

Serving People, Saving Nature

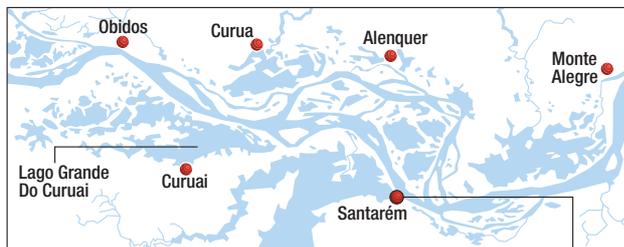
Brazil – One of Four Case Studies

Brazil: Várzea Project

The “Várzea” or floodplain of the Amazon River is one of the most important ecosystems of the basin both ecologically and economically. An environment characterized by high biodiversity and great ecological productivity, its resources have sustained the human population and economy of the Amazon for centuries. While world attention has been focused on the destruction of upland forests, the Várzea is also under great pressure. The intensification of commercial fisheries, commercial logging and the expansion of extensive cattle and water buffalo ranching are leading to the depletion of the Várzea natural resources and the degradation of its productive capacity. This process, in addition to threatening one of the most important ecosystems of the basin, also threatens the viability of smallholder settlements on the floodplain.

Concerned with the depletion of their natural resources, especially fisheries, floodplain communities have organized to assume control of local lakes, grasslands and forests and to impose rules to regulate access and use of their natural resources. In recent decades, a large number of community management initiatives involving partnerships between floodplain communities, grassroots organizations, and NGO's have emerged. IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis), Brazil's environmental protection agency, recognized their potential and has been revising its management policy to incorporate these initiatives into a formal co-management system for Várzea natural resources.

One of the major regional experiments in co-management is taking place in the municipality of Santarém. Over the last ten years, floodplain communities, the local fishers' union, environmental NGOs, IBAMA and other governmental agencies have undertaken a series of activities with the objective of implementing and consolidating a regional co-management system for the natural resources of the floodplain. The Várzea Project of IPAM (Instituto de Pesquisa



The Santarém Region of the Lower Amazon



Ambiental da Amazonia) has played a key role in this process. For the last ten years IPAM and other partner organizations have undertaken a series of projects including research on floodplain resource use, development of collective fisheries agreements, agricultural extension, environmental education, leadership development, institutional capacity-building and environmental policy, which are contributing to the construction of a model for the sustainable management of the Várzea that could be adapted to other floodplain regions of the Amazon.

Following a three-year research project carried out in the region, the Várzea Project was created in 1994 with financing from WWF and DFID, the UK Department for International Development. The project was developed in two five-year phases: Phase 1 from 1994 to 1999 and Phase 2 from 1999 to 2004. In Phase 1, the actions focused primarily on the region of Ituqui. The main objectives were: (1) to develop and implement a management system for the Ituqui lake system; (2) to work with communities to implement the agreement, and; (3) to strengthen the organizational and technical capacity of the Fisher's Union to disseminate the model to other communities in the region. In Phase 2, the project expanded the study area to include several other regions of the municipality, while the co-management system and the environmental education programme covered most of the floodplain region of Santarém. In addition, the project established partnerships with groups working in different locations between Amapá, in the Amazon estuary and Iquitos, in the Peruvian Amazon. The project also sought to implement integrated community development projects in the regions of Ituqui, Tapará and Aritapera.

Through this process, the project has developed a sustainable management strategy for the Várzea that seeks to optimize global production by integrating fisheries, cattle raising, annual and perennial crop production and habitat restoration. The project consists of four components:

(1) Lake management programme: The objective of the lake management programme is to undertake the research needed to develop management plans for floodplain lake fisheries. In the first phase, research concentrated on four aspects of the ecology of lake fisheries: (a) experimental fishing in eight different lakes in the Ituqui region to obtain basic information on the structure and composition of fishing communities; (b) a study of the biomass and species composition of aquatic macrophyte communities, (c) a study on the ecology and management of the pirarucu, a sedentary lake species of great commercial value, and; (d) a long term study of household fishing activity on five Ituqui communities.



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People on Ituqui Island moving hundreds of tree seedlings which are to be planted out in the Várzea near Santarém, Para, Brazil

(2) Fisheries development programme:

The fisheries development programme has concentrated on two main activities, development of a marketing system for pirarucu and a study of the fisheries sector and its role in the regional economy.

(3) Environmental education programme:

One of the major goals of the project is to develop the leadership skills needed for the co-management system now being implemented. The formal and non-formal educational programmes developed in the first phase were revised and consolidated during the second phase.

