2.3.4 Wildlife Conservation *in situ*

IBAMA is directly responsible for a number of projects for the in situ conservation of Brazilian wildlife. Some of them were begun in the 1970s and are today programs of major importance for wildlife conservation and management.

- The Research Centre for Bird Conservation (Centro de Pesquisas para a Conservação de Aves Silvestres - CEMAVE) was set up in 1977 for the conservation and management of areas important for birds, especially migratory birds. CEMAVE co-ordinates the National System for Ringing Wild Birds (Sistema Nacional de Anilhamento de Aves Silvestres), which now has a data base with over 350,000 birds ringed, and is involved in 96 research projects, as well as collaborative agreements and exchange programmes, with numerous national and international institutions.
- National Conservation and Management Centre for Amazonian Turtles (Centro Nacional de Conservação e Manejo de Quelônios da Amazônia - CENAQUA) was set up in 1979 to protect and manage the main nesting beaches and breeding areas for Amazon river turtles. It operates in the following rivers: Araguaia, das Mortes, Javaés, Trombetas, Xingu, Tapajós, Branco, Guaporé, Purus, Juruá and Amazon/ Solimões, as well as a number of lakes. It is estimated that over 40 million turtle eggs are destroyed annually, and that illegal commerce in these animals involves over 200,000 females each year. As of 1990, 15 field bases had been set up throughout the Amazon and in the states of Goiás and Mato Grosso. These field bases protect 115 nesting areas, where some 3.5 million turtles hatch each year. During the project's 17-year existence, more than 30 million turtles have been returned to the wild.
- The National Centre for the Conservation and Management of Marine Turtles (Centro Nacional de Conservação e Manejo de Tartarugas Marinhas - TAMAR), was set up in 1980 in response to the endangered status of five species, *Lepidochelys*

Table 2-33. Vegetation types, and their absolute and relative areas in Brazil, considered for the survey of protected areas.

Ecosystem	Vegetation types included	Original area (km²)	% of country area
Amazonia	Lowland terra firme dense forest, undulating and submontane relief hill forest, white-water seasonally inundated forest (*várzea*), black-water seasonally inundated forest (*igapó*), permanently inundated forest (*igapó*, black-water or clear-water), floodplain open mixed forest, mixed forest with palms, semideciduous forest, white sand forest (*campinarana* or *caatinga amazônica*), white sand scrub (*campina*), sandstone rock outcrops (*campina rupestre*), cerrado enclaves, savannahs and savannah woodlands of Roraima, inundated savannahs (*campos de várzea*), tidal *várzea*, palm forest (babassu palm), liane forest (*floresta de cipó*), bamboo forest (*floresta de bambu*)	4,005,082	47.1
Cerrado	Central Brazilian savannah, savannah forest (*cerradão*), scrub savannah (*campo cerrado*), seasonal semideciduous and deciduous forest, gallery forest, open montane vegetation (subalpine moorland).	1,890,278	22.2
Pantanal	Savannah, parkland savannah (*campo limpo*), evergreen gallery forest, seasonal semideciduous forest, chaco.	154,884	1.8
Caatinga	Tropical thorn scrub (*caatinga*) and dry deciduous forest (*caatinga alta*), rocky outcrops (*lajeiros*), humid forest (*brejos*).	939,391	11.0
Transition	Transition between cerrado central Brazil, Amazonian forests, caatingas, and palm (babassu) forest (*zona de cocais*).	164,201	1,9
Seasonal semideciduous forests	Inland mesophytic (semideciduous) forests inland (Atlantic forest), gallery forest.	518,834	6.1
Pine forest	Mixed forest dominated by the *Araucaria* pine, parkland savannah.	220,363	2.6
Extreme south Atlantic forest and coastal zone	Parkland savanna, seasonal semideciduous forest.	203,875	2.4
	Lowland moist forest, liana forest (*mata de cipó*), gallery forest, coastal scrub and forest on sandy soils (restinga), open montane (subalpine vegetation), dunes, mangrove swamps.	415,088	4.9
Brazil		**8,511,996**	**100%**

Source: Marino (1997).

