Commercial Non-Timber Forest Products of the Guiana Shield

An inventory of commercial NTFP extraction and possibilities for sustainable harvesting

By
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and Olaf Bánki

Commercial Non-Timber Forest Products of the Guiana Shield is the second in a series of documents to be published by the Guiana Shield Initiative (GSI) of the Netherlands Committee for IUCN. The GSI received funding from the Ministry of Foreign Affairs of the Dutch Government to lay the foundations for a long-term eco-regional project to finance sustainable development and conservation of the unique ecosystems of the Guiana Shield. This eco-region encompasses parts of Colombia, Venezuela, Brazil and the whole of Guyana, Suriname and French Guiana.
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The authors are most grateful to all persons that gave their comments on the report or helped in another way to achieve the goal of this study. We would like to thank all participants of the Guayana Shield Conservation Priority Setting Workshop in April 2002, Paramaribo, Suriname. We would like to especially thank the following experts:

PREFACE

With 2.5 million square kilometers of largely intact tropical rainforest and savannas, 10-15% of the world’s fresh water reserves and an extremely rich and highly endemic biodiversity, the Guiana Shield ranks among the most important ecological regions in the world.

The so-called ecosystem services of the region in the areas of climate stabilisation, watershed protection and the hydrological cycle, and the maintenance of a unique stock of biological and genetic diversity are a great asset to the global community, for present and future generations.

It is the aim of the Guiana Shield Initiative (GSI), a partnership of many international organisations with its secretariat at the Netherlands Committee for IUCN, to set up a system to adequately compensate the local communities and the relevant authorities for their continued delivery of these ecosystem services. These compensations could take the form of financial payments or of other types of remuneration (technical, medical or legal services), depending on the needs of the ‘producers’ of the services.

Directly associated with this long-term objective the GSI aims to secure the direct use of the biodiversity of the Guiana Shield by the local communities, also for commercial purposes. It is the latter which is the subject of this report. We are talking about all wild plant and animal products that can be harvested from forests or other types of natural ecosystems, which may appear on local, national and even international markets. Although often not statistically recorded, they are of great relevance for local incomes and a key to truly sustainable use of the forest. For the forest-dwelling communities they are an essential source of food, shelter, household equipment, forage and medicine.

For instance 65-90% of all plant species in the Guiana Shield are considered useful by the local indigenous people.

This report aims to highlight the Non-Timber Forest Products (NTFPs) of the Guiana Shield: which are they, what is their economic value, where are (potential) markets, and, last but not least, how can they be sustainably harvested? The danger of a successful NTFP is of course overharvesting, which in the end could lead to slaughtering the goose with the golden eggs.

As Secretary for the Brazilian Amazon and with my background in supporting the ‘extractivist reserves’ which now occupy such a prominent place in the Pilot Program for the Brazilian Rainforests, it gives me great pleasure to present this report to the reader. Especially I hope this ‘hidden economy’ will draw the attention of policy makers, both at the national and international level, who still too often see the value of forests only in terms of the timber on top of the soil, minerals in the subsoil or as a space to be converted into large scale plantations or agricultural production units. More sophisticated policy instruments are needed to create sustainable income out of capturing the value of the ecosystem services and to support the sustainable use of NTFPs by e.g. certification.

The data, conclusions and recommendations of this report on monitoring the chains of NTFPs from harvest to consumer, on certification and on integrating NTFPs in forest management should assist both public policy and the private sector to operate more responsibly and sustainable.

The global community deserves the goods and services of an intact Guiana Shield ecoregion, the Guiana Shield deserves a decent income.

Mary Allegretti
Secretary for the Amazon
Ministry for the Environment of Brazil
Member Steering Committee of the Guiana Shield Initiative
1.1 The Guiana Shield Eco-region

The Guiana Shield eco-region is a two billion-year-old Precambrian crystalline rock formation that extends from western Colombia to north-eastern Brazil. This eco-region includes parts of Colombia and Venezuela, the whole of Guyana, Suriname and French Guiana, the states of Roraima, Amapá, and the northern parts of Amazonas and Pará in Brazil (see Map opposite page). The Guiana Shield constitutes one of the largest tracts of undisturbed tropical rainforest in the world (Bryant et al., 1997). Due to a low population pressure, forest cover in the Guiana Shield is still high. The diversity of pristine rain forests, fresh and saltwater swamps, grassy savannas and coastal mangroves supports an abundance of wildlife, including numerous species unique to the region. The Guiana Shield shares irreplaceable biological richness, but also faces shared threats to conservation. Economic problems have created pressure on governments to increase logging and mining activities (Sizer, 1996). Poorly managed, these activities are environmental, social and health hazards. Although conservation initiatives have started in each individual country, there is no overall regional strategy to tackle trans-boundary problems shared in the Guiana Shield. Tackling such trans-boundary problems was an impetus to the development of the Guiana Shield Initiative.

1.2 The Guiana Shield Initiative

The ecosystems of the Guiana Shield perform vital ecological services for the global community. Carbon sequestration, the regulation of hydrological cycles, and the preservation of biodiversity are essential, now and in the future, to maintain regional and global climatic stability. Moreover, they are vitally to balance rainfall and river flows in time and space and ensure the health of ecosystems. Biodiversity conservation is also important to keep a stock of genetic material available for present traditional and non-traditional uses and for so far unknown future applications.

These ecological services, however, are in the public domain. They are, in the language of political economy, public goods – and are starting to be recognised as such by the relevant public authorities and private actors (Pagiola et al., 2002). The value of these services is not adequately accounted for by the global public finance sector or the market system. The air we breathe, a stable climate, and the
biodiversity contained in rainforests are all services provided at no apparent economic cost to us. This means that those who traditionally manage these ecosystems, for example indigenous peoples or government agencies, do not receive any direct economic benefit for keeping them intact, thus often forcing them to look for other, more profitable uses of these ecosystems to gain revenue. This, in combination with an economic need to make use of their ecosystems in order to gain revenue, means that very often ecosystems are not sustainably exploited.

The Guiana Shield Initiative (GSI) of the Netherlands Committee for IUCN (NC-IUCN) has the objective to promote ecologically, socially and economically sustainable management in the region. Since this has to be done by motivated people in the long term, a necessary condition is that the management is also financially sustainable. This implies that the relevant actors are assured over time of a decent income and are not forced or tempted into irreversible and destructive activities. In addition, reliable political arrangements are required for long-term carbon sequestration contracts, cooperation within watersheds, international payments for the preservation of biodiversity and the development of markets for sustainably produced commercial goods and services.

The general approach of the GSI follows a “bottom-up” arrangement, in which local ecosystem managers will be supported for maintaining their forests intact. Development of management and business plans will be stimulated, in order to ensure sustainability at the enterprise and trade levels. An important mechanism envisioned is a payment system for ecological services. Such a system would include the payment for hydrological services by communities dependent on ecosystems to provide their fresh water supply, as well as biodiversity option payments for the preservation of diversity in forest ecosystems for future use.

For thousands of years, local people have used the biodiversity of the Guiana Shield. Many indigenous groups in this region are almost totally dependent on natural resources for their survival (Prance et al., 1987; Grenand, 1992; Mikkelen et al., 1992; van Andel, 2000). One of the underpinning goals of the GSI is the generation of sustainable livelihoods for local inhabitants of the Guiana Shield, based on sustainable ecosystem management. The GSI strives to work with existing initiatives, relevant actors like governments, NGOs, universities, local communities and international donors. At this moment, GSI is partnering with the United Nations Development Programme (UNDP) to prepare a proposal to the Global Environment Facility (GEF) to continue its programme.

1.3 The Guiana Shield Conservation Priority Setting Workshop

A Guayana Shield Conservation Priority Setting Workshop (PSW) was organised by Conservation International, in collaboration with the GSI of the Netherlands Committee for IUCN and the UNDP Regional Offices of Guyana and Suriname (www.guayanashield.org). The workshop took place on the 5th-9th April 2002 in Paramaribo, Suriname. It brought together a multi-disciplinary group of experts in biological and socio-economic themes from the academic, governmental, private and civil sectors, to generate consensus on priority areas for conservation.

The PSW made an attempt to document the existing knowledge on forest and aquatic ecosystems, provide maps and tools to enhance conservation planning and awareness, provide baseline data for regional conservation efforts, and form strategic alliances to advance the recommendations of the workshop.

Background papers were prepared on the topics of physical geography, plant ecology, floristics, and the current status of mammals, birds, reptiles, amphibians, freshwater fish and insects. The socio-economic experts discussed forestry, carbon sequestration, mining, infrastructure, protected areas, tourism and non-timber forest products (NTFPs). The international experts that attended the PSW gave a valuable insight into the uses and benefits that could be drawn from the biodiversity in the Guiana Shield. The results of the PSW can provide one of the grounds for the identification of prime areas for conservation and sustainable management in the Guiana Shield. The main input of the GSI into this workshop was the integration of “economic alternatives” into the process, by examining the potential of generating income through carbon credit schemes, ecotourism and the commercialisation of non-timber forest products.

1.4 Non-Timber Forest Products

Non-timber forest products (NTFPs) are defined in this report as all wild plant and animal products that can be harvested from forests or other types of natural ecosystems (Ros-Tonen et al., 1995; de Beer and McDermott, 1996; van Andel, 2000). This definition excludes the use of industrial timber, but includes the small-scale use of wood for canoes, crafts, house construction and fuel. Plantations and cultivated gardens do not provide NTFPs, although wildlife may be harvested from these areas. Some definitions of NTFPs include ecotourism and other public goods and services, but these items are dealt with in separate working documents for the GSI.