(4) Fisheries policies and management

institutions programme: The fourth element of the Várzea project seeks to develop policies in support of the co-management of floodplain natural resources and to strengthen management institutions at regional and community levels.

These components have led to substantial biodiversity benefits, most notably the restoration of fish populations and the protection and regeneration of native forests.



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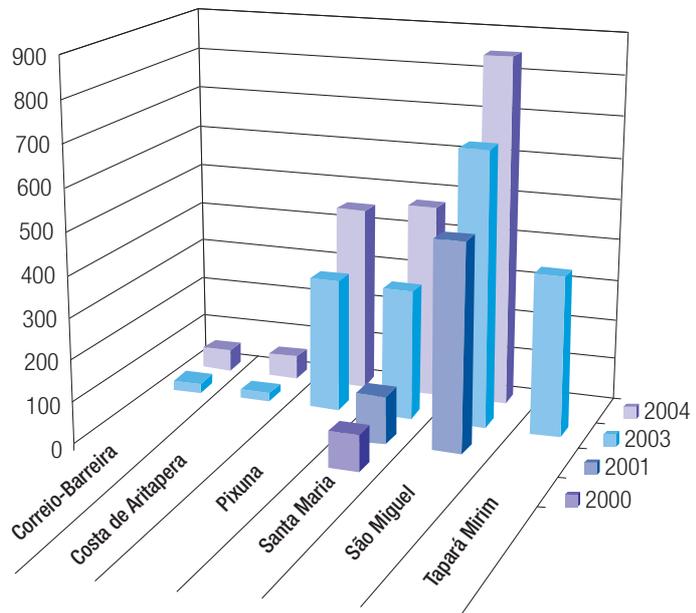


Brazil: Várzea Project

The overall livelihood objective of the Várzea project is to increase the capacity of floodplain communities to sustainably manage their local environment to raise household income and improve their quality of life. The Project seeks to achieve this overall objective by: a) strengthening local and regional institutions for the participatory management of floodplain resources; b) increasing income generated by improved ecological productivity of community management systems; c) implementing formal and nonformal educational programmes for schools and community and regional management organizations; and d) developing and implementing policies in support of the participatory management of floodplain resources.

This study found that lakes with functioning fishing agreements were 60% more productive on average than lakes without such agreements. The differences in productivity, despite similar effort levels, can be attributed to the success of communities with functioning agreements in eliminating outside commercial fishers. Figure 1 shows trends in pirarucu populations in the six communities participating in the project. In cases in which the project has been functioning two years or more, lake pirarucu populations have grown steadily, with the highest growth rates in those lakes with depleted pirarucu fisheries when they joined the project (see the last column) and lowest in communities that have been managing their fishery for more than ten years.

Figure 1: Trends in Number of Pirarucu Counted in Visual Census (unit:Real)



The way in which community-managed pirarucu fisheries generate income differs among participating communities. In the community of São Miguel Island, for example, fishing is conducted individually over the course of the six-month season (June-November). Income from the fishery goes to the individual fisher with a mark-up of about 21% charged by the community association that markets the catch. This year, the project had brokered an arrangement with a large processing company in Santarém interested in developing a market for community-managed pirarucu. The 2004 harvest, for example, produced 5.669 kilos of filet with a total value of R\$33,764. Of this total, fishers received R\$26,726 and the association received R\$7,037.50 (21%) or a net of R\$3,329.10. This was the highest income the association had made since it started marketing the catch directly. Income to individual fishers is highly variable because of differences in total effort and skill.

In the community of Santa Maria do Tapará, fishing for pirarucu is prohibited year round. The communities decided to organize a 3-day collective fishing expedition every second year. On the basis of census results and trends in the growth of the fishery, the community decided how many adult fish to take. The catch was marketed and the proceeds spent according to a prearranged plan. In 2004, the community caught 36 pirarucus with a total value of R\$5.016. This was divided among the 35 fishers and 6 women who participated in the fishing event. Part of this money was divided among the fishers based on how much time each person had invested in patrols and supporting activities. The rest was divided between the church, the school and the community association.

While the project has only been functioning for three years, and some communities have only just started participating, community evaluation of the project is highly positive with 91% expressing interest in continuing the project. According to 55% of those interviewed, the project has reinforced the idea of management in the community.