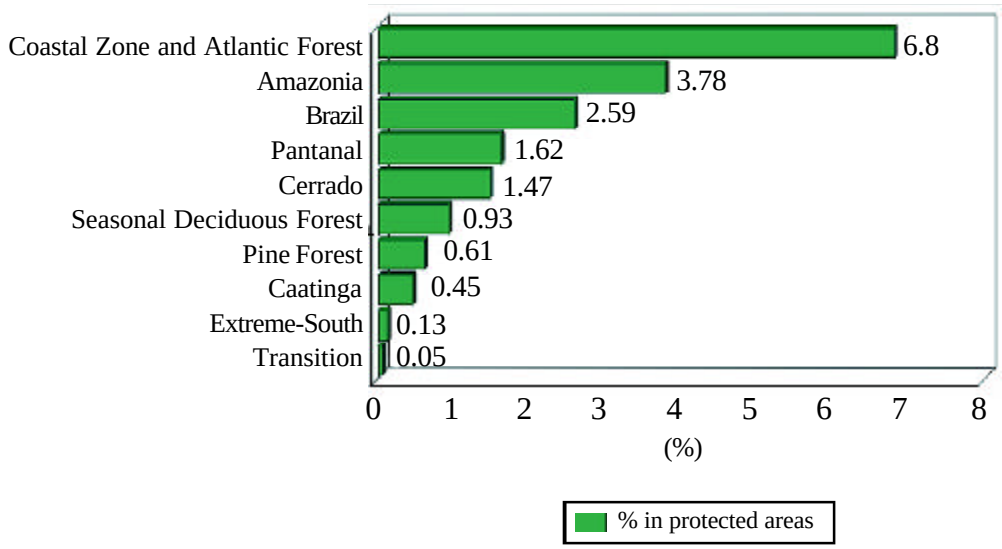

Figure 2-26. Percentages of the area of each of the Brazilian ecoysstems, and of Brazil, in protected areas of indirect use (strictly protected).
Sources: Marino (1997), PNMA (1997).

olivaceae, *Caretta caretta*, *Dermochelys coriacea*, *Chelonia mydas* and *Eretmochelys imbricata*. These turtles were being decimated by illegal occupation of their nesting beaches, the killing of breeding females and the harvesting of their eggs. There are now 20 field bases along the Brazilian coast, all located at the main breeding grounds. One thousand km of beach are under protection. Newly hatched turtles in the main breeding grounds are counted, tagged and set free, over 1.5 million to date. In situ protection covers 50% of the known nests. The project has contracted 200 former turtle hunters, each watching over 5 km of beach and paid by sponsors and the sale of such as T-shirts and stickers. The project also supports local handicraft, community vegetable-gardens, nursery schools and first-aid centres.

- The National Centre for Conservation and Management of Sirenia (Centro Nacional de Conservação de Manejo de Sirênios) studies, protects and rescues West Indian (*Trichechus manatus*) and Amazonian manatees (*Trichechus inunguis*).