The importance of NTFPs tends to be underestimated, because often they are not traded through established market channels and do not appear in national economic statistics (de Beer and McDermott, 1996). For the subsistence economy of forest-dwelling people, however, NTFPs offer a great source of food, shelter, household equipment, forage, and medicine. Ethnobotanical surveys in the Guiana Shield show that 65 to 90% of all plant species found in one hectare of forest are considered useful by local indigenous people (Prance et al., 1987; Grenand, 1992; Mikkelen et al., 1992; van Andel, 2000; Duivenvoorden et al.,...
INTRODUCTION

As a result, extractors may shift again to less sustainable land uses like logging or cattle ranging. Conservation and long-term utilisation of forest products require that they be harvested on an ecologically sustainable basis. The extraction of NTFPs is considered sustainable if it has no long-term deleterious effect on the regeneration of the harvested population, and when the yield remains more or less constant throughout the years (Strudwick, 1990; Hall and Bawa, 1993; Pollak et al., 1995).

1.6 Aim of this report

The central question in this study is: which NTFPs are commercially extracted in the Guiana Shield? Additional questions are: Do these products have a significant economic value? Are these NTFPs being harvested in a sustainable way? What are the main areas for extraction and marketing of NTFPs? Is this extraction legal or illegal? Does the harvesting of these NTFPs contribute to the conservation of biodiversity in the area? In other words: can the commercialisation of NTFPs prevent further deforestation or environmental degradation?

This report provides an inventory of the main NTFPs of plant and animal origin that are commercially traded in the Guiana Shield. It discusses whether the commercial trade in NTFPs can increase sustainable livelihoods of local communities and provide an incentive to protect biodiversity. The information given is based on literature, the Internet, fieldwork in the region by the first author (van Andel, 2001), and discussions with experts during the Priority Setting Workshop (PSW) in Paramaribo. Interviews with specialists were held throughout the five days of the workshop. Information gathered on NTFP collection and market areas was included in regional NTFP maps and entered into a database, which will both be made available with the outputs of the workshop. A draft version of this paper was used during the workshop as the working document on NTFPs. Personal comments of the experts have been integrated in the final version of this report.

The long-term aim of the NTFP component of the GSI is to provide adequate information and technical advice for ecosystem managers setting up forest-based business and management plans. There is a great demand for baseline information on NTFPs for the Guiana Shield. To enhance the sustainable extraction of NTFPs, it is important to focus on those products that have already been proven to be successful. On the other hand, it is necessary to maintain and develop a diverse range of NTFPs across the region, so as not to flood existing local and regional markets. The pitfalls associated with developing NTFPs should also be identified. Quantifying the total economic value of commercial NTFPs for the Guiana Shield is not attempted in this report, due to the fact that different methodologies result in varying estimates of economic value, not to mention the difficulty of finding comprehensive data on this subject for the Guiana Shield. All
commercially harvested vegetal NTFPs mentioned in this report are listed with their scientific and common names in Appendix 2.

The present study is in essence a working document to help guide the future of the NTFP component of the GSI. By taking a regional viewpoint, a comparison can be made of the various approaches taken by the six countries of the Guiana Shield, with regard to sustainable utilisation of their plant and animal resources. Examining both plant and animal commercialisation across an eco-region has turned up some interesting patterns and will hopefully lead to the exchange of ideas and expertise across the region. This study offers a comprehensive coverage of the commercial NTFPs in the Guiana Shield, but it is certainly not exhaustive. It should be seen as a starting point for discussion and represents a current snapshot of what will be an active field for the years to come.

1.7 Why include wildlife in a NTFP study?

In most studies on NTFPs, there is a tendency to examine flora or fauna, but seldom both; products of animal origin form, however, an important proportion of the NTFPs harvested in many tropical countries (Godey and Lubowski, 1992). Previous research in the Guiana Shield pointed out that wildlife is a major commercial product in the region (Redford and Robinson, 1991; Robinson and Redford, 1991a; Broekhoven, 1996; van Andel, 1998; Duijvenvoorden et al., 2001). Wildlife is generally more lucrative per unit than any other NTFP. Animals and freshwater fish are sold or bartered in the smallest Amerindian village and are often the only NTFPs worthwhile to bring from remote areas. Revenues from wildlife often cover the high transport costs as these species have often become rare in the more populated areas (van Andel, 2000). Nevertheless, wildlife is often excluded from NTFP inventories, since research is mostly carried out by (ethno-) botanists focusing on useful plant species. For instance, in the study of Duijvenvoorden et al. (2001), the trade in NTFPs in the Colombian Amazon was considered marginal, despite more than 8000 tonnes of freshwater fish per year being marketed in Leticia. If the authors had also included live animals, skins and bush meat in their market surveys, the trade in NTFPs would be even more significant.

NTFPs of animal origin fall into several categories: bush meat, medicinal products (edible and non-edible) and live animals or animal products for international trade (de Beer and McDermott, 1996). International demand for live animals (and for other animal products) represents an external pressure on the biodiversity of an eco-region rather than an internal pressure. International demand is often the real driving force to trade in live animals (www.traffic.org). Some countries of the Guiana Shield are major exporters of live animals (e.g., Guyana, Suriname), while others have totally prohibited international wildlife trade (Brazil). Whereas legal export is generally well monitored, figures for the domestic market for wildlife hardly exist, although these are often substantial. In Brazil, for example, it was estimated that 70% of wild animals were sold within the country (The Economist, 2001). There is evidence of illegal trade in live animals throughout the region. International trade in live animals as pets is without doubt more economically valuable than the bush meat trade.

Bush meat is any edible product from wild animals: meat, eggs, honey, freshwater fish and aquatic invertebrates. Commercial bush meat is included in this report, due to its importance in the local and regional markets across the Guiana Shield. Species hunted for the commercial wild meat market also often have higher exploitation rates than those hunted only for subsistence use (Bennett and Robinson, 2001). Despite the availability of cattle and poultry, more than 85% of the meat consumed in the Amazon is provided by hunting and fishing (Douroyeanni, 1985), with the majority of the Amazonian Indians relying on fish rather than game for their principal source of animal protein (Dufour, 1990). The annual trade in bush meat in the Amazon region was estimated at US$ 175 million (TCA, 1995). There also exists a lively market for secondary wildlife products such as skins, feathers, teeth, and shells. These are made into tourist crafts or utilised by indigenous people for decoration, medicine and magic rituals (Broekhoven, 1996; Bevilacqua et al., 2002).
This report focuses on those animals that have a high commercial value and are traded on local, regional and (inter-)national markets. Special attention is paid to species threatened by over-exploitation due to trade, like those listed on the IUCN Red List of Threatened Species, the Convention on International Trade in Endangered Species of Flora and Fauna (CITES) Appendices and the European Commission Regulations (see Appendix 3). Since we recognise the economic benefits of trade in wildlife for forest-dwelling people, we try to identify those species that might have a potential for sustainable harvesting. We also examine the results of several community-based wildlife harvesting projects in the Guiana Shield. All commercially harvested animals mentioned in this report are listed with their scientific and common names in Appendix 1.

1.8 Baseline biological research in the Guiana Shield

1.8.1 Plants

Regional flora and floristic inventories offer the basis for the research on vegetal NTFPs. They provide information about botanical diversity, forest composition and species distribution and are often compiled by European or North American universities, in cooperation with research institutes in the Guiana Shield countries themselves. In the following section, the major floristic literature is mentioned for each country in the Guiana Shield, as well as the local research institutes. Relevant ethnobotanical work is mentioned in the particular country sections.

In the Brazilian Guiana Shield, scientific research on plants and animals is carried out by the Instituto Nacional de Pesquisas da Amazônia (INPA) in Manaus and by the Emilio Goeldi Museum in Pará (MPEG). There are no recent floras covering this region; the *Flora Brasiliensis* needs updating (Maas, pers. comm.). Useful floras for Amapá are the *Flora of the Guianas* (edited by the Utrecht branch of the National Herbarium of the Netherlands (NHN-U), from 1984 onwards) and the *Guide to the vascular plants of Central French Guiana* (Mori et al., 1997, 2002). The area around Manaus is covered by the excellent *Flora of the Ducke Reserve* (Ribeiro et al., 1999). Hemming and Ratter (1993) published an illustrated book on the *Flora and Fauna of the Maracá ‘island’* in Roraima. A field guide to the flowering lianas of Trombetas was made by Knowles (1988).

The multi-disciplinary Tropenbos-International Programme contributes to the conservation and wise utilisation of forest resources in several tropical countries, by conducting strategic and applied research and upgrading local capabilities in the field of forest-related sciences. Tropenbos aims to develop management plans for NTFPs that are economically viable, ecologically sustainable and socially and politically acceptable. Several Dutch universities and foreign research institutes cooperate in the Tropenbos programme. In the Tropenbos-Colombia series, several plant families or floristic communities have been treated in detail for the Middle Caquetá region (Galeano, 1991; Martínez and Galeano, 1994; Aldana and Rosselli, 1995; Arbelaíz and Callejas, 1999; Murillo and Restrepo, 1999). Sánchez (1996) compiled a preliminary checklist of all plants collected in the Middle Caquetá region. More publications on the Colombian Amazon can be found on the Tropenbos website (www.tropenbos.nl). An illustrated field guide of the forest fruits of the Duida River (Serranía de la Macarena) was published by Stevenson et al. (2000). Scientific research in Colombia is carried out by various governmental and private universities and the von Humboldt Institute in Bogotá.

The flora of the entire Guiana Shield region of Venezuela is excellently described in the *Flora of the Venezuelan Guayana*, edited by the Missouri Botanical Garden (US). The *Flora of Venezuela* is also useful. Scientific research on plants and animals in Venezuela is carried out by the Universidad de los Andes (CVULA), Universidad Central de Venezuela (MBUCV), the Universidad Simón Bolívar (CVUSB), and the Museo de Historia Natural La Salle (MHNLS). An informative review of NTFPs was prepared for Global Forest Watch by Bevilacqua et al. (2002).

The three Guianas are covered quite well by the many volumes of the *Flora of the Guianas*, edited by the Utrecht branch of the National Herbarium of the Netherlands (NHN-U). Also edited by the NHN-U are the *Fruits of the Guianan Flora* (van Roosmalen, 1985), the *Flora of Suriname*, the *Check-list of woody plants of Guyana* (Mennega et al., 1988), and the *Bomenboek voor Suriname* (Lindeman and Mennega, 1963). Other useful publications are the *Checklist of the plants of the Guianas* (Boggan et al., 1997) and the *Guide to the vascular plants of Central French Guiana* (Mori et al., 1997, 2002). The floristic and ecological aspects of the different forest types in Suriname are treated in Lindeman and Molenaar (1959) and Ouboter (1993).