Following the management intervention strategy described earlier, a major objective of the project is to increase agricultural production, diversifying household income and reducing dependence on fishing. Two other concerns in working with farmers are to reduce risk of crop loss due to drought and increase flood season income. Over the course of the project the Projeto Várzea has tested four main production systems: traditional annual crops (corn, beans, watermelon and squash), irrigated vegetables (tomatoes, green peppers and cabbage), perennials (bananas and assorted fruit trees) and raised planting boxes to produce flood season vegetables, mostly tomatoes.

- **Annual crops:** The main crops that were cultivated included watermelon, beans, corn, manioc and squash, though only one community cultivated all six. Overall, the most important crops in terms of production and income were beans and watermelon. In 2003, a total of 7.6 hectares was cultivated in five communities (see Table 1). Total gross cash income was R\$68,373 and total net cash income \$52,317. Per capita returns to labour averaged R\$698 not including consumption, or about 2.7 minimum salaries. Given a three to four month season this works out to about a minimum salary per month for each family. This sum is about R\$130 (25%) more than the average agricultural income.

Table 1: Summary of Annual Crop Production Extension Programme

Community	Farmers	Crops	Ha	Total (R\$)	Net (R\$)	Per family (R\$)
Pixuna	26	6	3.2	45,409	34,566	1,329
Santa Maria	24	5	1.5	12,957	10,564	440
Tapará-Miri	7	2	1.2	6,282	4,931	704
São Miguel	18	5	1.7	3,725	2,256	125
Total/Average	75	6	7.6	68,373	52,317	698

- **Farinha (Manioc/Cassava Meal) Production:** The Project provided financial and technical support to a group of farmers so they could produce farinha rather than purchase it at prevailing market prices. As can be seen from Table 2, this project involved 13 families who obtained both farinha for family consumption as well as earning the equivalent of 90% of a monthly minimum salary of R\$260. Total commercial value of the crop was R\$436 per family or about R\$73 per month for the six month growing season. Participants were unanimous with regard to the importance of the work, and approximately 80% of respondents affirmed that the farinha project had had a significant impact on household income.

Table 2: Annual Farinha Production and Income, 2002-2004

Period	Production (kg)				Income Per Family (R\$)
	Families	Family Consumption	Marketed	Total	
2002	6	1,280	962	2,242	160
2003	13	4,989	2,836	7,825	218
2004	13	2,576	3,094	5,670	238

- **Planting boxes:** The third subproject has involved production of tomatoes in raised planting boxes during the flood season. The results are promising. Families harvested about 130 kg of tomatoes per ten meters of planting box over the three-month planting cycle. At R\$1.5 - R\$2.0/kg this system provides between R\$195 - R\$260 per box during the flood season or about R\$500 per family, equivalent to a monthly income of R\$175, about two thirds of the present minimum salary. One advantage of this system is that it can provide a secure income source even during years of exceptionally high water.
- **Perennials:** Work with perennials has focused primarily on cultivation of bananas. The project began with five families and was recently expanded to 19 families. Data for 2003 from one of the five farmers involved in the pilot project indicate that he obtained R\$1,978 from 120 plants on 0.14 ha. His monthly income was R\$164/month or two-thirds of the present minimum salary. These results indicate that where conditions are appropriate, bananas can provide a significant supplementary income source for Várzea families.
- **Community Seed Funds:** One common limiting factor for farmers is capital to cover costs of purchasing seeds, inputs and equipment. To overcome these problems, groups of farmers in each community formed seed funds with an initial donation of seed by the Project. Farmers receiving seed agreed to return twice the quantity of seed they borrowed either in seed or money at the end of the season. Four community seed fund groups were started in the Ituqui region with groups drawing up by-laws and electing leaders to administer the funds. When the extension programme shifted to the Tapará region, seed funds were started in the four communities the Projeto Várzea is working with in this region. These funds doubled their initial capital last year.

In general, respondents were unanimous regarding the importance of the extension programme, with 34% considering it very important and 66% important. Almost half the respondents (42%) believe that they have increased production as a result of the project while more than a third (37%) state that they have begun cultivating new species.

In addition to farming, the Project is experimenting with other income earning activities that could complement income from farming and fishing. Two main activities now being tested are beekeeping and shrimp fishing:

- **Raising Native Stingless Bees:** The stingless bee project was conceived as a way to provide supplemental income for households and also to strengthen interest in the quality of community habitat. Raising stingless bees is a traditional activity in floodplain communities and many families have several hives. The main contribution of the project was the introduction of modern hives that separate the area of larvae production from that of honey storage so honey can be removed without damaging the rest of the hive. In addition, specialists in stingless bees were invited by the project to provide technical assistance to community beekeepers. The Projeto Várzea is now working with a total of 52 beekeepers in five communities who maintain a total of 383 hives or an average of 5 per family. The Projeto Várzea has sought to market the honey with a label indicating that it is produced by community associations and is 100% pure. Stingless bee honey is increasingly sought after in Santarém and the price of honey has increased from R\$10 to R\$15 - R\$20 a litre. Average annual income for project beekeepers increased from R\$202 to R\$249 (almost a minimum monthly salary) since the project began. The beekeeping project is considered to be an important addition to household economic options by almost 90% of respondents.