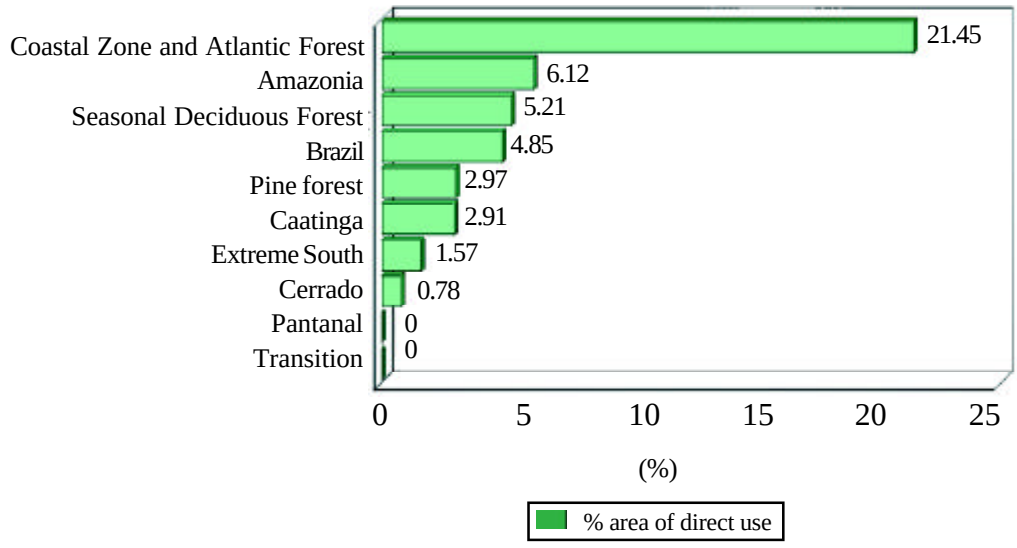

Figure 2-27. Percentages of the area of each of the Brazilian ecoysstems, and of Brazil, in protected areas of direct use (exploitation,sustainable management).
Sources: Marino (1997), PNMA (1997).

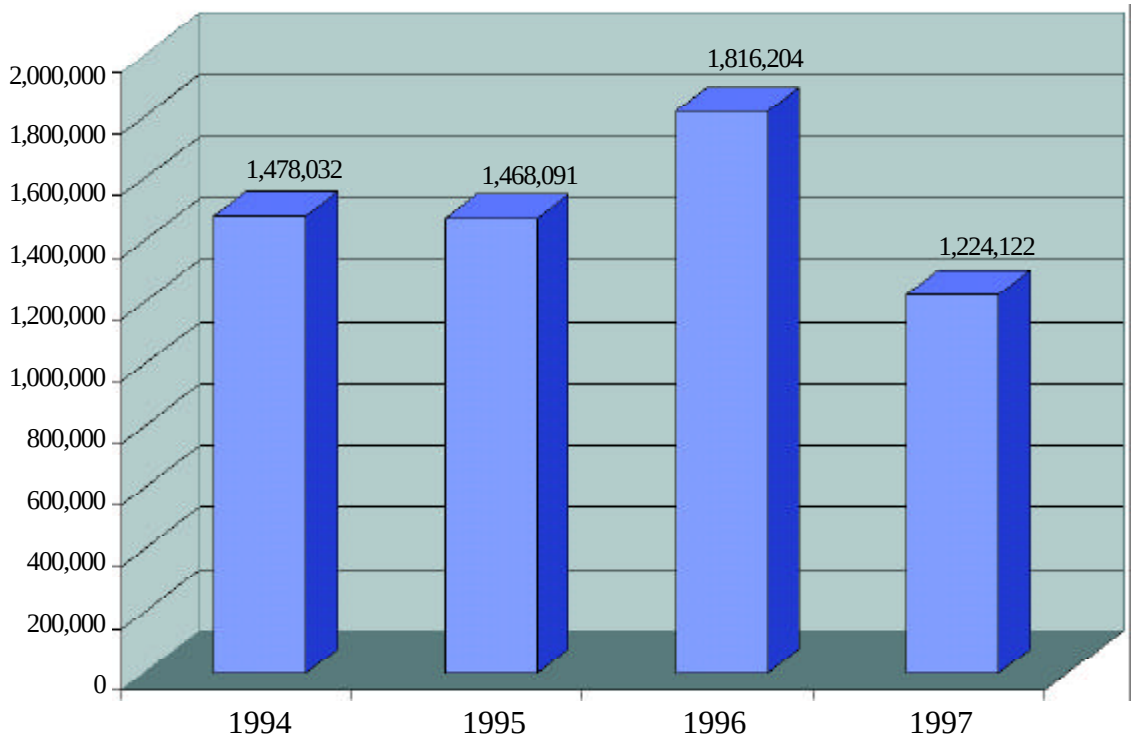

Figure 2-28. Public visitation of National Parks, 1994-1997 (visitors per year).

