA administration should be granted by "use concession" contracts to the residents. There is doubt and some conflict about three possible systems, which are: (1) rights are granted by IBAMA to individual residents, (2) IBAMA which grants the Reserve area to the Associação which in turn issues use use-licences to individual residents, and (3) the Associação is granted rights over common-use areas (lakes, beaches, disputed areas, non-used areas), and individuals have use-rights over territories actually in use (according to the Cadastro). In all cases, use-title holders must abide by the Use Plan rules, but in the two last instances the Association's monitoring role is strongest. Gaps in this proposed scheme include legal authority (exclude police action), training, and payment of grass-root monitors.

³. Mariana Pantoja Franco is currently doing extended fieldwork on such local conflicts and their resolution, as well looking for good indicators of local participation in collective decisions such as those on land-rights (including the use of lakes and beaches).

⁴. Under the "traditional" seringal system the rubber trails were owned by landlords, were leased to seringueiros and were monitored by paid personnel (the "mateiros" or woodsmen").

from this cooperative project, the financial failure has thrown suspicion over the former cooperative managers.⁵

Finally, local politicians try to de-incentive the Reserve idea. Thus, in a general election year, the municipal mayor who is active building up "TV houses" and other "improvements" in the reserve, alongside with deforestation.

Proposed measures to counteract these trends involve:

- The institutionalization of the land-use system and the resource-monitoring system, with a strong and well-defined role for the Association

- To establishment of a clear framework of political authority, based on the joint role of a single government agency (IBAMA-CNPT) and the Association, without overlapping and conflicting authorities at the municipal, State and federal levels.

In particular, the project should support the institution-building process by following ways: by supporting the developing monitoring tools to help the local operation of the land-use and resource-monitoring system, as well as other Reserve-related systems such as the health system, the educational system and the cooperative system (see below for project contribution), and by placing maximum effort on the development of human resources at the local level, concentrating on the health system (health agents), the educational system (teachers, usually women), the monitoring system (the fiscais de base), the cooperative managers (now inactive of acting as private traders) and the Association's staff (see below for project contribution).

III. SOCIO-ECONOMIC ISSUES

Economic and demographic issues are crucially important to the sustainability of the Reserve's biological system (see Dr. Brown's report on Subproject 1). Since the first biological field studies conducted by Dr. Brown and Dr. Cardoso in 1988 in connection with the Upper Jurua Extractive Reserve proposal, it was recognized that the Jurua Reserve had an extremely high biodiversity, and that this extremely high biodiversity ("hyper diversity") might benefit from human occupation at low demographic levels. On the other hand, it was also stressed that the current biological system would be disrupted by demographic growth beyond certain limits.

Low demographic levels⁶ were contingent upon: (a) the predominance of extensive extraction over agriculture and cattle-raising as market-oriented

⁵. Luiz Ferreira (a local Association advisor) has conducted for the project a two-month field investigation covering all cooperative trade-posts.

activities in the forest hinterland, implying an optimal floor of 300 ha forest per household; (b) the trail-use system based on non-divisible, non-inheritable trails and corresponding territory rented by individual families, implying a ceiling to the number of households per *colocação*; (c) high mortality rates (accompanied by high birth rates) and absence of roads or other migratory routes.⁷ This implies that the existing hyperdiverse system, is sensitive to:

(A) Changes in the rubber market which pull rubber tappers from commercial extraction towards commercial agriculture, both by moving to riverbank areas or by converting former extraction territories into pasture land or commercial crops; - Intensification of agricultural and animal husbandry techniques (including "agroforestry systems" if not combined with economic incentives for natural forest conservation), increasing carrying capacity in hinterland areas and creating an internal push towards greater number;

(B) Changes in the property system, either by abolishing ownership (and thus creating an "open access" situation), or under a system of confused, non-enforced territorial rights.

(C) Improvement of health conditions and incentives to immigration.

A combination of the above threats could lead to a fast increase in population, and intensified agricultural systems. This scenario would not only jeopardize the biodiversity conservation goal, but could also threaten the goal of raising the quality of life due to impoverished environment and growing numbers.

In the present there are changes of the type "A"(crises in the rubber market and associated shifts towards market-oriented agriculture and cattle-raising), of type "B"(absence of clearly define property rights), and of type "C"(health services and incentive to unsustainable migration towards hinterland areas, such as the Vila Thaumaturgo Mayor's project of "Vila Restauração").

These trends are not an inevitable "tragedy of the commons" scenario. The market pull toward unsustainable (or incompatible with hiperdiversity) resource use could be compensated by adequate economic policies (ranging from price support as it is now being done, to value-adding technical improvements in the processing phase, to better marketing efforts). All these measures are now being put into practice in varying degrees. Since rubber making is a fast-return

6. A 75% of households and 90% of *colocações* (*sing. colocação*) are in the hinterland area; the encroaching ranches and specialized family-scale agriculturalists occupy the river banks. While there are 6 households per locality of ranch in the riverbank zone, this number is 2.3 for the *terra firme* zone (in the hinterland). Overall demographic density is of 2,6 persons/sq km in the riverbank zone, and of 0.85 persons/sq km in the *terra firme* zone.

7. Cf. Age-structure tables by Rosana Baenninger (from NEPO).

activity (after initial investment in trail clearing and repairing), simple measures to add value to rubber have an immediate effect of raising also the value of forest conservation. The current lack of well-defined property-use rights may be ended by means of adequate institutional changes. Finally, although a sharp rise in numbers may be anticipated as a result from better health conditions and lower rates of mortality at birth, educational programs and special reproductive health programs should help to stabilize the population in the future.⁸ An essential issue is to grant the local body of Reserve representatives an effective autonomy vis-a-vis the municipal government.

Thus, while "it is maintained ... that the Extractive Reserve offers a realistic possibility for both conservation and development in the Amazon region", this possibility depends on many measures and conditions, including the establishment adequate public policies in the economic and social area, as well as training of the local population with the collaboration of technical and scientific personnel.

IV . SOCIO-ECONOMIC DATA

The methods proposed to monitor socio-economic situation included (a) surveys on health, education, income and labor (using data of an initial survey carried out in September 1991), and also on the use of natural resources and pressures on wildlife, plants and other resources; (b) mapping of human action on the area at the scale of 1:100.000. There follows a summary list of activities related to this component.

The general goal of the is to build a data banks for socio-economic monitoring including the following end-products:

- Easy-to-update full resident's inventory (*cadastro*) containing basic information of domestic groups . This inventory should be linked to the Reserve digitized maps. Should also be plotted: services (blacksmiths, tinsmiths, carpenters, mechanics and private trade posts) and collective equipment (schools, health posts, cooperative posts, churches and radio stations). Target: Association's personnel.

- Data banks on health, education and resource use indicators, to be updated with the help of local health agents, teachers and ecological monitors, in collaboration with the respective teams. Data banks and monitoring methods of

⁸. A reproductive health activity was started in January 1994, focusing on Reserve midwives. One Ph.D. student of the University of Campinas will start fieldwork on gender issues also in 1994.

cooperative-productive activities (to be updated by trained cooperative managers or other specialized local staff), and social involvement (meetings, complaints, conflicts solved) . These data, organized and put in useful form, should in turn support the activities of health, education, ecological monitoring and social mobilization within the Reserve. Targets: health agents, teachers, ecological monitors (fiscais de base), cooperative managers, Association staff.