Biological research in Suriname is carried out by the National Herbarium of Suriname and the National Zoological Collection; both are departments of the Anton de Kom University in Paramaribo. Scientific research in Guyana is carried out by the University of Guyana, with an Amerindian Research Unit involved in studies of indigenous peoples, the Guyana Forestry Commission and the Iwokrama International Centre for Rainforest Conservation and Development. The Tropenbos-Guyana programme has carried out forestry research in central Guyana for more than ten years, resulting in many publications (www.tropenbos.nl). ORSTOM started botanical inventories in French Guiana in the 1960s and a regional Herbarium (CAY) was set up. Scientific research is further carried out by CNRS (biological and anthropological research), Silvolab, the Smithsonian Institute (Biological Diversity of the Guianas program), the NHN-U (*Flora of the Guianas*), the New York Botanical Garden (documenting plant diversity in
Central French Guiana and Wageningen University, which runs a field station in the remote forest of Nourages.

1.8.2 Animals
Baseline research on the taxonomy and distribution of animals in the Guiana Shield varies from being fairly complete (birds) to very limited (amphibians, reptiles and insects). More details on the status of scientific knowledge on Guiana Shield animals can be found in the Conservation Priorities for the Guayana Shield, 2002 consensus – the report containing the results of the Priority Setting Workshop. A surprisingly large body of work addresses the subject of wildlife management and trade in the Guiana Shield, but many of these documents remain unpublished or difficult to obtain.

Several researchers have tackled the question of sustainable hunting levels for South American animals (e.g., Bodmer, 1995; Bodmer et al., 1997; Redford, 1993; Robinson, 2000; Robinson and Bennett, 2000; Robinson and Redford, 1991b, 1994). However, research that measures the effects of harvesting on animal populations remains limited. A comprehensive synthesis report covering the present international knowledge about wildlife management in Amazonia was carried out by Richard-Hansen (1998), as a basis to initiate new studies and action in French Guiana. This study deals with the issues of indigenous hunting in the past and present, the biology and ecology of the main game species, and sustainable hunting and game legislation in the various countries. It contains species accounts for all hunted species, including a compilation of data on species distribution, abundance, densities and reproductive capacity. Specific research on hunting in French Guiana has been carried out and a new research programme has recently been launched (Ouhoud-Renoux, 1995; Richard-Hansen and Hansen, 1998; Richard-Hansen and Hansen, in press).

In 2000, the Iwokrama International Centre hosted a regional wildlife management workshop that covered applied research, community participation, education and training. All stakeholders relating to wildlife management in the Guiana Shield were invited (Iwokrama, 2000). Several documents were prepared for this workshop relating to the status of wildlife use and management in various countries of the Guiana Shield. Craig-Clark et al. (2000) review current wildlife management systems (including species, habitats and major threats) in Guyana. Ouboter (2000) covers the current status of wildlife in Suriname and the major human influences on this resource, including hunting, fishing and pet trade. Ochoa et al. (2000) discuss the importance of wildlife in the Venezuelan Guayana, commercial use and the illegal trade, as well as recommend strategies for conservation.

With regard to the wildlife trade, most work focuses on the three Guianas. Recent reports by Duplaix (2001) and Ouboter (2001) on behalf of the regional office of the World Wildlife Fund (WWF–Guianas) cover the wildlife trade in Suriname, Guyana and French Guiana and provide useful anecdotal evidence of the illegal trade. A third report, Hoefnagel (2001), takes the wildlife trade management legislation and policies of the three Guianas and provides suggestions for harmonization, development and improvement of the various frameworks.
2

BRAZIL

1. Commercial NTFP extraction

The Brazilian part of the Guiana Shield is situated north of the Amazon River and includes the States of Roraima, Amapá and the northern parts of Pará and Amazonas (see Map). For the commercial harvesting of NTFPs, Brazil is without doubt the most important country in the Guiana Shield. Although the number of people involved in extractivism declines (Richards, 1993), an estimated 1.5 million people still depend on commercial NTFP extraction in the Brazilian Amazon (Browder, 1992). It should be noted, however, that the ‘Amazon region’ is formed by the States of Maranhão, Pará, Amapá, Amazonas, Roraima, Mato Grosso, Rondônia, and Acre; an area much larger than the Brazilian Guiana Shield. Since most publications on nature conservation or NTFP extraction consider the Brazilian Amazon as more or less one geographical unit, it was quite difficult to interpret the existing studies for the much smaller Guiana Shield area. Furthermore, production figures and harvested volumes are mostly given per state (Table 3). The fact that only parts of Pará and Amazonas lie within the Guiana Shield makes it even more complicated to estimate the economic importance of NTFPs in the study area.
The majority of the commercially extracted NTFPs in the Brazilian Amazon are marketed in Manaus and Belém, the two major Amazonian ports, and to a lesser extent in Macapá and Santarem. Manaus and Belém are situated outside the Guiana Shield, but they may be stored and shipped from Manaus or Belém. Table 1 shows the export value of various Brazilian NTFPs. The species in the table are harvested in the Guiana Shield area, but export figures only existed for the entire country or the Amazon region. The main states where commercial NTFP extraction takes place are Pará and Amazonas, followed by Amapá and Roraima (Table 3). The major NTFPs per state are given below:

Pará: açai juice (from the fruits of Euterpe oleracea), palm heart (Euterpe oleracea), Brazil nut (Bertholletia excelsa), wildlife, and rubber (Hevea brasiliensis). Other, less important products are coumarin (Dipteryx odorata), balata (Manilkara bidentata), rosewood oil (Aniba rosaeodora), andiroba oil (Carapa guianensis), jatoba (Hymenaea courbaril), maçaranduba (Manilkara huberi), copaiba balsam (Copaifera reticulata), rotenone (Lonchocarpus spp.), and ucuúba (Virola surinamensis).

Amazonas: Brazil nut (Bertholletia excelsa), wildlife, rubber (Hevea brasiliensis), açai (Euterpe oleracea), piassaba (Leopoldinia piassaba), copaiba balsam (Copaifera reticulata), sorva gum (Couma macrocarpa), rosewood oil (Aniba rosaeodora) and ucuúba (Virola surinamensis).

Amapá: palm heart (Euterpe oleracea), rubber (Hevea brasiliensis), Brazil nut (Bertholletia excelsa), açai (Euterpe oleracea), wildlife and medicinal plants.

Roraima: Brazil nut (Bertholletia excelsa), wildlife, sorva gum (Couma macrocarpa), piassaba (Leopoldinia piassaba), and ornamental plants.

2.2 Wildlife

2.2.1 Commercial wildlife harvesting

Freshwater aquarium fish are the most important commercial animal product in Brazil, especially in the Upper Rio Negro region. Freshwater fish for food is another important commercial product and sport fishing is becoming a popular tourist activity. Besides aquarium fish, the trade in other live animals is not considered significant in northern Brazil. Illegal wildlife export from northern Brazil is thought to occur on a very small scale, with perhaps a few monkeys finding their way to Japan, where they are purchased as a status symbol. There is a local pet trade in this area, as a by-product of subsistence hunting. Commercial bush meat hunting is also not considered to be a problem in the north of Brazil, although hunting does certainly occur for subsistence use (van Roosmalen, pers. comm.) and there is quite some hunting pressure along the coastal areas of Amapá (Takiyama, pers. comm.).

2.2.2 Wildlife regulations and management

Brazil has very strict environmental laws. The country’s environmental crime law of 1998 prohibits the hunting, capture, transport or keeping of native species in captivity, punishable by fines and/or imprisonment unless permission is granted by the Federal Government. Wildlife export is prohibited, with the exception of freshwater fish. IBAMA, Brazil’s Institute for the Environment and Renewable Resources, regulates the 1998 law and issues the required permits for aquarium fish. Unfortunately, there seems to be little capacity for law enforcement.

2.2.3 Illegal Trade

Wildlife is being illegally transported out of Brazil, as border controls are weak or non-existent. Reptiles native to Brazil have been found in neighbouring Suriname, indicating smuggling is going on (Hoogmoed, pers. comm.). There has been a lot of press interest in the status of illegal wildlife trade in Brazil, stimulated by a report produced by the Brazilian NGO RENCTAS (National Network for Combating the Traffic of Wild Animals). This report made an attempt to uncover the scale and economic value of the illegal wildlife trade. However, this type of analysis is always highly contested as getting accurate figures on an illegal activity is by definition near impossible (Cook et al., 2002). The report claimed that wildlife trade is worth US$ 1 billion for Brazil alone and estimates that 12 million animals are taken from the wild each year (RENCTAS, 2001). Despite being based on guesswork, the report was picked up by the Brazilian and international press (e.g. The Economist, 2001).
Table 1: Value of NTFP exports from Brazil [in US$ x 1,000]

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Data are given for the country as a whole. Source: Broekhoven (1996), RENCTAS (2001), Ribeiro Silva et al. (2001), Banco do Brazil, cited in Richards (1993). a Data for Amazonas only: Chao and Prang (2002). Data for piassava are probably lumped figures for Leopoldina piassaba and Attalea funifera.

The major areas for (illegal) wildlife trapping and trading as identified by RENCTAS (2001) are given in Table 2 (see also Map). Manaus is a major centre in the area for capture, sale and export, whilst Belem is a key area for the sale of wildlife products (RENTAS, 2001). In Belem, jars containing the purported medicinal — but prohibited — body parts and oils of endangered animals such as the manatee, Amazon turtle and pink river dolphin can be bought in plain sight (Faiola, 2001).

Table 2: Areas of wildlife capture and sale in the Brazilian Guiana Shield

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<th>Capture and Sale</th>
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<td>Amapá</td>
<td>Macapá, MACAPA</td>
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Source: RENCTAS, 2001

2.2.4 Ornamental Fish

Brazil is the main exporter of aquarium fish in South America, with 80% of the ornamental fish exported originating from the Rio Negro Basin (Woolfiet, 1995).