* The 1997 data for some to the parks are restricted to the period January-July, in others January-August, in others January-September.

** In 1994 and 1995, nine parks were open to visitation. In 1996, thirteen parks, and in 1997 eighteen parks were open to the public.

Source: IBAMA-DIREC.

- The National Research Centre for the Conservation of Wild Predators (Centro Nacional de Pesquisa para a Conservação de Predadores Naturais - CENAP), determines policy for the management and conservation of the large predators of the mammalian Order Carnivora, particularly regarding cases of attacks on cattle and humans.

The wildlife conservation strategy established by IBAMA includes the use of specific committees to formulate policy and action, both in situ and ex situ, for critically endangered species. Six committees have already been established for: the golden lion tamarin (*Leontopithecus rosalia*); the black lion tamarin (*Leontopithecus chrysopygus*); the black-faced lion tamarin (*Leontopithecus caissara*); the golden-headed lion tamarin (*Leontopithecus chrysomelas*); the buff-headed capuchin (*Cebus apella xanthosternos*) and the robust tufted capuchin (*Cebus apella robustus*); and Spix's macaw (*Cyanopsitta spixii*).

IBAMA also provides institutional, logistic and financial support for projects and direct action for the recovery and management of other endangered species such as the Brazilian Amazon parrot (*Amazona brasiliensis*), the humpback whale (*Megaptera novaeangliae*), and aquatic mammals of the southern Atlantic coast, the sea lion (*Otaria flavescens*) and the South American fur seal (*Arctocephalus australis*).

The IBAMA Decree No. 2.097, 20th December 1994, created the Special Working Group for Aquatic Mammals (Grupo de Trabalho Especial de Mamíferos Aquáticos - GTEMA), the main task of which is to draw up an action plan for conservation and research on Brazilian aquatic mammals in Brazil, including cetaceans, pinnipeds, sirenians and mustelids.

IBAMA also administers the bureaucracy and policing of traffic, exports and imports of Brazilian and exotic plants and wildlife, and is responsible for producing and updating the national threatened species list (Lista Oficial de Espécies de Fauna e Flora Ameaçadas de Extinção).