- Survey methods -based data banks on key indicators, such as: demographic density, main resource used (agricultural area, pasture land and cattle, rubber-tree trails), monetary income, labor intensity, consumption patterns and permanent equipment (capital goods). Data should be linked to thematic maps to be produced by the biological-remote sensing teams. These data should provide inputs to the activity of mapping the current spontaneous zoning of the Reserve territory and to propose guidelines for sustainable zoning and management plan.

Beggining of research on market and prices, gender issues and the regional political system.

Local teams who are the backbone of the Reserve institutions should contribute with information and data, participate actively in the formulation of methods and selection of indicators, and benefit from the information to management purposes. To support these multiple goals, it will be essential to introduce user-friendly software to access the data banks. Thus, an Association member should be able to find in the map the recorded colocação of a given resident starting from his name or nickname alone, together with additional data on his declared rubber trails, and a record of previous moves.

Activities

There was a delay in the elaboration of basic monitoring tools (data bank structure, pilot forms and manuals for monitoring; survey methodology; mapping methodology). Much time was devoted to processing and analysis of information (1991 census) and to updating resident's inventory data.

Baseline for demographic and economic data (starting: 1991)

Authors: Rachel Meneghello, Fernando Lourenço, Iara Rolim and Lilian (at CESOP/Unicamp)..

Description. Construction of a databank based on the primary forms of the 1991 census of 857 households (SPSS was used). Data were stratified in two main zones (Margin/Hinterland); and Hinterland was further subdivided into Tejo/banks, Tejo/hinterlands, Other rivers).

Period: October-December 1994

Results: A narrative report was written by Mauro Almeida. It contains information per household head and per individuals on demographic variables, production and resource use.

Next steps: -Revision of 1991 methodology; planning of annual census (forms, manuals, field guides, training of supervisors and field researchers); pilot application; census (1994). Elaboration/adaptation of user-friendly software.

Updating of residents (1991-1993).

Authors. Fieldwork: Mauro Almeida, Mariana Pantoja, Maria Clara; computer analysis (Rachel Meneghello and Fernando Lourenço at CESOP-UNICAMP).

Description and methods. Residents in previously selected areas were checked and updated. Data were compared with 1991 census data. This update covered nearly 20% of Jurua riverbank zone; and nearly 80% of Hinterland zone. Data include 500 household heads. 1991 Data format is: (number in household database)(number in SGI map)(name)(1991 address/status)(1993 address/status). Status may be "unmarried at the time" or "dead". These data were organized as matrices informing origin and destin of household heads (1991-1993). Moves within the Reserve (accross main zones) and migration accross the Reserve boundaries are measured.

Results. A matrix and flux graph link initial and end points with frequencies. There is 30% rate of internal moves within the Reserve; a 10% loss of residents. There is no mass evasion in response to price fall

Period. Fieldwork: March-April.

Next steps- Forms and manuals to monitor residence (in maps and database)

Updating of Reserve resident's map (1991-1993). (CEDI-PPIB)

Authors. Alicia Rolla and Sema (CEDI-Programa Povos Indigenas no Brasil), using field data collected by Mauro Almeida and Mariana Pantoja.⁹

Description and methods. On the digitized Reserve's map (using GIS and obtaining approximate locations by means of GPS),

Period. March/April 1993(fieldwork), May-June 1993(map).

Results. Partly updated 1993 map showing household distribution (a set of maps at the scale of 1:100.000), containing numbered houses.

Next steps. Linking the GIS map (plotting residents) to the data bank (currently having a separate numbering); producing a user-friendly software for simultaneous map and databank use. Improving residents' location by means of systematic use of GPS. Training residents in GPS use and in map use. Compute densities (households per area; individuals per area) after selecting appropriate grid. Overlap density data with deforestation rates and occupational data.

Socio-economic survey (1993).

Authors. Field work: Mauro Almeida, Mariana Pantoja, Luiz Ferreira, Virginia Gandres, Louro; computer analysis: Rachel Meneghello, Fernando Lourenço; Iara Rolim; Lilian.

Description and methods. A survey of 130 households stratified by Reserve zones

Results. Demographic data; occupational data; income. Tables with frequencies are available.

Period. Fieldwork: July-August.

Next steps- Prepare definitive survey material (forms, manuals, field guides; training of local users).

⁹. Maps were produced by an agreement between IBAMA and ASSOCIAÇÃO, under the coordination of M. Almeida, having CEDI-PIB as technical agency.

- Select and test indicators (for income, labour effort; demography)

Demographic analysis.

Author. Rosana Baenninger, from NEPO-UNICAMP.

Description and methods. At this phase, analysis of the 1991-1993 demographic data.

Results. Report, age-structure tables and comments by sub-zones. Very high birth and mortality rates; demographic structure typical of very undeveloped countries.

Period. November 1993.

Next steps. Planning of research schedule; contribution to the general census.

Household diary

Author. Antonio Barbosa de Melo.

Description and methods. Diaries for household activities covering three houses (settlement of "Pão" at Manteiga River, Tejo Hinterland) on: hunting (date/yield by species, amount and gross weight; hunter); on rubber tapping (date/yield/trail/tapper); on manioc making (date/kgs rubber made); on trade (date/rubber sold; purchases and price).

Results. Suggested increase in game abundance after fall in rubber-tapper numbers; increase in local petty trade. Three sets of notebooks.

Period. August 1993-February 1994.

Next steps. Revision of data and supervision by mammal biologist (Eleonor Setz). Development of standard diaries; training of further researchers and selection of pilot sites for monitoring. Manuals.

V. INSTITUTIONAL SUPPORT

The activities initially proposed to support the local institutions were (a) community meetings and training activities to evaluate changes and to formulate policies; (b) development of monitoring system for social sustainability.

The team put much effort to support the Association, given the current difficulties. This has included a contribution to the Associação's overhead (as foreseen in the project under the heading of "services of the Associação") as a bridge to the future working of the Association with IBAMA support, advising and training .

Association's institutional program

Author. Milton Gomes, Luiz Ferreira, Francisco B. de Melo, M. Almeida.

Description and methods. Meetings.

Results. Six-month project and budget, covering: office reorganization, grass-root activities of three directors at 48 *Comissões de Base*, and organization of the April general

meeting. *Period.* 1-2 August 1993; October 1993; February 1994 (field trips of M. Almeida)

Next steps. Monitoring and training for the Association's office (personnel, budget, roles, rules). Monitoring system for the grass-root activities and training in organizational issues.

Institutional structure.

Author. Louise Silberling (University of Cornell).

Description and methods. Assessment of ASAREAJ office; preliminary steps to build up a data-gathering network to monitor and assess general institutional viability.

Interviews. Standard evaluation procedures.

Results. A report will be produced.