- **Shrimp Fishing:** Over the four month period each fisher caught 319 kilos of shrimp, or an average of 64 kilos per month (see Table 3). Shrimp were sold at R\$6/kg for large shrimp and R\$5/kg for medium shrimp providing each family with a total income of R\$1.305 for the five month period or about R\$261 a month, equivalent to the legal minimum salary.

Table 3: Monthly Capture and Sales of Shrimp, Santa Maria, 2004

Month	Days	Kilos	Net Return (R\$)
August	17	89	377
September	25	143	545
October	29	216	876
November	26	168	718
December	5	23	95
Average Month	20,4	64	261
Total	204	319	1,305

The five different initiatives that the project is testing generated a total annual income of R\$5.166 per family (see Table 4).

Table 4: Total Annual Returns per Activity and Family

Activity	Average Income (R\$)	Period
Annual crops	698	Aug-Feb
Farinha	436	Aug-Feb
Planting boxes	500	Apr-Jul
Bananas	1.978	All Year
Beekeeping	249	Aug & Feb
Shrimping	1.305	Aug-Dec
TOTAL	5.166	

In addition to income benefits, however, the Project has also contributed to livelihoods in other ways. First, it has strengthened community/stakeholder capacity to work together to resolve collective management problems that threaten individual and collective well-being. Strong and effective local institutions are essential to the sustainable management and conservation of floodplain resources. While the focus is on management issues, the organizational skills acquired by community members contribute to the group's ability to deal with other collective issues or social dilemmas, thereby making possible progressive improvements in the quality of community life.

Project activities for strengthening community/stakeholder organizational capacity to manage and market their natural resources have involved formal educational activities such as floodplain community schools; local/community resource management organizations; and regional floodplain management organizations. These three different activities are mutually reinforcing. Community schools serve as focal points for dissemination of ideas about the community environment and as centres for development of school-community conservation and management projects that may directly support related community initiatives. At the same time, regional floodplain organizations such as lake fisheries councils and Fishers' Unions provide the institutional basis for floodplain co-management in the first case and political bureaucratic representation for floodplain residents in the other. The analysis shows the following results:

- **Participation in Local and regional organizations:** Várzea residents are generally involved in more than one organization. Of the people interviewed for this evaluation, the largest proportion (23%) were members of the Municipal Fishers Union, followed by community associations (19%), lake patrols (18%), Regional Fisheries Councils (13%). Some 27% of respondents were affiliated with a variety of other kinds of organizations including soccer clubs, pirarucu fishers association, church groups and school councils. On average respondents participate in 12 meetings per year, with the exception of church related activities where the average was 28 meetings annually. Respondents rated their participation as 8 of a possible 10 points, the same value they gave for the performance of the organization.

- **Environmental Education Community**

Schools: The environmental education programme was developed in the first phase of the Project in collaboration with teachers and schools of the Ituqui region. Two initial activities included a needs assessment of Ituqui schools that was presented to the Municipal Secretary of Education, and preparation of a set of themes that would serve as the basis for a course in environmental education of the Várzea. Over the course of the last five years, the training programme was extended to the four Várzea districts of the municipality: Ituqui, Tapar, Aritapera and Urucurituba. A total of 53 schools, 175 teachers and 4,317 students were involved in the programme (see Table 5). The number of teachers is underestimated because of the relatively high turnover due to movement of teachers from one district to another and also because of changes in hiring policy. It is estimated that approximately 13,250 people in these 53 communities were indirectly involved via community activities and student interaction with family and neighbours. In addition to the sequence of workshops, a number of other activities were developed to maintain involvement with environmental education activities over the course of the year.

- **Local/Community Resource Management**

Organizations: The basis of floodplain ecosystem management is the organizational capacity to manage local resources and reconcile individual and collective interests in exploiting them. Towards this end, Project activities at the community level have focused on two types of groups: community-wide organizations for addressing community affairs, including relations with local government, and generally smaller project oriented groups involved in specific conservation, management or other income earning activity.