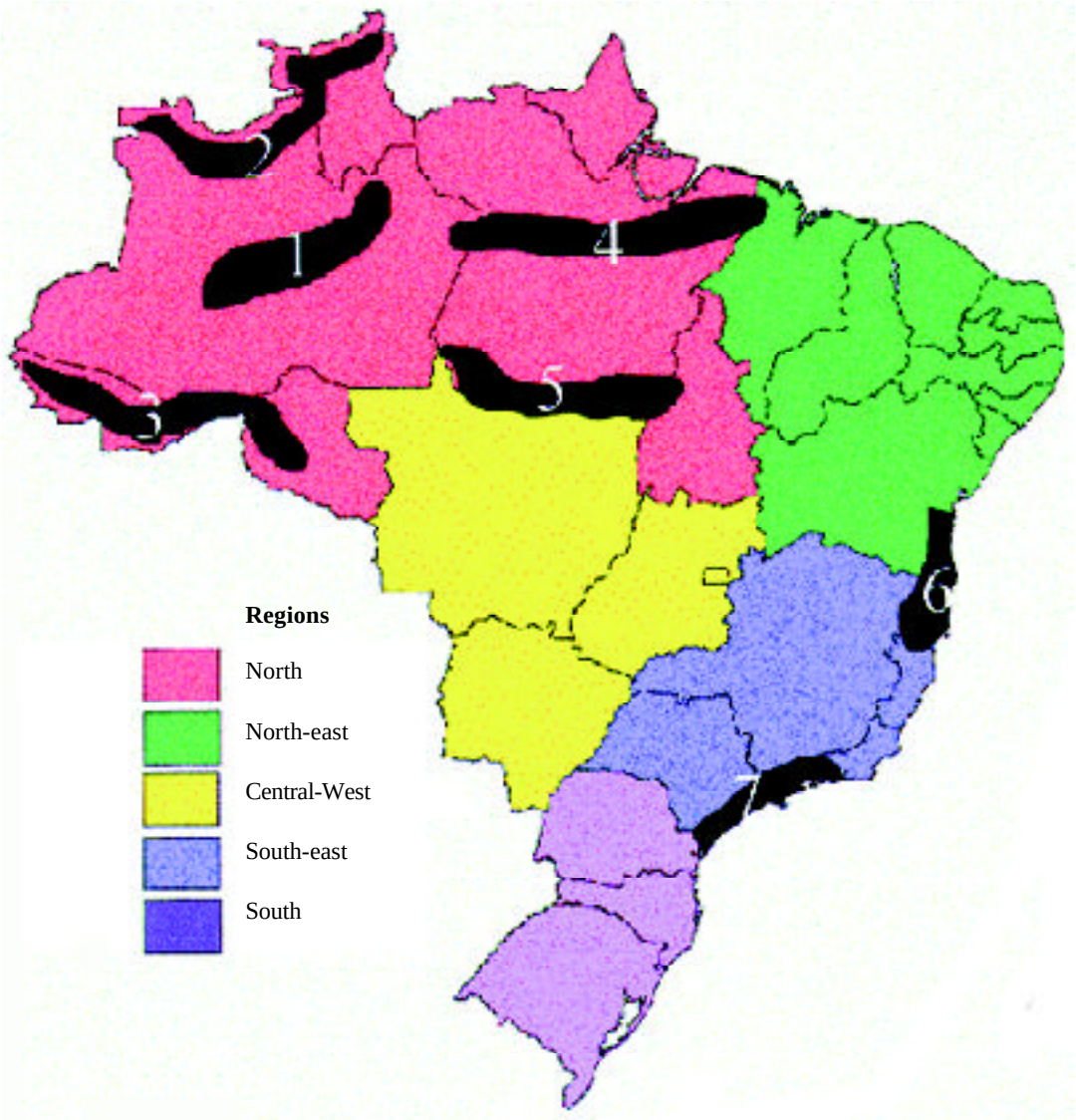

Figure 2-29. Priority Biological Corridors for conservation.
Source: Brazil-MMA, PPG-7 (1996).

2.3.5 Indigenous Lands and Conservation of Biodiversity

According to the National Indian Foundation - FUNAI which is subordinated to the Ministry of Justice, there are 559 areas classified or claimed as Indigenous Lands, covering 84 million ha, or about 9.85% of the country (Table 2-39).

More than 70% of these lands, a total of 61.36 million ha, and representing 54% of the lands under claim, have been demarcated (14 areas), ratified (32 areas) or registered (256 areas), and represent 7.18% of the country. Another 257 areas, 22.78 million ha (or 27.12% of the total) are in different stages of survey and legalisation. Sixty-seven of them (20.32 million ha or 24.2% of the total) have had their borders defined, 13 areas (2.45 million ha) have been identified as indigenous land (Table 2-39 and Figures 2-30 and 2-31). A further 177 areas have yet to be defined.

According to the NGO, the Socio-environmental Institute (Instituto Sócio-ambiental - ISA), São Paulo, just between 1992 and 1997, 196 Indigenous areas were defined or ratified, covering an area of 47.46 million ha (Table 2-40).

A significant part of these indigenous lands is of great importance for the conservation of biodiversity. In the Brazilian Amazon alone, there are 160 ethnic groups living in 358 indigenous lands (Table 2-41). Due to their large size, many of these areas still preserve the reproductive cycles and food webs necessary for the conservation of their biological diversity

Traditional knowledge, handed down by Indian societies throughout their history, is important for conservation and sustainable use of biodiversity. This fact is well known internationally and is recognised by the Convention on Biological Diversity. This knowledge has led to the production, on an industrial scale, of medicines, food varieties

and other materials of value. The Indian societies should benefit from the exploitation of these products, as determined in the Convention itself.

Article 8, item j, of the Convention, establishes as the duty of the parties involved: "Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the use of such knowledge, innovations and practices".