Period. October 1993.

Next steps. Complete a data-gathering system; to build up indicators; to elaborate manuals and guides.

Assessment of Cooperative activities.

Author. Luiz Ferreira (community leader); advising and schedules by Louise Silberling and M. Almeida.

Description and methods. Interviews (Boca do Tejo, Seringueirinha; Boca do Bage; Dourado; Restauração; Manteiga; Riozinho; Machadinho; Maranguape; Acuria; São João;; Caipora; Rio Breu); collecting of balances and accounting books. .

Results. Residents' views, interviews with managers, and auditing of general administration.

Period. October 20-December 20 (fieldwork)

Next steps. Discussion of results and recommendations at community meetings; planning meetings; manuals and training courses. Indicators (personnel; equipment; performance).

Training of ASAREAJ board of directors: statutory rules for membership and enrollment.

Authors. Patricia Coube (teacher); Antonio L.B.Macedo (local Project Coordinator); Augusto A. Reis (Health Agent-ASAREAJ).

Description and methods. Workshops on organization and statutes

Results. Two workshops; use of role playing; visual illustrations and drama. There are confusing and overlapping roles (representatives/monitors).

Periods. September 1993; November 3-9 1993.

Next steps: Manual (in elaboration); improvement of Statutes.

Local political organization; conflict resolution.

Author. Mariana Pantoja Franco.

Description and methods. Following up local Association meetings; record of land conflict cases.

Results. Diagnostics of falling social involvement and representation (attendants per area; attendants over official participants; participants/casual attendants/family members) related to lack of feedback (training, official status, payment).

Period. Four months in 1993.

Next steps. The work will focus on local conflicts and resolution processes; and on indicators of social involvement in public issues involving the Reserve.

Environmental Education. (Partly supported by the Project)

Author. CEDI team: Maria Clara Di Pierro (geographer, educator), Orlando Joia (biologist, educator), Claudia Lemos Vovio (educator). Also (Project Team): Mariana Pantoja Franco.

Description and methods. Elaboration of reading books/manuals; 2 courses (one for Reserve teachers; another for Association personnel and Fiscais de Base).

Results. Manual on the Reserve's History; Manual on the Use Plan. A course for 23 teachers (Reserve's History; Reading and Arithmetic). A course for 48 "fiscais de base", using the commented version of the Use Plan, received an enormous input of the local residents on ecological issues such as the causes and effects of riverbank erosion, predatory fishing techniques, predatory hunting.

Period. January 1994, at Boca do Tejo.

Next steps. Updating of books/manuals; introduction of monitoring methods for educational efficiency.

VI. DIFFICULTIES

We face difficulties in the local coordination of the project activities. These were partly due to the political changes and institutional recent changes. First, the Associação (which has a common office with the regional branch of the National Rubber Tapper's Council) has established its own, separate office and administration along 1993. The Regional Branch of the National Rubber Tapper's Council has changed three times of coordinator in the same year, and the Association's president has renounced to his office in August. The Association was weakened along this process, and for some months (August-October) had minimal communication with the IBAMA. The Association has not obtained from IBAMA authority to monitor and enforce the Use Rights System on the base of concession rights, and the authority to monitor and enforce the Use Plan. IBAMA concentrated its efforts in the elaboration of a three-year Plan to develop four Reserves, but is yet to start the discussion of the Plan with local residents and with the Associação members.

Another importante change was the creation of a new municipality (in 1992), the Município Marechal Thaumaturgo. Residents of the Reserve hinterland areas are for the first time having the visits of politicians. The main promise made by the elected mayor is the building up of two "villages", one at Restauração (also one main focus of the Association's activities) and another at Foz do Breu. Thus, although very weak locally (the Vila Thaumaturgo municipality seat has no post service, no regular transportation of any kind, no bank, no telephone, no hospital, no priest), the mayor competes for authority over the reserve, concentrating his resources in the building of the villages.

SUBPROJECT 3: FOREST ENCYCLOPAEDIA

I. INTRODUCTION AND OBJECTIVES.

The idea is to collect an inventory of rubber-tappers' traditional knowledge in the Upper Juruá. A database will be created and the results will be published to reach the general public and to be used in school training.

II. WORK IN 1993.

In meetings held with the whole project team, it was decided that in 1993 priority would be given to results in the other three sub-projects. Work for the Encyclopaedia therefore concentrated in the preparation of guidelines and forms for field research. A summary of topics to be covered was distributed among participants and is being tested by biologists. Some fieldwork was also carried out less as an exhaustive study and rather as a survey of potential data. It indicated very good prospects.

III. FIRST RESULTS.

By now, some 300 useful plants are listed and most of them identified (Emperaire). Ethno-ecology was investigated and preliminary results were reached, concerning classification and practical knowledge of soils and of biological communities (Lewinsohn, Garcia, Marinho, Roig, Almeida) . Traditional knowledge about fish and fishing methods was elicited (Begossi and Amaral). Among other topics which were investigated were beliefs and omens related to success in hunting and strategies related to plagues (Cunha).

As examples of diversity, 32 different varieties of manioc were listed, with their characteristics and relative advantages. Strategies and criteria for choosing some varieties as against others were understood. 31 types of wood were listed for different uses in construction (Cunha).

A list of entries to the Encyclopaedia has been produced, as well as forms for some topics (ethnozoology, ethno-botany, ethno-pharmacology, hunting).

To find the best way to achieve respect to the population's intellectual rights is part of the research itself. We have included a clause to this effect in the

term of agreement signed by the Project with ASAREAJ in April 1993. Intellectual rights of traditional people are still lacking recognition, nationally as well as internationally (see M.C.da Cunha report to UNESCO 1993 on the subject, in annex). On the other hand, authorship in traditional knowledge is difficult to establish: this is one of the reasons that suggests the establishment of funds to deal with retribution of intellectual rights. We are submitting the idea to IBAMA.

IV. FRUSTRATIONS AND GOALS.

Work in the Forest Encyclopaedia has not reached cruise speed. For one thing, Manuela C.da Cunha, who coordinates this sub-project has been overwhelmed with administrative tasks. Material is being gathered, although still in a dispersed fashion, by both biologists and social scientists.

There is a need to train biologists in symbolic dimensions of cognition and to train social scientists in biological data collection. A graduate course both at the University of Campinas and at the University of São Paulo is planned during the first semester 1994 (March to June) to deal with these problems. Philippe Descola, an eminent French anthropologist, will assist in these courses. The next step will be the systematic training of local people.

Work in two neighboring Indian Reserves has been started. A great effort will be put into the Encyclopaedia this next year.