The black-water streams of this area have notably high fish diversity. A preliminary list of Brazilian aquarium fish can be found at www.ornamental-fish.org/brazillist2.htm. IBAMA reported the export of 20-25 million individuals per year from Amazonas State (via Manaus), generating an annual revenue of US$ 3 million, making it the third largest extractive product (Prang, 2002). This is a dramatic increase compared to the export figures in the 1980s, which were around half a million US$ per year (Table 1). IBAMA regulates the trade in aquarium fish; exporters must have licences and a closed season is maintained to prevent over-exploitation (Woolfiet, 1995). Importers have an interest in preventing over-exploitation to guarantee a steady supply in the following years, but complain that they receive little information on the exact period of the closed season, providing little time to increase their stocks before the supply is stopped (Grossman, 2002).

The trade in Brazil is based mainly on the cardinal tetra (Paracheirodon axelrodi). The collection of this species is concentrated in the surroundings of Barcelos (Amazonas), provides 10,000 jobs and is responsible for 80% of the income of the municipality (Geer, 2000). The success and extent of the cardinal tetra trade is due to a few factors: 1) the demand for the species in developed countries is high, 2) breeding in captivity is difficult, 3) cardinal tetras naturally reproduce in extremely large numbers, enabling collectors to supply large quantities without...
BRAZIL

2.2.5 Freshwater fish

Fish consumption in the Brazilian Amazon is one of the highest in the world, with per capita consumption reaching 480 grams per day in Pará State (Gerrits, 1997). The growing populations of Manaus and Belém and their commercial fishing fleets have led to a decline in numbers and size of commercially valuable species in the states of Pará and Amazonas, such as the pirarucu (Arapaima gigas), tambaqui (Colossoma macropomum), arowana (Osteoglossum bicirrhosum), tucunare (Cichla spp.), matrinxã or jatuarana (Hemiodopsis spp.), jaraqui (Sema prochilodus spp.), surubim (Prochilodus fasciatus), tucunare (Hoplosternum thoracatum) and piramutaba (Brachyplatystoma vaillantii) (Gerrits, 1997). Over-exploitation probably has the greatest effect on Arapaima gigas, a large air breathing fish, which is considered a delicacy in the region. The Mamirauá Sustainable Development Institute in Amazonas has developed a successful management and monitoring model for Arapaima. This model has recently been introduced in the North Rupununi, Guyana, where the species has suffered declines due to the high demand from neighbouring Brazil (Iwokrama, 2001).

Portuguese businessmen in Manaus have started a large-scale breeding project for commercial fish species. Surveys of reproduction cycles and other important factors will be carried out by biologists (www.amazonia.org.br). A fish raising project in Roraima, carried out by Cooperativa de Produtores Rurais da Região do Apiaú (CEPRRA) between April and November 2002, was funded by the Brazilian GEF Small Grants Programme. The aim of the project was to increase income and quality of life using native species of fish and forest fruit trees. The species tambaqui (Colossoma macropomum) and curimatã (Prochilodus spp.) were raised in tanks and food was provided for the fish by planting Mauritia flexuosa and Euterpe oleracea nearby. The fruits of these palms belong to the natural diet of these fish species. Unfortunately, the project failed as many fish died due to a lack of technical assistance (Fleischer, pers. comm.).

There are varying views on the sustainability of this trade. The cardinal tetra is effectively an annual fish; therefore most individuals die each year in the dry season regardless of the extraction. Trade levels remain constant – indicating that harvesting is sustainable (Chao and Prang, 2002). Watson (pers. comm.) mentioned that besides the physical difficulty of collecting fish in fast flowing water 10m deep, numbers of specimens collected are kept deliberately low to keep the price up. This makes good economic sense, as there is relatively low demand for fish with a high price tag and the tendency is that once a market is over-supplied, the price crashes and never recovers. By keeping prices high and limiting supply, livelihoods may be assured and the resource can be exploited sustainably. Success relies on a limited entry into the fishery and a certain amount of cooperation between collectors (Watson, pers. comm.). It has been noticed that harvesting boats are moving further up the Upper Rio Negro each year and are now reaching Santa Isabel do Rio Negro, suggesting possible over-exploitation (van Roosmalen, pers. comm.). This phenomenon could be due to the population doubling in Barcelos over the last decade; the number of collectors has grown substantially due to the lack of economic alternatives in the Rio Negro Basin (Chao and Prang, 2002). According to van Roosmalen (pers. comm.), IBAMA does not have the capacity to monitor the ornamental fish trade and feels that a comprehensive monitoring system would be necessary to control the trade. Van Roosmalen suggests that the harvest might be sustainable, but there are no studies to back this up. However, Project Piaba (see below) has been monitoring the trade and considers it to be sustainable (Chao and Prang, 2002).

The trade in cardinal tetrads in the middle Rio Negro led to the initiation of ‘Project Piaba’ in 1991, an interdisciplinary, community-based project to keep the ornamental fishery commercially feasible and ecologically sustainable. The Project works closely with the University of Amazonas (Manaus), INPA (National Institute for Amazon Research) and IBAMA, educating collectors and communities on the best practices for harvesting, handling and shipping of fish (Watson, 2000a). The Project slogan, “Buy a fish – Save a tree” originates from the fact that the cardinal tetra needs the shade of intact forest cover to survive (Geer, 2000). On the other end of the supply chain, the project informs consumers of the ‘green’ value of these fish, in view of the fact that purchasing them will help to conserve the ecosystems in which they were harvested.
meat from a boat in Manaus, containing expensive alligator and anteater meat, as well as the fish species pirarucu and tambaqui (www.amazonia.org.br). Commercial trade in freshwater turtles remains a problem in Brazil (van Roosmalen, pers. comm.).

Freshwater river turtles (Podocnemis spp.) used to be an important source of food in the Amazon and Orinoco regions (Hildebrand et al., 1988). Populations have declined due to the trade in meat and eggs, which can still be found on the markets of Manaus and Belém (Broekhoven, 1996; van Roosmalen, pers. comm.). The giant South American turtle (Podocnemis expansa) occurs in Brazil, Colombia, Guyana and Venezuela, as well as other Amazonian countries, and is probably also found in Suriname and French Guiana. P. expansa is listed on the IUCN Red List as Low Risk - Conservation Dependent, which is encouraging, as on the 1994 Red List this species was considered Endangered. Other commercially harvested river turtles are the red-headed river turtle (P. erythrocephala) and the yellow-spotted river turtle (P. unifilis). P. erythrocephala is found in the Amazon region of Brazil, Colombia and Venezuela. P. unifilis has a broader distribution, covering the entire Guiana Shield. Both species are considered Vulnerable on the IUCN Red List (P. erythrocephala: Vu A1bd and P. unifilis: Vu A1acd). All three species are listed on CITES Appendix II. There are several projects protecting the nesting beaches of river turtles in Brazil located along the Purús River and within nature reserves (van Roosmalen, pers. comm.).

A study on the breeding of river turtles in small ponds in the Cuyabeno Reserve in Ecuador calculated that the value of turtle meat was US$ 20,000, with 22,000 kg being produced per hectare, much more than can be made by producing beef (Nations and Coelho Hinojosa, 1989). However, many turtle breeding initiatives have run into difficulties. A study funded by the Brazilian GEF Small Grants Programme on the husbandry of P. expansa was expected to function as an income generation activity for local fishermen of the Lower Rio Branco in Roraima. The project, which lasted from May 1998 until April 2000, was very promising at first, but by the end of the project there were problems with keeping the turtles and organising activities. The turtles were eventually released into the river. Although not successful in generating income for the locals, the project was proved valuable for research purposes (Fleischer, pers. comm.).

Commercial exploitation of black caiman (Melanosuchus niger) continues in Brazil, whereas it has stopped in most of the other range countries (Ross, 1998). Black caiman meat and skins can be found on the market in Pará, coming from Amazonas (van Roosmalen, pers. comm.), while the meat from the Upper Amazon region is being sold in Leticia, Colombia (Ross, 1998). Populations of black caiman are recovering and fairly stable in Brazil, and the Madeira, Purús and Juruá Rivers are nowadays teeming with large individuals that often become a problem by attacking locals, in particular during the dry season. (van Roosmalen, pers. comm.).

The Amazonian manatee (Trichechus inunguis) was hunted almost to extinction for its meat, fat and hides (Emmons, 1997). Although manatees now have legal protection, locals continue killing the animal for its meat, that is sold on the black market in Santarém. There are just a few remaining populations in the Amazon River, its tributaries in Brazil, Colombia, Venezuela (Rodriguez, 1998) and in the Rupununi and the Essequibo Rivers in Guyana (Emmons, 1997). Van Roosmalen (pers. comm.) has discovered viable populations (either unaffected or slightly affected by hunting) along rivers in the Brazilian Amazon. Its status on the IUCN Red List is Vulnerable (A1cd) (IUCN, 2002) and the species is listed on CITES Appendix I. The ‘Project Manatee’, supported by the National Rubber Tappers Association, studies the status of the Amazonian manatee in several rivers including the Amazon and Negro in the state of Pará. Conservation strategies will be developed from the results of these surveys (www.amazonia.org.br). The West Indian manatee (Trichechus manatus) is found along the seacoasts of the Guiana Shield, as well as in the mouths of the Amazon, the Cauca and Magdalena Rivers in Colombia and the Orinoco in Venezuela. This species suffers from the same problem of over-hunting as the Amazonian manatee (Emmons, 1997).