2.4 Biodiversity Conservation *ex situ*

Herbaria, zoological collections, arboreta, germplasm banks, botanical gardens, zoological gardens and micro-organism culture play an important role in the conservation of biodiversity.

A workshop on ´Biodiversity: Perspectives and Technological Opportunities´, organised by the Tropical Database - BDT and sponsored by the Financiadora de Pesquisas e Projetos - FINEP, was held in Campinas in March 1996. One of the conclusions arising from the workshop was that the effective development of a scientific and technological infrastructure for biodiversity conservation was strongly dependent on the training of human resources and expansion of the physical infrastructure. Likewise it was recommended that "there is a need for a support programme for the maintenance and amplification of scientific collections and, most especially, the development of effective computerised data bases to improve the efficiency and speed with which they can be accessed and used".

2.4.1 Herbaria

Herbaria are systematic collections of dried and pressed plants for research and reference. The most recent survey listed 92 herbaria throughout the country (Table 2-42).

These herbaria are concentrated in the south-east and south of the country, as can be seen in Figure 2-32. There is a serious lack of herbaria in such biologically important regions as the north (the Amazon) and central-west (the Cerrado and the Pantanal of Mato Grosso) (Figure 2-33). In the central-west the number of preserved specimens of cryptogams is minimal and there are considerably fewer specimens of phanerogams when compared to the rest of the country (Figure 2-34). The north and central-west regions suffer a serious lack of personnel and training centres, and there are very few qualified taxonomists in the Amazon. There are no herbaria at all in the states of Rondônia and Roraima.

Table 2-34. Total and relative area of protected areas (indirect use, strictly protected) in the different Brazilian ecosystems.

Ecosystem	Ecosystem area (km²)	Protected areas (km²)	% of ecosystem
Amazonia	4,005,082	151,503.41	3.78
Cerrado	1,890,278	27,697.85	1.47
Pantanal	154,884	2,502.54	1.62
Caatinga	939,391	4,252.14	0.45
Transition	164,201	77.00	0.05
Seasonal semideciduous forests	518,834	4,834.28	0.93
Pine forest	220,363	1,348.26	0.61
Extreme south	203,875	267.31	0.13
Atlantic forest and coastal zone	415,088	28,218.25	6.80
Brazil	**8,511,996**	**220,701.04**	**2.59**

Source: Marino (1997).

Many institutions have established partnerships abroad, notably they include the Smithsonian Institution with the National Institute for Amazon Research (Instituto Nacional de Pesquisas da Amazônia - INPA), the New York Botanical Gardens and The Royal Botanical Gardens, Kew (Projeto Flora do Nordeste) with the Cocoa Research Centre (Centro de Pesquisas do Cacau - CEPEC) in Bahia.

Table 2-35. Total and relative area of protected areas (direct use, exploitation, sustainable management) in the different Brazilian ecosystems.

Ecosystem	Ecosystem area (km²)	Protected areas (km²)	% of ecosystem
Amazonia	4,005,082	245,097.94	6.12
Cerrado	1,890,278	14,687.15	0.78
Pantanal	154,884	0.00	0.00
Caatinga	939,391	27,344.85	2.91
Transition	164,201	0.00	0.00
Seasonal semideciduous forests	518,834	27,026.23	5.21
Pine forest	220,363	6,539.61	2.97
Extreme south	203,875	3,209.69	1.57
Atlantic forest and coastal zone	415,088	89,037.47	21.45
Brazil	**8,511,996**	**412,942.94**	**4.85**

Source: Marino (1997).

In 1993, the main institutions involved in botanical research in the state of São Paulo presented a joint proposal to the State Science Research Foundation (Fundação de Amparo à Pesquisa do Estado de São Paulo - FAPESP) for a major inventory ´Flora Fanerogâmica no Estado de São Paulo´. The first stage involved the collation of information on the phanerogams maintained in the 11 herbaria with the largest and most representative collections. A total of 220 families of phanerogams involving just over 120,000 specimens were documented, a density of 0.48 specimens per km² of the state (Figure 2-4).