SUBPROJECT 4: ZONING

I. INTRODUCTION AND OBJECTIVES

The original project stated that the local population (ASAREAJ) required, as part of a management plan for the Extractive Reserve, a scientific base for zoning of the Reserve into a "mosaic of wildlife sanctuaries, controlled extraction areas, agro-forestry management areas, and intensive human use areas" (pp. 3, 22), preferably with the latter two categories restricted to no more than 5% of the total area (draft of Land Use Plan, 1992). The zoning of such a large and mostly still unexplored area of tropical rainforest would be achieved by a combination of the most modern technology available for analysis of remote sensing data, done by the LAPIG (= Georeferenced Information Processing Laboratory) of the Geosciences Institute of UNICAMP (directed by Dr. Alvaro P. Crosta), with field data on soils and vegetation collected in numerous accessible parts of the Reserve, along and away from the rivers, by members of the biological team, all combined into an operative Geographical Information System (GIS). The final zoning map of the Reserve, produced by this system with adequate supervision from ground truthing and realistic vegetation classification as well as observed distributions and abundances of useful and other plants and animals, would attempt to maintain the use patterns and zoning already sanctioned by the rubber-tappers and at the same time guarantee that all types of vegetation and all species present (not only those presently or potentially used by the human population) be protected in viable populations. This procedure would maintain a maximum of options for the future, based on sustainable use of the natural resources in the Reserve.

II. FIELD WORK IN 1993

General geoscientific information - geology, topography, soils, drainage patterns - was collected by Henrique L. Roig (associate of LAPIG) in a visit to the area in May and June 1993. The extreme heterogeneity of the substrate (with numerous interdigitations and gradational or abrupt contacts, in both horizontal and vertical planes, both in the soil and in the underlying sediments) was typical of ancient-environmental fluvio-lacustrine sediments (Solimões Formation) cut by more recent alluvial plains continuing the same process (Fig. 4-1). While not surpassing 100 m in vertical variation, the rolling relief in the older sediments (as ridges, hills and terraces) was strongly sculptured and associated with a relatively fine and clearly disciplined drainage system, showing deeply incised rivers undergoing great and rapid fluctuations (3-10 m) with heavy rains (Fig. 4-2). Unweathered rock was close enough to the surface to be exposed in most river-

banks and rapids, and numerous small hanging tributaries (with rapids or waterfalls at their mouths) could be seen (often used as a source of clean water by the population and rivergoers). Inundation areas of many types were recognized, including on high terraces away from watercourses (collecting rainwater only). The continued hydrological reworking of the landscape and substrate was evident in all sections examined and could be ascribed to factors running the full scale from macrogeological events (at the end of dry ages) through mesogeological tectonics (the Andes are only 200 km to the S and W) to microgeological variations (yearly and daily rainfall cycles). This excessive heterogeneity in the substrate is probably a major factor contributing to the high biological diversity of the system (see subproject 1 report), also helped by the generally eutrophic soils coming from numerous carbonate concretions (Fig. 4-1), that also slow down erosion and pedogenesis, maintaining the soil shallow (cambisols or inceptisols) in parts of the Reserve.

The "Campina" areas in the reserve do not have deep sandy soils, but are associated with periodically flooded basins similar to the Pantanal; true Campina may exist in the extreme north of the Reserve (upper Rio Bagé, visible in the satellite images), but was not mentioned by RADAMBRASIL. Its unique flora and fauna would require special treatment in the zoning; as the sandy substrate is inapt for agriculture, this should not present difficulties.

Sand is commonly present in the very heterogeneous soils, and accumulates extensively along the rivers (point bar deposits), but most soils are silty, loamy or even clayey and excellent for agriculture and forest regeneration and productivity. The soil type in a given site is not predictable, as the alluvial mosaic is fine-scaled and not determined in its formation; it can be estimated by a trained eye, however, by the plants and animals growing on it (this information will be an important part of the Encyclopedia, subproject 3). Hydromorphic or organic soils, common in inundation areas at all levels, are favorable for some crops.

True metallic mineral resources are unknown and not very likely in the region, though older rocks occur to the W of the Juruá and north of the Amônia quite near the Reserve. Different-sized grains of earth and refractory clays are readily available for construction and domestic use, but gravel would have to be imported. The region is famous for its fossil beds, including well-preserved extinct giant ground sloths and other Pleistocene and Recent species.

III. INTERPRETATION OF SATELLITE IMAGES

Two nearly cloud-free recent Landsat images exist for the region, one taken in October 1989 and the other in September 1992. The latter, including only bands 3, 4 and 5, covers 99% of the Reserve area and was made available to the Project through an agreement with CEDI (= Ecumenical Center for Indian Documentation) in São Paulo; the former, with all seven bands, covers nearly 90% of the Reserve, was purchased by the Project from INPE (=National Institute for Space Research), and gave persistent defects in resolution and noise that have not yet been satisfactorily removed. Both are in digital form, and both have been stored on the optical disk purchased by the Project, along with a variety of partial and global reclassifications.

This information has been combined with others through the procedure shown in Figures 4-3 and 4-4. Analogic information was digitalized in a form compatible with the Landsat images, through the use of an AutoCad system, ASCII for verbal information, and GRASS for synthesis. Consecutive cycles of reinterpretation of the original images (which come in 256 shades of grey) by the inclusion of biological data on forest systems and land use (gathered through the printing of pixel-level images taken into the field and compared with local reality using rivers or GPS for reference) have led to classifications such as those in Figs, 4-5 and 4-6, where different types of vegetation and cultivation can be recognized and generalized to all areas of the Reserve, including those of difficult access. These feedback cycles (growth truth/image reinterpretation) will continue in 1994, in order to guarantee that the final classification is as realistic as possible in relation to actual land use and biological characteristics.

The final resolution level chosen for the data is <200m, representing <45 pixels (of 30 x 30 m) in the satellite data or >125,000 separate cartographic units in the final 1:250,000 zoning map. The vegetation/topography interaction causes a single vegetation type to give several different classes in adjacent pixels; rivers may also show very different classes on their facing margins. This "texture", partly caused also by the sun's inclination and the projected shadows on the surface, is important in the final classification. Except in the case of narrow creeks, this resolution (200 m) also may represent an acceptable measure of general biological characteristics, especially at the system level (for individual populations, important differences can be detected all the way down to the cm level, especially when related to soil, drainage, and vegetation/light structure, but such can never be detected from a satellite nor stored and analyzed properly in a Reserve-wide zoning). When a single pixel shows as a clearly distinct class, unrelated to adjacent ones (such as a small body of water, patch of campina, garden, or house), this can be respected in the final classification.

To date, over-all unsupervised classifications for the Reserve have been generated with 7, 10, 15, 19, and 25 different classes, and in each case checked

against ground data (to identify and name the classes); one much more realistic image (Fig. 4-6) has also been produced through reclassification with color-composition RGB supervision, now in the field for further ground verification in a number of selected areas being visited by the biological team.

In the 19-class interpretation, 5 classes of human land use could be distinguished, possibly related to naked soil or pasture, beach crops, upland crops, regeneration, and houses; ground truthing is underway. Most levels of classification recognized 4 fundamentally different types of vegetation, with some finer detail due to topography or mixed systems: this is also being tested.

In all of the classifications, a third to a half of the classes have little or no meaning as landscape units, being only results of texture of the forest canopy and the angle of the sun. The final supervised classification will be done with STC (Semivariogram Textural Classifier) using information from a number of adjacent pixels to smooth these effects and give a realistic picture of the vegetation (each cycle occupies many hours or days of continuous computing).