In general, primates are only affected by local hunting and not by commercial trade (van Roosmalen, pers. comm.). One primate that is vulnerable to hunting pressure is the common woolly monkey (Lagothrix lagothricha, L. poeppigi and L. cana); it is recorded as the most intensively hunted monkey in this region, as its meat is prized above all other large primates. The woolly monkey is usually the first species to disappear where hunting pressure is high. The common woolly monkey is listed on CITES Appendix II. L. poeppigi and L. cana are listed as Vulnerable (A1c) on the IUCN Red List (IUCN, 2002) and L. lagothricha appears on Brazil’s list of threatened animals (IBAMA, 1992) and as Vulnerable on the Colombian Red List (Rodriguez, 1998).
### Table 3: Production of selected Brazilian NTFPs from the Amazon region

(Maranhão, Pará, Amapá, Amazonas, Roraima, Mato Grosso, Rondônia, and Acre)*

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**Source:** IBGE data in Anderson (1988), Richards (1990) and Coppen (1995a/b)

* NB: This area is larger than the Guiana Shield region of Brazil

** Data for piassaba are probably lumped figures for Leopoldinia piassaba and Attalea funifera
2.3 Plant Products

2.3.1 Acai
The fruits of the palm species *Euterpe oleracea* are one of the most important vegetable NTFPs in the Brazilian economy (Table 3). This multi-stemmed palm is widely distributed in the swamplands of northern South America and attains the greatest concentrations in the brackish Amazon estuary (Henderson and Galeano, 1996). *E. oleracea* has a major fruiting season from August to December in Brazil (Kahn and de Granville, 1992). People harvest the fruits by climbing the palms, cutting the inflorescences, and extracting the fruit pulp mechanically or by hand. This highly nutritious liquid is processed into a beverage, ice cream, pastries, and other food items. Mixed with cassava flour, rice, or sugar, acai is consumed in huge quantities by the poor section of the Amazonian population. In some areas, people consume over two litres a day (Strudwick and Sobel, 1988; de Castro, 1983). People also cultivate *E. oleracea* for its fruit. As long as people climb the trees to collect the fruit, instead of cutting all mature stems, acai production can be considered sustainable. Other sustainable management practices are selective thinning of forest competitors (lianas) and pruning to increase production (Anderson and Jardim, 1989).

The bulk (92%) of the acai fruits is collected and processed in Pará (Richards, 1993). The main marketing constraint is the high perishability; fruits must reach the market place within 24 hours. This limits the commercial extraction to areas near market centres. However, the short distances, the ease of processing and the absence of complex wholesale and export market structures, result in a high proportion of the sale accruing to the producers. Most fruits are brought by the harvesters themselves to the processing plants. Acai supports a huge domestic economy in the Brazilian Amazon (Table 3), but until recently it was hardly exported (Richards, 1993; Broekhoven, 1996). The market for indigenous Amazon fruits, however, has been growing steadily in the past few years, because of the popularity of health stores in the Amazonian countries themselves and in Europe and the US. If the acai fruit pulp is frozen at -18ºC, it can be transported over long distances (Villachica, 1996). Acai is now widely sold for sale in the form of bottled drinks and frozen pulp on the Internet. The drink is very popular among Brazilian immigrants in the US (www.aruanda.com.br, www.ast-int.com.br).

2.3.2 Palm heart
The same palm that produces acai (*Euterpe oleracea*) also yields an edible palm heart. A palm heart consists of the young, rolled leaves in the crownshaft that have not yet been exposed to sunlight. It can be consumed raw or cooked and is considered a delicacy. Although several palms have edible hearts, *E. oleracea* is now the world’s main source of industrially produced palm heart (Strudwick, 1990). To harvest a palm heart, the entire stem is cut down and its crownshaft removed. Because of its frequency and clonal, self-regenerative habit, *E. oleracea* is able to support a large palm heart industry. The main area is Pará and to a lesser extent Amapá, worth some US$ 120 million annually in domestic consumption and export value (Strudwick and Sobel, 1988). The palm hearts are processed and canned in factories on the banks of the Amazon. The cans are transported to Belem, from where the best quality hearts are exported to Europe and the US, while the smaller and more fibrous hearts are distributed on the domestic market (Strudwick and Sobel, 1988).

After having depleted natural stands of the single-stemmed *Euterpe edulis* in southern Brazil during the 1960s, the palm heart canning industry shifted to *E. oleracea* in the Amazon Estuary in the 1970s (Galetti and Fernandez, 1998). *Euterpe* resources in the Amazon have certainly dwindled since then. Pollak *et al*. (1995) predicted that the economic boom in the palm heart industry would be short-lived, since many of the hundreds of canning factories in the Amazon estuary were closing down in the early 1990s. An important reason for this over-harvesting is that Brazilian factories do not request a minimum size for their palm hearts. Unlike the canning industry in Guyana, low-grade or small-sized palm hearts are kept for the national market in Brazil (Strudwick and Sobel, 1988; Pollak *et al.*, 1995; van Andel *et al.*, 1998). IBAMA has proposed a minimum diameter size of 2 cm, but regulations are not enforced and many ‘illegal’ palm hearts are still being processed (Pollak *et al.*, 1995). Furthermore, the palm swamps are generally not allowed sufficient time to recover from cutting. Repeated harvesting with short rotation periods leads to the weakening of the individual palm clumps and a slower regeneration. Ecological research on *Euterpe* populations has pointed out that harvesting at short intervals (1-2 years) causes clump mortality and a steady decline in production. Harvesting at longer intervals (4-5 years) causes less damage to the natural stands and produces a higher palm heart yield (Pollak *et al.*, 1995; van Andel, 2000; Peña-Clara and Zuidema, 2001).

Several authors have designed large-scale management systems for the Brazilian palm heart industry. Calzavara (1972) presented results from a plantation, in which palm hearts were harvested every four years, felling 30% of the stems > 10 m and 30% of the stems between 2 and 5 m during each harvest. Anderson and Jardim (1989) reported a system in which three large palm hearts were extracted from each clump every third year, combined with selective thinning of vegetation without local uses. Strudwick (1990) gave an example of a successful management plan in Marajo, in which a factory divided an area of 5 x 2 km into smaller rectangles of 200 x 500 m. These plots were harvested every four years and actively managed. Undesirable vegetation and palm leaf debris where cleared to provide sufficient light and a better germination of *E. oleracea*. The forest was thus maintained in an optimum state for the future production of palm heart. This system supplied approximately 700 harvestable stems per ha. It was estimated that it would take just over two years to harvest the entire area. Upon completion, the
The Brazil nut, locally known as castanha do Pará, is the seed of Bertholletia excelsa. This giant tree is mostly found in groves of 50 to 100 individuals in undisturbed rain forest. The nuts are sold with their shell or are cracked in local plants. They are eaten raw or roasted. Oil extracted from the nuts is used in cosmetics, soap and aviation lubricants. The main export is directed towards the US, the UK, Germany and Australia. Brazil nuts are one of South America’s most important NTFPs, marketed worldwide for about US$ 30 million annually (Broekhoven, 1996). Export from Brazil in 1988 was US$ 4.5 million (Table 1).

Recently, Brazil nut harvesting shifted from Pará (34% of the Amazonian production) and Amazonas (24%) to Acre (33%). This caused significant increases in production and transport costs, due to lower densities of trees and the greater distance to Belém, where a few large companies handle 70% of the Brazilian exports. Brazil nut collection is less significant in Amapá (5% of the national production) and Roraima (2.2%). Over-harvesting, a lesser demand, the felling of mature trees for timber, a lack of regeneration and the hunting of agouti’s (the tree’s main dispersal agent) are threatening the Brazil nut industry (Richards, 1993). Export values dropped to US$ 2.5 million in the 1990s; figures of recent date were unfortu-
nately unavailable. Attempts to produce Brazil nut in plantations in Amazonas
and Pará have had limited success, probably because of the tree’s complicated pol-
lination biology, as well as soil and climatic factors (Mori and Prance, 1990; Broekhoven, 1996).

In Riberalta (Bolivia), scientific research on the sustainable harvesting, general
ecology and population dynamics of *B. excelsa* is carried out by the Dutch-
Bolivian PROMAB programme (Boot, 1997; Zuidema, 2000; Peña-Claros, 2001).
One of these studies indicated that high levels of Brazil nut extraction may be sus-
tained for at least several decades, without reducing production potential and
with good prospects for continued regeneration of exploited populations
(Zuidema, 2000). Another study reports a method for increasing the density of
*B. excelsa* in secondary forests by enrichment planting, which seems to be a good
option for the management of Brazil nut resources (Peña-Claros, 2001). It
remains a question, however, whether the results obtained in Bolivia can be
extrapolated to the situation in Brazil.

The extraction of Brazil nuts often goes hand-in-hand with the tapping of rub-
ber. Some major extraction areas for these NTFPs in the Brazilian Guiana Shield
are the Cajari River Extractive Reserve, the Maracá Reserve, and the Trombetas,
Erepecurú (Oriximiná), Jauafer, Xeriuni and Branco Rivers. Indigenous people
are often involved in the collection of these NTFPs, like the Maroons along the
Rio Trombetas and Macushi and Wai Wai Indians in Roraima (van Roosmalen,
pers. comm.).

### 2.3.4 Rubber

After the establishment of plantations in South East Asia and the development of
synthetic substitutes, natural rubber tapped from wild *Hevea brasiliensis* trees has
lost most of its economic importance (Richards, 1993). Extraction in Brazil has
only continued as a result of government policy to subsidise national production,
resulting in Brazilian rubber prices up to three times the international price
(Fearnside, 1989). Until 1992, rubber was a major NTFP in the Brazilian Guiana
Shield, both in volumes and value (Table 1 and 3). Schwartzmann (1989) esti-

mated that in the 1980s, half a million people in the Brazilian Amazon depended
on the extraction of rubber and other latex products for their income. Today,
most rubber is collected in Pará and Rondônia, followed by Acre and Amazonas
(Richards, 1993).

Rubber is mostly collected in the dry season; extractors often shift to harvesting
Brazil nuts in the rainy season. Most of the present-day rubber tappers are still
involved in the aviamento system, in which middle-men supply market goods on
credit at inflated prices, to be paid for in rubber, which is purchased at low prices
(Richards, 1993). This system, also known as debt peonage, is not exclusive to the
rubber industry, but prevalent in the extractive economy throughout the Guiana
Shield (see Discussion Chapter). The establishment of extractive reserves was ini-
tiated by requests of the rubber tappers to escape this depressing debt peonage
system (Broekhoven, 1996). The future of natural rubber is rather hopeless, as
60% of the national production now comes from large plantations in Mato
Grosso and São Paulo (Browerd, 1992). Moreover, the leading processing factory
for rubber and sorva in Manaus has recently stopped its activities
(van Roosmalen, pers. comm.).