“There have been a number of changes due to the project. Today there are the Fisheries Councils that the project helped to develop in the municipality of Santarm. In all the districts, the fishermen are benefiting from the work to organize these fishermen. Before the project, fishermen were embarrassed to admit they were fishermen, but now they aren’t ashamed any more because they know that the fisherman is a professional. This has really helped the fishermen to clarify [their] own identity.”

Mr. Sanduca

Table 5: Schools, Teachers & Students in Environmental Education Programme

Region	Schools	Teachers	Students	Population
Ituqui	11	40	1212	2750
Tapar	13	48	1193	3250
Aritapera	15	41	1084	3750
Urucurituba	14	46	828	3500
Total	53	175	4317	13250

Second, the programme has contributed to improved health. Health is a critical issue on the floodplain both because of the problem of water quality and the very limited diet consisting almost solely of farinha and fish. In the first phase the project had a programme that worked with mothers’ groups to improve the quality of family diet. A second activity involved preparation of household medicines. A third initiative that contributes to improvement of human health is the Trash Campaign that has raised awareness of the problem of trash in the community and mobilized community residents to clean up their trash. The trash recycling component of the Campaign also creates an incentive for residents to continue cleaning up their trash.

At a regional scale the main contribution that the project has made to the health of floodplain communities has been through our work in strengthening the organizational capacity of municipal Fishers' Unions to provide basic health services to their members, either directly or indirectly via government agencies. Table 6 shows the range of services offered by Municipal Fishers' Unions of Western Pará.

Table 6: Main Kinds of Benefits Provided by Fishers' Unions (1 = yes, 0 = no)

Union	Social Security	Unemployment Benefits	Medical	Dentist	Lab Exams	Lawyer	Funeral	Total
Santarém	1	1	1	0	1	0	1	6
Alenquer	1	1	0	0	0	0	0	2
Óbidos	1	1	0	1	0	0	0	3
Juruti	1	1	0	0	0	0	0	2
Oriximiná	1	1	0	0	0	0	0	2
Almeirim	1	1	0	0	0	0	0	2
Praíha	1	1	0	0	0	0	0	2
Monte Alegre	1	1	1	1	1	0	0	6
Curuá	1	0	0	0	0	0	0	1
Terra Santa	1	0	0	0	0	0	0	1
Faro	1	0	0	0	0	0	0	1
Aveiro	1	1	1	0	1	0	0	4
Itaituba	1	1	0	0	1	1	0	4
Total	13	10	3	2	4	1	1	36

Third, the project contributed to a reduction of the following vulnerabilities:

- **Management and Income Diversification:**

It has contributed to decreased resource vulnerabilities through a strategy that seeks to increase and diversify household income and implement management systems that a) increase productivity and diversity of household economic systems; b) strengthen community and co-management systems to insure that resource use is maintained within sustainable limits, and; c) develop marketing arrangements that reduce vulnerability to variations in local market conditions, and d) developing land tenure policy for the floodplain that recognizes individual rights to floodplain properties and natural resources. Another important area involves restoring the quality of floodplain habitat and the productive capacity of the floodplain lake ecosystem. This is covered in the next section.

- **Conflict:** One of the main problems on the floodplain is the conflict between cattle owners and farmers and fishers over damages caused by free roaming cattle. Traditionally, it has been the position of cattle owners that it is the responsibility of farmers and fishers to protect their crops and equipment and not of cattle owners to control their animals. This has created considerable insecurity, especially for farmers. Farming on the floodplain is already a complicated activity where returns are low and risks of losses due to flooding, drought or market variations are great. In our sample, 61% of farmers claimed to have suffered losses averaging R\$418 in the last two years due to destruction of crops, fishing gear or fences by cattle (see Table 7). Of these only about 25% received compensation from the owner of the cattle.

Table 7: Cattle Conflicts in the Community

Cattle Conflicts	
Conflicts with cattle in community	61%
Suffered losses last two years	37%
Average Value of losses (R\$)	418,29
Types of Loss	
Destruction of crops	82%
Destruction of fishing gear	11%
Destruction of fences	5%
How was the problem resolved	
Absorbed loss	63%
Talked to owner of cattle	26%
Complaint to Public Ministry	7%

In response the Public Ministry in collaboration with Embrapa, the agricultural research institute and the Várzea Project, have worked with communities to develop legally binding agreements between cattle owners and other community members. To date some 25 cattle management agreements, Terms of Adjustment of Conduct (TACs), have been signed and 16 have been drafted and await signatures. In addition, assessments have been conducted and reports drafted in 5 communities and another 5 are awaiting assessments. Though not without problems, TACs have apparently made a significant contribution to resolving the problem of losses and conflicts involving cattle

(see Table 12). Of respondents whose communities have agreements, 81% state that they work, 59% that community members comply with the TAC and 71% that it has improved cattle raising in the community. Virtually all respondents considered the process of creating a TAC to have been a positive one because it brought the community together and made cattle owners more aware of the problems caused by cattle. All respondents also thought agreements should be maintained as they brought improvements to the community and environment, reduced conflicts and strengthened agriculture in the community.