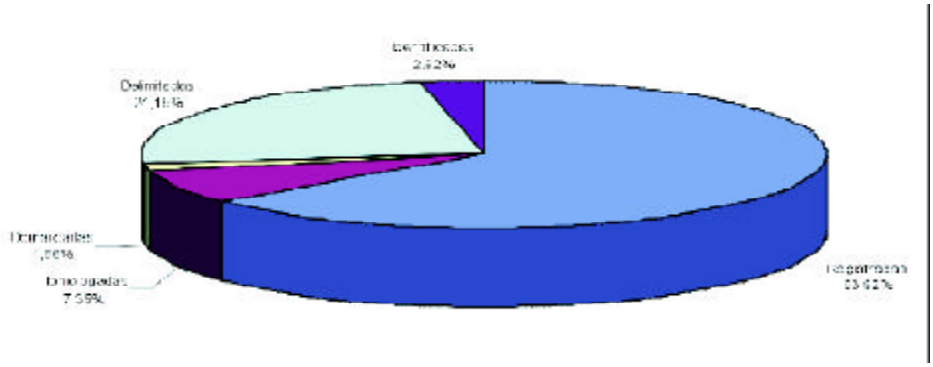

Figure 2-30. Status of Indigenous Lands in Brazil (Percentage in Relation to the Total Area).
Source: FUNAI, 1997.

The state of Rio de Janeiro has also benefited from a major survey (currently being reorganised), the ´Projeto Flora do Estado do Rio Janeiro´, co-ordinated by the Research Institute of the Rio de Janeiro Botanical Gardens (Instituto de Pesquisas Jardim Botânico do Rio de Janeiro). In the 1988, the Institute published the list of phanerogams collected and deposited in the herbarium which, although totalling 5421 taxa of 188 families (Marques and Novaes 1996), led to the conclusion that very little was known of the state's angiosperm flora.

Deficiencies in all the programmes include a lack of geographical referencing, the poor quality of many of the specimens, a lack of standardisation in the documentation and registration of the specimens, incompatibility in the computer programmes used by different institutions, and insufficient taxonomic identification for much of the material.

2.4.2 Zoological Collections

The Workshop ´Biodiversity: Perspectives and Technical Opportunities´, organised by the Tropical Data Base (Base de Dados Tropicais - BDT) in Campinas in 1996, listed the following shortcomings with regard to zoological collections:

- Lack of funding for maintenance;
- Collections not being identified or properly registered;
- Lack of continuity in collections other than those in museums, often the results of a lifetime of work by researchers who have retired, or who have changed jobs or merely completed their research, and fail to turn their collections over to museums;
- Lack of consistency in the policy and leadership in a number of institutions, resulting in the loss of collections;
- Lack of taxonomists.

The National Council for Scientific and Technological Development - CNPq and the São Paulo State Science Research Foundation (Fundação de Amparo à Pesquisa do Estado de São Paulo - FAPESP) finance projects which include the maintenance of collections of zoological specimens. About 10% of the research projects in Zoology financed by FAPESP go to training, infrastructure and/or the establishment

Table 2-36. Federal and state protected areas and RPPNs*.

		Indirect use	Direct use	Total
Federal	Area (ha)	15,889,543	23,178,668	39,068,211
	Number	103	81	184
	% of country	1.87	2.72	4.59
State	Area (ha)	5,969,143	23,796,189	29,765,332
	Number	267	184	451
	% of country	0.70	2.80	3.50
RPPN*	Area (ha)	341,057		341,057
	Number	150		150
	% of country	0.04		0.04
Total	Area (ha)	22,199,743	46,974,857	69,174,600
	Number	520	265	785
	% of country	2.61	5.52	8.13

* RPPN =Private Natural Heritage Reserve.
Sources: Brasil. (1996); Bruck *et al*. (1995); Dias (Unpublished); IBAMA, Diretoria de Ecossistemas (DIREC); IBAMA (1997); Rylands (1991); Rylands & Pinto (1995); World Conservation Monitoring Centre (1997).