### 2.3.5 Balata

Sometimes described as South American gutta-percha, balata is obtained from
the latex of *Manilkara bidentata*, a rain forest tree found in northern Amazonia
and the Guianas. Its non-elastic, insulating properties make balata suitable for
submarine and telephone cables. In the first half of the 20th Century, Brazil (Pará)
was the main supplier on the world market, followed by Guyana, Peru, Venezuela
and Suriname (Fanahawe, 1948; Coppen, 1995a; van Andel, 2000). Nowadays,
balata is almost totally replaced by synthetics, exported only in small quantities
for root canal fillings in dentistry (Pennington, 1990) and the chewing gum
industry (Rehm and Espig, 1991). Balata is also sold on the national market in the
form of animal figures and other tourist crafts (Coppen, 1995a).

### 2.3.6 Macaranduba

The latex from the *macaranduba* tree, *Manilkara huberi*, also used to be exported
to the US for the chewing gum industry. After the development of synthetic gums,
production dropped from 1000 tonnes per year in 1965 to ca. 30 tonnes in 1994
(Table 3). The main production area is Pará, with Manaus as the principal pro-
cessing centre. Macaranduba is sometimes sold on the Belém market (Coppen,
1995a). The product is also in decline because the tree is logged for its timber
(Richards, 1993).

### 2.3.7 Sorva gum

Tapped from the bark of a 30 m high forest tree (*Couma macrocarpa*), sorva has
now largely been replaced by synthetics in the chewing gum industry, which has
led to a drastic decline in demand (Table 1 and 3). In 1978, sorva exports were val-
ued at almost US$10 million, while the most recent export values are around US$3
million. Brazil is currently the only supplier in the world market, with most of
the export going to the Far East. Amazonas was the centre of Brazilian produc-
tion, with Roraima as the only other source of sorva (less than 10% of the pro-
duction). Nevertheless, sorva latex remains an important extractive product in
Amazonas, especially when conditions for rubber collection are bad. Destructive
tapping methods seem to have changed towards more sustainable methods using
climbing irons (Sizer, 1991). The Brazilian chewing gum industry relies totally on
synthetic ingredients, so there is no domestic market for sorva. The processing
and storing of sorva for export takes place in Manaus (Coppen, 1995a), but the
main processing factory recently closed down (van Roosmalen, pers. comm.).
2.3.10 Other oils and waxes

Coumarin is produced from cumaru nuts or tonka beans, harvested from *Dipteryx odorata*, a common but not abundant tree in the Guiana Shield. The seeds contain coumarin, used industrially to flavouring tobacco, as a vanilla substitute and in perfumes. Cumaru nuts are harvested mainly in Pará (Richards, 1993). As a result of the development of synthetic coumarin, prices and export volumes have been declining since the 1940s (Schwartzmann, 1990).

Ucuúba oil, extracted from the seeds of *Virola surinamensis* and *V. sebifera*, is commercially harvested on a small-scale in Amazonas. The product is used in the manufacture of soap and candles, and has a regional market as medicinal oil. Resources have dwindled lately due to timber harvesting, low prices, rural to urban migration and alternative income-generating possibilities, which reduced labour availability and supply consistency (Richards, 1993). *V. surinamensis* is also logged for timber, and as a result listed as Endangered (A1ad+2cd) on the IUCN Red List (IUCN, 2002).

Andiroba or crabwood oil is obtained from the seeds of the crabwood tree (*Carapa guianensis*), a common tree throughout the Guiana Shield that is also valued for its timber. In Brazil, the oil is industrially used for soap production and as illuminator. Pará produces 38% of the andiroba oil; the remainder comes from outside the Guiana Shield area (Richards, 1993). According to Schwartzmann (1990), the nuts have virtually disappeared from the commercial market due to low prices and logging. However, throughout the Guiana Shield, it is a common medicinal oil on the domestic market (van Andel, 2000). Several initiatives are being developed to promote the oil on the international market (www.amazoncoop.org).

Cauassu wax is obtained from the leaves of the herb *Calathea lutea* (Marantaceae), which grows in clumps along the Amazon River. It appears to have the same quality (but is cheaper to harvest) than carnaúba wax, produced from the palm *Copernica prunifera* in north-eastern Brazil (National Academy of Sciences, 1975). Although carnaúba wax has lost importance due to synthetics, it still retains a market for high quality floor and automobile polishes (Johnson, 1997). Cauassu wax might play a role as an Amazonian alternative to carnaúba wax (National Academy of Sciences, 1975).

2.3.11 Piassaba

In the Roraima and Rio Negro area, beard-like fibers are collected from the leaf base of the palm *Leopoldinia piassaba* and used to manufacture rope, brushes and brooms. This palm grows in nearly pure stands in dense, seasonally flooded forests. *L. piassaba* (Pará piáçava) is endemic to the basins of the Rio Negro and Upper Orinoco Rivers (Putz, 1979). Collection of these fibres is a benign and sustainable form of exploitation, providing that trees are not damaged during har-
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A large percentage of Brazil’s population depends heavily on medicinal plants for primary health care (Ribeiro Silva et al., 2001). An example of a registered trader is the Instituto de Pesquisas Científicas e Tecnológicas do Amapá (IEPA) that coordinates several medicinal plant projects and publishes simple, well-illustrated phytotherapy manuals for local people (IEPA, 1999, 2000). The States of Paraná and São Paulo are the main exporters of medicinal plants. The main importing countries are the US and Germany (Ribeiro Silva et al., 2001). In June 2001, Brazil decided that all research and commercial use of biological material must be approved by a new council linked to the Office of the President. Companies must share any royalties from commercial use of natural resources with the Government and local institutions or pay steep fines. The Constitution of 1999 ‘guarantees and protects’ knowledge, technology and innovations of Amerindian communities. It requires that all activity related to genetic resources and knowledge associated with them be shared collectively and prohibits companies from patenting materials they use or discover.

2.4 The future of commercial NTFPs in Brazil

The international trade in natural gums, resins and latex has declined over the past quarter century (Johnson, 1997). Cutting the fibres does not damage the terminal bud of the palm, but when demand is high and the trees are too tall for collection from the ground, palms are sometimes cut down to obtain the fibres (Putz, 1979). To ensure a continuing growth, two to four leaves are left intact on the palm, so that four to five years the palm can be harvested again. Overexploitation can lead to scarcity of fibre-producing individuals, but not of the palm stands themselves (FAO, 1997). Along coastal Brazil, similar fibres are harvested from Attalea funifera (Bahia piassava), while in Acre the product is obtained from yet another palm species (Aphandra nataliae). Unfortunately, the Brazilian Institute of Geography and Statistics (IBGE) combined all piassaba fibres in its export statistics (Table 1). No information was given on the direction of the export or the reason for the exceptionally large production figures in 1992 (Table 3). According to Voeks (1988), 83% of the national production comes from Attalea funifera, while Para piassaba accounts for less than 10% of the national market. Still, the Amazonian fibres could become more important in the near future, as natural stands in Bahia are threatened by over-harvesting and fire (Voeks, 1988).

2.3.12 Medicinal plants

Ethnobotanical research has pointed out that a great number of medicinal plants are being used by indigenous groups in northern Brazil, like the Yanomami (Milliken and Albert, 1997; Milliken, 1997) and Wairiri Atroari Indians (Milliken et al., 1992). Few of these medicinal plants were reported as being commercialised. According to IBAMA, only 88 native medicinal plant species have been identified and traded on the domestic and/or export market. However, unreported use and trade is common throughout Brazil, as medicinal plants are highly valued in health care and used widely for therapeutic and religious purposes. A joint IBAMA/TRAFFIC study (Ribeiro Silva et al., 2001) revealed that large amounts of medicinal plants are exported from the country (www.traffic.org/news/brazilmp.html). The study estimates the total export of medicinal plants from Brazil at almost US$ 6 million per year in the mid 1990s (Table 1). Jaborandi leaves (Pilocarpus jaborandi), used in the treatment of glaucoma, make up a significant part of this export. The species appears in a list of threatened species in Brazil (Ribeiro Silva et al., 2001). The IBAMA/TRAFFIC figures place medicinal plants as a major export NTFP next to Brazil nuts, but official export figures from the Banco do Brasil (Table 1) are much lower. Ribeiro Silva and co-workers do not distinguish between cultivated medicinal species and those harvested from the wild (NTFPs). These confusing figures illustrate the lack of trustworthy data on the trade in NTFPs, and on medicinal plants in particular. More clarity in the legal instruments and recording systems regulating harvest and trade in the medicinal plants is also urgently needed (Ribeiro Silva et al., 2001).

A total of 70 companies and individuals have officially registered with IBAMA to trade in medicinal plants. This is a small number, considering the fact that a large number of medicinal species are used. The IBAMA/TRAFFIC study (Ribeiro Silva et al., 2001) states that only 88 species are being traded and that the total export per year is US$ 6 million. This is a significant amount, considering the low number of companies involved. The study also states that the export of medicinal plants is regulated by IBAMA, but that the export data are not available. The IBAMA/TRAFFIC study also states that the export of medicinal plants is regulated by IBAMA, but that the export data are not available. The IBAMA/TRAFFIC study also states that the export of medicinal plants is regulated by IBAMA, but that the export data are not available.
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The Rio Jauaperi project aims to investigate and implement sustainable forest exploitation techniques. From the mouth of the Jauaperi to the Igarape Xixuaú, several shamans, midwives and local experts on medicinal plants have contributed to an ethnobotanical database (www.amazonia.org/htm/relatorio.htm#4), which unfortunately lacks many scientific names. IBAMA is currently setting up an extractive reserve in the Xixuaú area, where Brazil nuts and cupuacu (Theobroma grandiflorum) will be commercialised (www.amazonia.org/htm/jauaperid.htm).