IV. DIFFICULTIES ENCOUNTERED IN THE G.I.S. WORK

Besides the noise in the satellite images, mentioned above, some difficulties were encountered in fixing criteria and scales for the final map, and in ground truthing - always a source of surprises and uncertainties. The GIS information has not always been consistent with GPS measurements in the field, and even the drainage and Reserve limits are still subject to some variance.

V. GOALS FOR 1994

Using supervised and textural-averaging classifications related to the flux of new data from the field, an optimal image of land use and vegetation will be obtained. In collaboration with socio-economic data provided by ASAREAJ as well as details of biological and phytosociological patterns, this will be transformed into a proposal for zoning, to be approved by ASAREAJ and IBAMA.

VI - DIAGRAMS

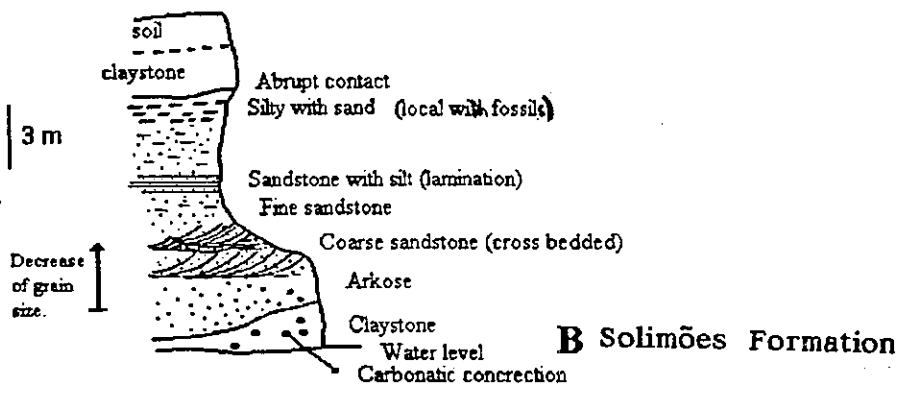
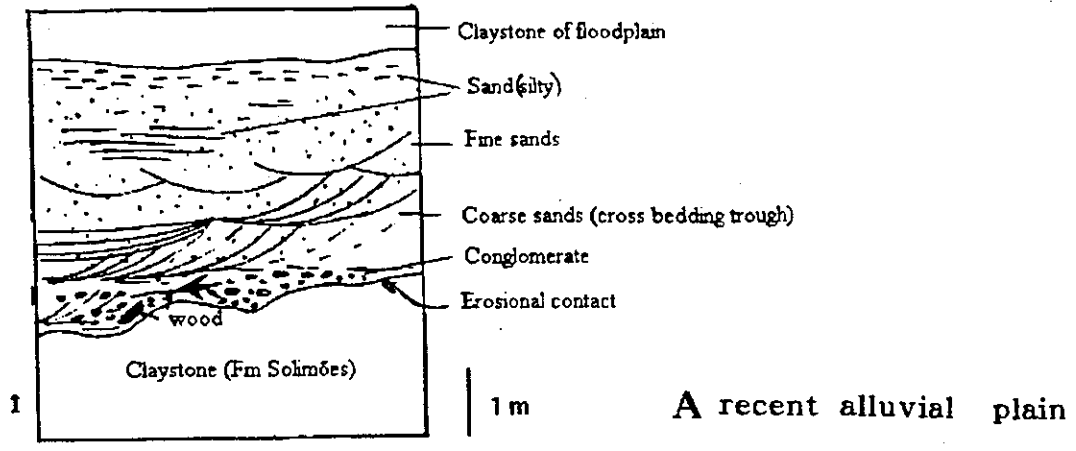


Fig. 4-1: Schematic profile showing vertical lithological variation and sedimentary structures:
a) Section of the Tejo river, b) Section of the Juruá River

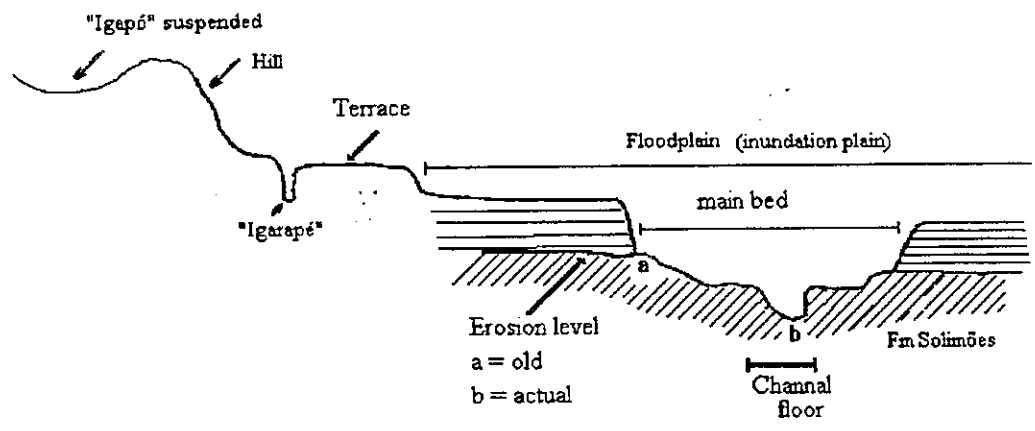


Figure 4.2: Rio Tejo transversal profile, showing the main geomorphological characteristics.