- **Property Rights:** A third area in which the project is working to reduce vulnerability is through developing a legal process for recognizing floodplain property rights. As noted earlier, one of the main problems faced by floodplain land owners is that the floodplain is the property of the federal government and so it is not possible for floodplain landowners, despite having lived on the land for generations, to obtain legal title to their land. Few have any kind of documentation and those that do have only a sales receipt or a will. In collaboration with the Strategic Studies Component of the Provárzea Programme Várzea Project researchers conducted a study of floodplain land tenure arrangements and also of the two pilot experiences in regularizing floodplain land tenure via concessions. While the study evaluating land tenure arrangements on the floodplain has been concluded and recommendations for regularizing private property have been presented, the Projeto Várzea is still far from having a definitive solution to the problem of recognizing private property on the Várzea that reconciles collective and individual interests. One outcome of this process was a general agreement that responsibility for administering floodplain properties should be transferred from the SPU (Serviço do Patrimônio da União) to INCRA (National Institute for Colonization and Agrarian Reform), which is far better structured to administer a system for regularizing floodplain property. The Projeto Várzea continues to work with floodplain communities, INCRA and the SPU to develop a viable solution to the problem of recognizing floodplain property rights.
- **Community Capacity:** At the regional scale, the project has also sought to strengthen community capacity to reduce vulnerabilities through greater ability to engage government agencies and pressure them to attend to local demands. Access to social benefits through the Fishers Union ensures that households have access to the social safety net available to all Brazilian citizens, including health care, unemployment and retirement benefits. Unions also represent the interests of fishers and the floodplain population in general in negotiations with government agencies and politicians.

In terms of the distribution of livelihoods benefits, the following observations can be made:

- **Lake Management Initiatives:** The main lake management initiatives involve collaborations with community associations and with the Association of Pirarucu Fishers and Aquaculturalists. While community associations are composed of men and women, fisheries management initiatives tend to be composed primarily of men though women often participate in collective activities. While men do much of the work associated with these activities and also receive whatever training is involved, benefits tend to be distributed on a family basis.
- **Agricultural Initiatives:** Agricultural projects involve groups of farmers most of which are composed largely, but not exclusively, of male heads of household. While women participate in farming activities and may also participate in any educational activities, families tend to be represented by the husbands.
- **Habitat Restoration:** The main group with which the project has collaborated has been the Grupo Renascer, which consists of 13 male farmers. However, collective activities have involved a much broader segment of the community, especially school children and their teachers. This is also true of the turtle nesting beach initiative that involves a significant portion of the community. Night-time patrols, however, tend to be carried out by the men.

- **Co-management system:** While fishing is predominantly a male activity, women do fish and in some communities there is a strong tradition of commercial fishing by women. The family as a whole tends to benefit indirectly from a sustainably managed fishery, regardless of who does the fishing. Leadership in the co-management system also tends to be predominantly male with women making up about 30% of the Council members.
- **Formal Education:** Formal educational activities directly involve teachers and students. Teachers tend to be primarily women, comprising 79% of the teachers in the four regions where the PEA has been working. To the extent that mothers tend to be more involved with their children and with schools, they constitute an important group that is reached indirectly via the formal educational programme. However, the transfer of knowledge and experience that children gain in environmental education activities probably is generalized to the family as a whole.
- **Non-formal education:** Non-formal educational activities described earlier include management courses, training programmes for Regional Fisheries Council members and Fishers Unions. All three of the groups are composed largely of men but have a significant proportion of women. Participation in management courses is largely self selected or indicated by the community. In the last two courses, women made up 23% of the participants. In courses for regional Fisheries Council members, women comprised about 30% of participants.
- **Unions:** The average proportion of men and women in the 13 Municipal Fishers' Unions is roughly the same (27%) although there is much greater variability in proportions among the Unions.

Flooded forest, during rainy season waters rise up to 15 meters. Brazil