The BioTrade Initiative, launched by UNCTAD in 1996, aims to enhance the capability of developing countries to produce value-added products and services derived from biodiversity, for both domestic and international markets (www.biotrade.org). They support the regional programme Bolsa Amazonia, which establishes links between the market sector and indigenous communities interested in marketing natural products (www.bolsamazonia.com). They promote the trade in Brazil nuts, açai pulp and copuá oil, focusing on sustainable management, processing, marketing and commercialisation of NTFPs. A sister organisation of Bolsa Amazonia is POEMA (Poverty and Environment in the Amazon Programme). Created in 1992, POEMA is a research and development programme based at the Federal University of Pará involving rural producer cooperatives, governmental bodies, NGOs, science and technology institutions and the private sector, with the goal of alleviating poverty and conserving the Amazon (www.ufpa.br/poema).

A total of 200,000 Amerindians live in the Brazilian Amazon. From ethnobotanical surveys we know that they use a wide variety of plants and animals (Cavalcante, 1972, 1974, 1979; Milliken et al., 1992; Milliken and Albert, 1997, 1999; Shanley et al., 1998), but most of these NTFPs are used only for subsistence. Unlike in the other countries of the Guiana Shield, Amerindians are not the main people involved in commercial NTFP extraction in Brazil. Most indigenous groups live in reserves far away from markets, and thus face few opportunities to market their products. In the Waimiri Atroari Reserve, on the border of Roraima and Amazonas, the National Foundation for Indigenous Affairs (FUNAI) tries to encourage craft production and Brazil nut gathering for the Manaus market (Milliken et al., 1992). A small craft project with Ischnosiphon polyphyllus, carried by the Artisans Association of Novo Airão, is co-funded by WWF-Brazil.
3

COLOMBIA

3.1 Commercial NTFP extraction

Colombia, with its very diverse landscapes and numerous climatic zones, is a so-called ‘mega-diversity country’ that harbours 10% of all plant and animals species in the world (Castaño-Uribe and Cano, 1998). The Guiana Shield area of Colombia includes the administrative divisions of Amazonas, Caquetá, Vaupes, Guaviare, Meta, Guainia and Vichada (see Map). These are the political divisions covering the Amazon and Orinoco Basins. At the Priority Setting Workshop in April 2002, it was determined that the western boundary of the Colombian Guiana Shield should be the rocky outcrops of Chiribiquete, based on the overlap of distributions of various taxonomic groups. This would exclude the Serranía de Macarena, a mountain range that was considered part of the Guiana Shield during preliminary discussions.

The Llanos Orientales (250,000 km\(^2\)) can be characterised as a vast savannah that is partially flooded during the rainy season. Gallery forests are found along the main rivers. The region is sparsely populated: the indigenous population is mainly found in Meta, Vichada, Guaviare and Guainia. Cattle-breeding is the main economic activity, followed by cash crop agriculture. Guerrilla activities and coca cultivation are quite prominent in the Llanos. The main NTFPs are wildlife, piassaba (Leopoldinia piassaba), crafts and canangucha (Mauritia flexuosa).

The Colombian Amazon (400,000 km\(^2\)), covered largely with pristine tropical rainforest, is sparsely populated by Indian tribes. Major deforestation is taking place at the foothills of the Andes, where there is a high concentration of colonists and the majority of the coca is produced. Guerrilla activities of the FARC are concentrated in this area. Deeper inland, their presence is less evident, although increasing (M. von Hildebrand, pers. comm.). The main commercial NTFPs in Amazonas are rubber, wildlife, canangucha (Mauritia flexuosa), asahí (Euterpe precatoria), copoazu (Theobroma grandiflorum), milpesos (Jessenia bataua), and crafts (wood carvings, basketry and cumare fibers from Astrocaryum chambira).

The two largest cities in the Colombian Amazon are Leticia and Florencia. Leticia, with 22,000 inhabitants, is the only Colombian port along the Amazon River. Although Leticia is located outside of the Guiana Shield, it is a major market for NTFPs from the region. Most transport is by boat; the city is well connected to the large Amazonian ports of Iquitos (Peru) and Manaus (Brazil) and linked with the rest of Colombia by aeroplane (Pulido and Cavelier, 2001). Florencia, with a
3.2 Wildlife

3.2.1 Commercial wildlife harvesting

The main commercial NTFP of the Colombian Guiana Shield appears to be freshwater fish, both for food and the aquarium fish trade, although official export figures are not detailed enough to make a definitive assessment. There is a considerable domestic wildlife trade in Colombia: Bakker (1999) found several species, especially birds, on markets in the centre of Colombia that originate from the Amazonia or Orinoco areas. Colombia has specialised in export of several captive-bred CITES listed reptiles. In the late 1980s, Colombia exported thousands of live primates, mainly *Saguinus oedipus* (Broekhoven, 1996), but this no longer occurs.

3.2.2 Wildlife regulations and management in Colombia

Colombia ratified CITES in 1981 and introduced administrative and scientific authorities in 1997 to effectively manage the trade (Muntingh and Veening, 1999). Wildlife is the main NTFP harvested here.

3.2.3 Illegal Wildlife Trade

Wildlife trafficking is reported to be a problem in the Colombian Guiana Shield. Primary centres of illegal wildlife trade are: Leticia, Florencia, Puerto Inirida, San José del Guaviare, Miraflores and Puerto Carreño (Bakker, 1999). Wildlife is transported across the borders of Venezuela and Brazil regularly, as control is weak and not focused on animal transport. The army is reported to be engaged in illegal trade in caimans and monkeys. In the Serranía de Macarena, poaching by colonists and the army is a great problem (Muntingh and Veening, 1999). The local NGO Asociación para la Defensa de la Reserva de la Macarena is involved with the rehabilitation of wild animals that are confiscated by the authorities, such as parrots and macaws, but their present facilities are rather poor and in need of upgrading (Muntingh and Veening, 1999). Illicit trade in Crocodilianskins is undermining efforts of sustainable use programmes (Ross, 1998).

A recent report commissioned by WWF-UK and TRAFFIC discovered parallel smuggling routes: traditional drug trade routes are also being used for wildlife trade (Cook et al., 2002). In 1993, a shipment of *Boa constrictor* from Colombia with legitimate CITES (Appendix II) documentation was discovered to contain 39 kg of cocaine. The cocaine was packed in condoms and found inside the snake’s digestive system; all 225 snakes used to smuggle the cocaine died (Cook et al., 2002).
3.2.4 Freshwater fish

The most important commercial NTFPs within the Colombian Guiana Shield are the large catfishes, caught mainly in the Vichada, Meta, Guaviare and Caquetá Rivers (Rodriguez, 1999a; Mojica, pers. comm.). Commercial fishing forms the basis of the local economy and is the primary source of income for local inhabitants along the middle Caquetá River (Rodriguez, 1999a). Commercial fishing is mainly an activity of the colonists, while the Indians catch smaller fish for subsistence (van der Hammen, 1992). The annual catch in the Caquetá River is between 100–120 tonnes per year and the total industry was worth over US$ 780,000 in 1993 (Rodriguez, 1999a). The final intermediaries get the majority of the profits, while the fishermen get only 14% of the total income generated (Rodriguez, 1999a).

The most important commercial species are: dorado (Brachyplatystoma flavicans), lechero (Brachyplatystoma filamentosum), pejenegro (Paulicea platynema), pirabutón (Brachyplatystoma vallianti) and pejeleño (Sorubimichthys planiceps) (Rodriguez, 1999a). Pulido and Cavelier (2001) found that 8,525 tonnes per year of fish were sold on the market of Leticia between 1992 and 1996; making Leticia the main trade centre for commercial fish. Nineteen species are found on the market in Leticia; however two species form the bulk of the trade (46%): dorado (B. flavicans) and pintadillo (P. faciatum). The majority of the fish found on the Leticia market, however, originates from Brazil (Mojica, pers. comm.). The fish are stored in deep freeze units in Araracuara, La Pedrera and Leticia before being transported by aircraft to Bogotá (Rodriguez, 1999a). Freshwater fish were hardly sold on the Florencia market (Pulido and Cavelier, 2001).

The large catfish of the Caquetá River have been under continuous pressure for decades, but with the introduction of deep freeze units and improved fishing equipment this pressure has increased dramatically (Rodriguez, 1999a). The Tropenbos-Colombia programme helps local people to monitor their fish resources and examine the dynamics between the forest, the river and the fish populations (Rodriguez, pers. comm.). Colombia has a legal quota system for its fisheries. Colombians are crossing the border, fishing in Venezuela and Brazil and exporting their catch from Colombia or Venezuela. There is a mafia style racket in Amazonas State controlling the commercial fishing (Mojica, pers. comm.).

3.2.5 Ornamental fish

Ornamental fish have been exported from Colombia for more than thirty years (Ajiaco-Martínez et al., 2002). The Colombian Guiana Shield is the most important harvesting area, especially the Meta, Vichada, Tomo, Vichada and Atabapo Rivers. Most ornamental fish are transported to Bogotá and from there exported to the US (58%), Europe (23%), Japan (13%) and other Asian countries (Ajiaco-Martínez et al., 2002). The Instituto Nacional de Pesca y Acuicultura (INPA) has registered the export since 1991. Export increased from ca. 13 million fish to almost 24 million in 1999, but recently figures have somewhat lowered (Table 4). According to Ajiaco-Martínez et al. (2002), these figures should be interpreted with care, since collectors often supply unreliable information.