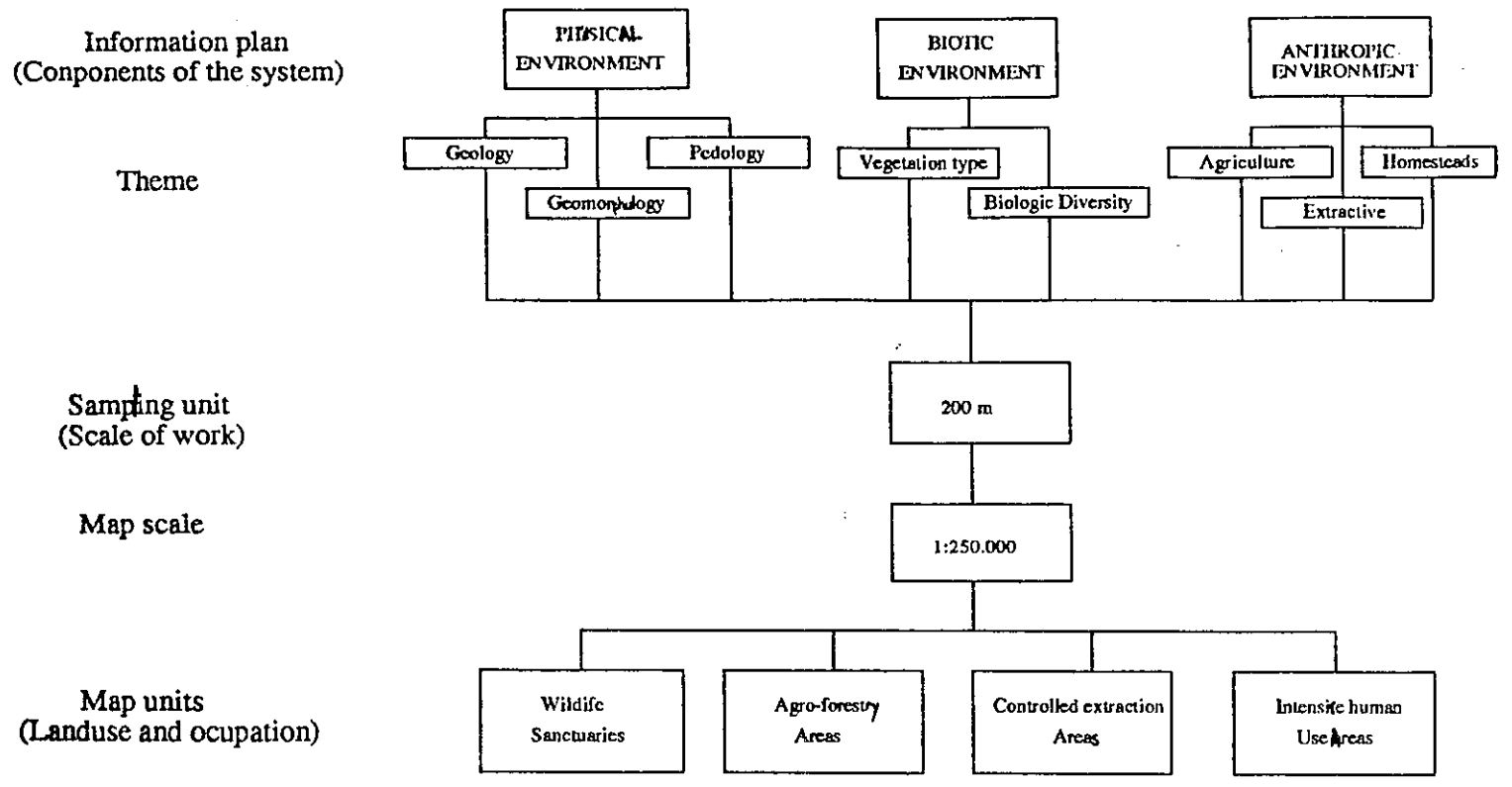


Fig. 4-3 Criteria adopted for making the zoning map

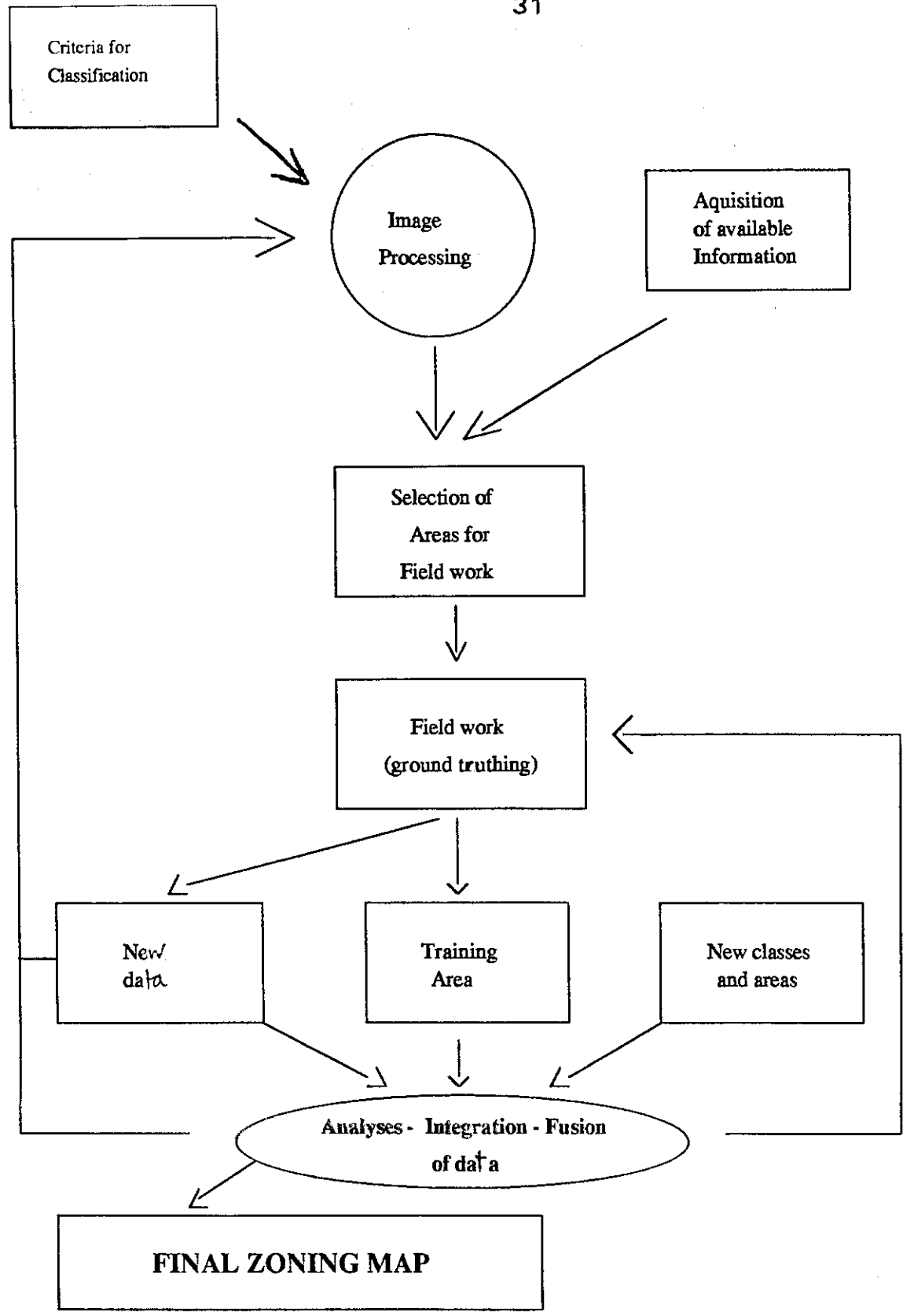


Fig. 4-4 Flow chart for work

ADMINISTRATION

PROJECT ADMINISTRATION

Funds are managed, upon signed request by Manuela Carneiro da Cunha, by FUSP, the Fundação de Apoio à Universidade de São Paulo. Ours was FUSP's first project (a circumstance we did not know from the start) and procedures were developed with some hesitation at first. FUSP is still not very effective with scientific imports, (imports facilities being one of the reasons we had chosen it), partly due to change in the laws governing any acquisition by a public office. FUSP, on the other hand, has proven effective and cautious in dealing with salaries and taxes.

General administration is run by Manuela Carneiro da Cunha, with the help of a secretary, provided for by the University of São Paulo to the Núcleo DE História Indígena. Administration is a very heavy job, particularly because one has to supervise local administration and accountancy in Cruzeiro do Sul, operating with sui generis local methods and demands. In September, Manuela C. da Cunha will be moving to the University of Chicago: there is a strong need for an assistant to be found, from March 1994 on, who would be trained in the current procedures. Neither Mauro Almeida nor Keith Brown, the other two coordinators of the project, can possibly take up the daily administrative chores: an effective assistant is vital for the continuity of the project.

From March 1993 to August 1993, we were expecting Antonio L. Batista DE Macedo to be the local coordinator both in Cruzeiro do Sul and in the Reserve. Francisco Barbosa de Melo, whom we had planned would be the incumbent, was not available at the time, being then the coordinator of the Juruá Branch of the Conselho Nacional DE Seringueiros. Macedo is a very bright and charismatic character, with little formal education, and was the source of many projects being undertaken in the Juruá. For example, the conception of the Health project presently being run by Health Unlimited was originally his, as well as the idea of expanding the Reserve to include the whole Upper Juruá and not just the Tejo river, like the proposal first formulated by Mauro Almeida. For some reason, Macedo did not really take up the activities in the reserve, and limited himself to Cruzeiro do Sul, where he did a fine job. From April 93 on, he bought nearly all the boats and motors needed, had them fixed and repaired, and organized, together to some extent with Manuela C. da Cunha, the general infra-structure. He also acted, as he had done before, as an advisor to the Upper Juruá Rubber Tappers Association (ASAREAJ- Associação DE Seringueiros e Agricultores da Reserva Extrativista do Alto Juruá). In August 93, after an evaluation meeting with the Association (ASAREAJ) Board in the Reserve, it was decided that coordination in Cruzeiro do Sul would rest with Macedo while Francisco Barbosa de Melo (Chico

Ginu), who had by that time been replaced as head of the CNS-Juruá, would be the coordinator of the headquarters in the Reserve. The original salary for the local coordinator was split between Macedo and Chico Ginu. Delays in the construction of the headquarters in the Reserve (see below) contributed to impair Chico Ginu's performance. Also, we now feel that a permanent member of the academic team is needed in the headquarters for the next two years. He should work in strong connection with the local coordinator to administrate on behalf of the Project the headquarters' activities in training, courses and consultancy and to prepare someone from the Reserve to take up the responsibilities involved.

INFRA-STRUCTURE.

This was the year for buying most of the equipment, provide for staff, boats, local headquarters, etc., a much time-consuming endeavor which took a lot of energy and some frustration as well. Some detail will be given as regards boats and headquarters.

Boats:

At present the project owns

- A 10 ton boat, with a diesel motor of 22 HP, equipped with a generator (3 kva, 5 HP) and a freezer.
- A 4.8 ton boat, with a diesel motor of 18 HP.
- One dug-out canoe carrying 1,200 kgs, with a 12 HP engine.
- One dug-out canoe carrying 800 kgs with a 10.5 HP engine.
- One dug-out canoe carrying 800 kgs with a 12 HP engine.
- One aluminum boat with a 25 HP outboard engine.

The 22HP, the 18 HP and one of the 12HP engines are second-hand and came along with the two larger boats, which are also second-hand. We were able to purchase these two boats (along with their three motors) for grossly the sum envisaged for just one boat. The smaller boat was a bargain (1,098.90 US\$) and has proved very useful.

The same thing happened with canoes. We had envisaged 500 dollars for one and we were able to buy three of them for 329.67.

Funds for one of these motors (12 HP) were provided for by researchers, since there was no provision for it in our budget .

Canoes and boats have to be repaired quite often (at least every dry-season), since the river is loaded with floating and dangerously submerged logs. There is consistently at least one motor being repaired, and spare parts in Cruzeiro do Sul are often not available. Canoes will probably have to be replaced before the end of the project. They do not last more than two years. At least one motor will have to be replaced.

The two larger boats are essential for traveling during the wet season in the tributaries of the Juruá, and at any time on the Juruá itself. Canoes are vital for the headwaters, and during the dry season for all the tributaries. To improve living conditions, the large boats have now been provided with tables and benches; one

of them has cabinets, electricity and a freezer. The smaller one uses a gas lamp at night. Both are provided with a small kitchen and a toilet. They can be used to work and to sleep (in hammocks) as well. The larger will accommodate 7 to 8 people (including the 2 people crew) while the smaller will easily accommodate 4 to 5. If used only for traveling and not for sleeping in, they can shelter a much larger crowd. Of course, engines are noisy and boats are not the best place to work in.

Headquarters.

Headquarters are necessary, mainly during the dry season, for researchers, and the whole year round for training. The chosen spot was next to Restauração, on the upper Tejo river, since it combined closeness to a variety of ecological systems and population density. We made plans for a four-part building (one for eating, one for working, one for sleeping and one for bathing) which would provide for training courses, material and data storage.

These headquarters were the source of much trouble, which I will now explain.

The location was chosen in April 93, and a term of agreement was signed with the Association. The resident of the area also gave his permission. A carpenter and boat-builder was contacted, gave an estimate, but resigned from the job before even starting it. A construction firm from Cruzeiro do Sulky was approached, and a contract was signed. The building was to be ready by the end of July, but work progressed slowly and by late October it was still not ready. Out of the four parts of the headquarters, there were (inadequate) roofs covering two parts only, and there were walls in almost three of them. An array of excuses was presented, as the firm kept pressuring for more funds. Some of them were justified, but the firm was told that any further disbursing would be contingent on the completion of the work.

Although the project had the authorization to use local timber for the building and local palm leaves for roof coverage, we had instructed the constructor to buy planks and palm leaves from outside the Reserve. Yet, since the river was low, and the work was supposed to be completed until the end of July, he did not comply. The resident in the area was understandingly worried with a large extraction of palms. He also complained that unnecessary trees had been felled.

On the first week of November, a representative of IBAMA (Instituto Brasileiro do Meio Ambiente) came to the area. He had been called by the Association (ASAREAJ) to halt deforestation by a cattle rancher on the Fazenda Natal, encroached in the Reserve. The IBAMA representative came from Rio Branco, Acre, and from the outset, he declared to be favorable to cattle ranching and publicly defended the creation of 'vilas' (small villages) in the Reserve. He dismissed the importance of deforestation and instead put an embargo on the construction of the headquarters and a fine on the construction firm. As we came to realize later, he had legal grounds to do it, although the act was clearly political

and to be connected to local politicians' hostility to the Reserve. It appears that since the government, although having created the extractive reserve in the Juruá, has not yet passed the titles to the residents, these residents have no legal title to authorize constructions. As IBAMA lawyers later pointed to us and to the astonished president of ASAREAJ, in fact no resident may legally build or even repair a house in the Reserve. Manuela C.da Cunha and Mauro Almeida have been twice (in early December 93 and end of January 94) to the IBAMA in Brasília, where CNPT (Centro Nacional das Populações Tradicionais) is trying to find a way out of this imbroglio. In fact, IBAMA has incorporated the main lines of our project into its pilot project for G-7 funds. As a swift solution to the headquarters problem, IBAMA is now offering to sign a term of cooperation with the University of São Paulo, in which it specifically states the construction of headquarters in the Reserve. Since this delay also meant deterioration of the buildings, the ASAREAJ president and Manuela C.da Cunha took it upon them to have covering plaited palms bought from outside the Reserve, transported and used to cover the four buildings. This work should be ready by early March. In January 1994, although not ready, the headquarters hosted an environmental education course, paradoxically under a term of agreement linking ASAREAJ with IBAMA. It had also served in late October to host a training in organization. It is also being presently used by a biological team.

We think the headquarters should be completed as soon as possible, once the legal impasse has been solved. Contract with the construction firm should be terminated, and a combination of local people and some skilled workers from outside (such as a plumber) hired.

FINAL REMARKS.

MAJOR SETBACKS

1. Lack of definition about the legal rights of ASAREAJ and the inhabitants of the Reserve, since the Government has not yet passed titles to the land.

2. This leads to a similar lack of definition about the legal status of the base itself, which however should be solved shortly through an agreement between IBAMA and the University of São Paulo.

3. Conflicts between local representatives of IBAMA and IBAMA officials in Brasilia as regards guidelines for the Reserve and for our project.

4. Conflicts between local municipality, Acre politicians and Reserve Association (ASAREAJ) which depends from the Federal Government. 1994 being a year of general elections, this next year will no doubt be even more difficult.

5. Except for the Health Unlimited project which seems to be running smoothly, none of the other projects in the area have started. This puts an increased pressure on our program coming from local demands of immediate assistance in areas such as education, agriculture and commercial goods. Research and monitoring devices per se, in the absence of other programs, can appear futile to the population.

6. Construction of the base is still not finished, due to 1 and 2 (above) and to construction firm.

7. Lack of an assistant to help in coordinating teams and in administration of the project.

8. Lack of a permanent academic resident as an administrator of the base.

9. Difficulties from some members of the biological team in dealing with local demands, which points to the necessity of hiring someone to take care of logistics (food, fuel, schedules, pilots and external demands) during expeditions.

PROPOSED MEASURES

1. Pressure on government and IBAMA to solve legal status of residents of the reserve.

2. As a result, finishing of the base and installation of facilities both at the base and in the boats.

3. Systematic training of local teams should now start as a priority.

4. Local coordination by an academic, permanently residing in the base.

5. More careful management of expeditions, resulting in better infrastructure.

A great deal of work has nevertheless been done, as can be seen in this report, and we are trying to find solutions to those of these problems which are within our reach.

GLOSSARY

ASAREAJ	Associação de Seringueiros e Agricultores da Reserva Extrativista do Alto Juruá
CNPT	Centro Nacional de Desenvolvimento Sustentado das Populações Tradicionais, IBAMA
CNS	Conselho Nacional dos Seringueiros
CNS-Juruá	Conselho Nacional dos Seringueiros, Juruá Branch.
IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, Ministério do Meio Ambiente e da Amazônia Legal.

Financial statement

Name of organization: Fundação de Apoio à Universidade de São Paulo/FUSP

Signature of Director:

Title:

Date of report: March 4, 1994

Period covered: March 1, 1993 to February 28, 1994.

Total grant:	\$ 488,925
Total disbursed to FUSP this fiscal year:	\$ 191,441
Total of Expenditure:	\$ 143,349.73

Project operating expenses	Original Total Budget	Budget 1993	Expenditures	Variance
Air Tickets	38,200	12,733.30	19,828.38	-7,095.08 ^a
Per diem	153,600	51,200.00	31,063.21	20,136.79
Permanent equipment*	67,826.31	51,074.82	36,458.61	14,616.21
Supplies*	28,075.00	9,358.33	7,949.23	1,409.1
Documental material*	8,000.00	2,666.66	1,506.35	1,160.31
Services*	113,223.70	37,741.23	33,148.17	4,593.06
Salaries and wages*	66,000.00	22,000.00	13,395.78	8,604.22 ^b
Workshops and meetings	14,000.00	4,666.66	0.00	4,666.66 ^c
Total	488,925.01	191,441	143,349.73	48,091.27

GRANT BALANCE TO BE CARRIED FORWARD TO NEXT FISCAL YEAR \$48,091.27

^a . Air tickets prices have raised substantially. The amount of flights was grossly what had been anticipated for this year, namely one third of the total. (26 SP-CS-SP, 2 Manaus-CS-Manaus, 1 Rio Branco-CS-Rio Branco, 4 SP-Brasilia-SP).

* . See itemized lists attached.

^b . Released time to be used in 1995.

^c . First meeting was postponed to end of April 1994.

ITEMIZED LISTS

I. Permanent Equipment	Original Budget	Expenditure	Variance
Aluminium Boat	1,236.08	1,236.08	0
1 25 HP Outboard engine	1,738.96	1,738.96	0
2 dug-out canoes	184.50	329.67	-145.17
1 engine 12 HP	1,402.21	1,402.21	0
4.8 ton wooden boat with 18 HP diesel motor and 10.5 HP gasoline engine	7,000.00	2,353.99	4,646.01 ^a
Ten ton wooden boat with 22HP diesel motor	14,500	5,747.13	8,752.87 ^b
Rewritable optical disk	4,500	5,737.24	-1,237.24
GPS	1,952	2,033.79	-81.79
Binoculars	200	370.8	-170.8
Building of project headquarters	12,500	10,451.31	2,048.69
Generator 3KVA and 5HP diesel engine	2,200	1,639.34	560.66
Two solar batteries	2,000	1,405.11	594.89
Freezer	600	557.38	42.62
List of items enclosed in March 15 letter	1,312.55	1,455.6	-143.05
Total	51,326.3	36,458.61	14,867.69

II. Supplies	Original Total Budget	Budget 1993	Expenditure	Variance
Fuel	23,000.00	7,666.66	5,196.88	2,469.12
General supplies	4,175.00	1,391.67	2,588.61	-1,196.94
Xerox	900.00	300.00	163.74	136.26
Total	28,075.00	9,358.33	7,949.23	1,408.44

III. Documental material	Expenditures
Satellite images	670.33
Books	836.02
Total	1,506.35

^a . This boat was a bargain.

^b . We were able to buy good second-hand boats (no new boats available anyway) with second-hand engines for a much better prices than had been expected.

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IV. Services	Expenditures
Digitalization of cartographic data	3,091.17
Air taxi rental	1,344.54
Boat rental	3,041.20
Maintenance of boats	1,731.94
Boatmen	1,180.39
Preparation of data base	2,837.29
Other services	5,403.63
Taxes on services	154.50
Messages, mail, pharmacy	76.61
Conselho Nacional de Seringueiros	4,882.18
ASAREAJ	9,295.7
Bank taxes	109.02
Total	33,148.17

V. Salaries and wages	Original Budget	Budget 1993	Expenditure	Variance
Salaries and taxes	48,000.00	16,000.00	13,395.78	2,604.22
Salaries			10,361.90	
Taxes			3,033.88	
Released Time	18,000.00	6,000.00	0.00	6,000.00
Total	66,000	22,000	13,395.78	8,604.22