Table 4: Export value of ornamental fish from Colombia (1995–2001)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of fish</th>
<th>Export Value [US$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>19,595,000</td>
<td>4,420,907</td>
</tr>
<tr>
<td>1996</td>
<td>17,355,000</td>
<td>4,461,032</td>
</tr>
<tr>
<td>1997</td>
<td>15,755,000</td>
<td>3,736,333</td>
</tr>
<tr>
<td>1998</td>
<td>18,404,000</td>
<td>3,679,483</td>
</tr>
<tr>
<td>1999</td>
<td>23,599,000</td>
<td>4,215,475</td>
</tr>
<tr>
<td>2000</td>
<td>14,854,221</td>
<td>2,663,473</td>
</tr>
<tr>
<td>2001</td>
<td>14,922,000</td>
<td>3,609,525</td>
</tr>
</tbody>
</table>

Source: Blanco, 2002

The majority (76%, 110 species) of aquarium fish originate from the Orinoco Basin. Major centres of harvesting are Arauca, Puerto Carreño, San José del Guaviare, Puerto Gaitán, Villavicencio and especially Inírida (Guainia), where 50% of all fish are collected (Ajiaco-Martínez et al., 2002). The Inírida Rivers harbour a great diversity of ornamental fish species, providing an important economic resource for the indigenous population of the area. An estimated 194 ‘pescadores’ fish for ornamental species along the Inírida, Orinoco and Atabapo Rivers. It is especially important as there are very few alternative sources of income in this area. The total value of the aquarium fish trade in the Inírida region was estimated at US$ 110,000, based on the price paid to the fishermen (Ramírez-Gil and Ajiaco-Martínez, 2002). The remainder of the aquarium fish (22%) are caught in the Amazon Basin (Leticia, La Pedrera and Puerto Leguízamo) (Ajiaco-Martínez et al., 2002). Harvesting of certain species can be limited to particular localities, for example the tetra brillante (Hemigrammus sp.) comes primarily from Puerto Gaitán (Ajiaco-Martínez et al., 2002).

A total of 155 species are commercialised in Colombia. The most important commercial species are the neon tetra (Paracheirodon innesi), cardinal tetra (P. axelrodi), otocinclus (Otocinclus spp.), arawana (Osteoglossum bicirrhosum, O. ferreirae), tetra brillante (Hemigrammus sp.), estrigata (Thoracocharax sp., Carneigrella spp.), tigrito (Pimelodus pictus), cohereora (Corydoras spp.) and rojito fino (Hyphessobrycon sweglesi). One of the economically most valuable species is the black arawana (Osteoglossum feroxius). There are some concerns that this species is being over-exploited and it is considered Endangered in Colombia (Mojica, et al., 2002).
3.2.6 CITES Reptiles

Colombia exports several captive-bred CITES listed reptiles: green iguana (*Iguana iguana*), spectacled caiman (*Caiman crocodilus crocodilus* and *C. c. fuscus*), tegu lizard (*Tupinambis teguixin*) and the *Boa constrictor* (Table 5). The increase in trade in reptiles is probably driven by the growing US market for reptiles as pets. In 1997, the US imported 1.8 million reptiles worth more than US$ 7 million (UNEP, 2000).

| Table 5: Colombia’s CITES Export Quotas 1997-2002 |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Caiman crocodilus † skins | 660,000 | 79.2 | 500,000 | 145 | 660,000 | 123 | 660,000 | 2.6 | 599,000 | 199,000 |
| Boa constrictor live | 90,000 | 71.0 | 75,000 | 88.6 | 11,000 | 48.7 | no quota | – | 6,535 | 17,028 |
| *Tupinambis teguixin* live | 3,000 | 0 | 2,000 | 0 | 3,000 | 0 | 3,000 | 36.2 | 3,378 | 3,378 |

The green iguana (*Iguana iguana*) has a widespread distribution covering parts of the US, Mexico, Central America, the north of South America and many Caribbean Islands. The green iguana is herbivorous, lives in trees and occurs in a variety of tropical and subtropical forest types. Nowadays, the species is exported mainly for the pet market in the US, where it is currently considered to be the most popular reptilian pet. Between 1993 and 1997, Colombia exported more than 2.4 million iguanas, 95% of which were imported by the US (UNEP, 2000).

Colombia has by far the highest export quotas exporting iguanas of the Guiana Shield. Export quotas from Guyana and Suriname are much lower and are not close to being realised. The green iguana is listed on Annex B of the European Regulations, which regulates import of the species into Europe. As well as being exported internationally, the iguana is hunted locally for the trade in its eggs and meat, especially in the Caribbean region of Colombia (Bakker, 1999). Green iguanas have been an important protein source across Latin America for thousands of years (Broekhoven, 1996) and this still holds true for rural communities today (Werner, 1991; Ojasti, 1996). Bakker (1999) records values of 30-80 pesos (US$ 0.07) per iguana egg purchased from a hunter, and each egg is then sold on for 200 pesos (US$ 0.30). *Iguana iguana* is not considered threatened (Low Risk – Least Concern) in Colombia (Rueda, 1998), but there are concerns about declining numbers. It is listed on CITES Appendix II, originally listed due to the trade in its skin (Hoogmoed, pers. comm.).

The green iguana is bred in captivity in many Latin American countries, such as Costa Rica, Nicaragua, Panama and Colombia. Management schemes for the green iguana can vary from raising iguanas in prairies to raising iguanas in greenhouses. The various management techniques mentioned in Werner (1991) are relatively easy and often inexpensive to implement.

*Boa constrictor* have a widespread distribution covering Mexico, Central, South America and several Caribbean Islands. The most common subspecies found in the pet trade is *Boa constrictor constrictor*, also sometimes known as the Colombian red tail boa. This snake is listed on CITES Appendix II. Almost all Colombian captive-bred *Boa constrictor* are imported by the US for the pet trade (UNEP-WCMC, 2002). Captive-bred *Boa constrictors* sell for between US$ 200 and 300 in the US, depending on skin pattern and age. *Boa constrictors* are also bred in captivity in the US and Europe.

Northern tegu lizards (*Tupinambis teguixin*) are found in all countries of the Guiana Shield as well as Bolivia, Ecuador, Peru, Trinidad and Tobago. Tegu lizards are now primarily exported for the European and US pet markets. Although Colombia has an official CITES quota for *T. teguixin*, they did not record any exports. However, the US did record the import of 1,800 tegu lizards from Colombia in 2000 (Table 5). *Tupinambis* spp. were previously heavily hunted for their skins (Bakker, 1999) and eggs are harvested for local consumption across Latin America (Broekhoven, 1996). *T. teguixin* is not listed on the IUCN Red List, but is listed on CITES Appendix II and Annex B of the EC Regulations.

3.2.7 CITES Reptiles: Crocodilians

Many crocodilians are exploited for their valuable skin, which supports an international trade worth over US$ 500 million annually. However, the main threat to...
Crocodylians worldwide is habitat loss. Many species have suffered drastic declines in numbers and in the extent of their distributions due to commercial over-exploitation and indiscriminate killing in the past. Although, there have been no extinctions due to direct human exploitation, over-exploitation combined with severe habitat loss has brought several species to the brink of extermination (Ross, 1998). One of the most endangered crocodile species in the world is found in Colombia — the Orinoco crocodile (Crocodylus intermedius). The spectacled caiman and black caiman historically have been decimated by the skin trade from their entire ranges, and are described below as Colombia is exporting skins from captive breeding programmes.

The CITES Appendix II-listed spectacled caiman (Caiman crocodilus) is found throughout the Guiana Shield. It is much smaller and more abundant than the black caiman. It is quite an adaptable animal and can be found in many wetland habitats. With the depletion of the more valuable larger crocodilian species by the 1950s, the trade turned to the spectacled caiman. Colombia topped the statistics for C. crocodilus, exporting more than 11 million skins between 1951 and 1980 (Ojasti, 1996). Colombia is now also heading the CITES statistics with the highest quotas for export in captive bred C. crocodilus skins (Table 5). Although caiman hides have a relatively low value compared to skins of other crocodile species, the spectacled caiman, along with the yacaré caiman (Caiman yacare), supplies approximately 75% of the world trade in legal crocodilian skins (Ross, 1998). Good survey data exist for this species across its range and it numbers in the millions. It is listed as Low Risk-Least Concern on the IUCN Red List, although it is locally depleted or extirpated in some localities (Ross, 1998). The subspecies Caiman crocodilus apaporiensis, a narrower-snouted form, has a very restricted distribution in the Upper Apaporis River and its status is virtually unknown. Urgent action is needed to conserve this subspecies and surveys are needed to determine its population status (Ross, 1998). C. crocodilus apaporiensis is listed on CITES Appendix I.

The CITES Appendix I-listed black caiman (Melanosuchus niger) is found throughout the Guiana Shield, except for Suriname and Venezuela. It lives in a wide variety of habitats including large rivers and streams, oxbow lakes, and sometimes seasonally flooded savannah. As with the spectacled caiman, the black caiman used to be abundant in the Colombian Amazon region, but was virtually exterminated due to the skin trade in the 1950s and '60s, when the populations of more desirable crocodile species (Crocodylus acutus, C. intermedius) had already massively declined (Ross, 1998). It is currently listed on the IUCN Red List as Low Risk-Conservation Dependent (IUCN, 2002) and is considered Endangered (A1cd) on the Colombian Red List (Rueda, 1998). Since 1968, the species has had full legal protection in Colombia, but this has recently been reversed as the population has substantially recovered (Ross, 1998; IUCN, 2002). Local people continue to hunt the black caiman for its meat, (medicinal) fat and as bait for tortoise traps. Ross (1998) recommended more basic ecological studies, population surveys, and regional management coordination to develop compatible sustainable use programmes and control illicit trade. The Von Humboldt Institute, in cooperation with the Ministry of Environment, is carrying out a national census of the crocodilians.

The Orinoco crocodile (Crocodylus intermedius) is restricted to the middle and lower reaches of the Orinoco River in Venezuela and Colombia and is considered to be one of the most seriously threatened New World crocodiles (Ross, 1998). It is mainly found in the Llanos savannahs, where it nests in holes. The Orinoco crocodile appears on CITES Appendix I and is listed as Critically Endangered (A1c, C2a) on the IUCN Red List (IUCN, 2002). Wild adult populations may stand at less than 250 individuals (Ross, 1998). Commercial exploitation from the 1930s to the 60s has decimated wild populations, and little recovery has been evident since that time. Orinoco crocodiles group together in ponds and rivers during the dry season, which is thought to be a factor leading to its decimation (Ross, 1998).

The Von Humboldt Institute census of crocodylians focused on C. intermedius. The Colombian Government is considering future commercial exploitation of Orinoco crocodiles based on closed-cycle farming. The Ministry of the Environment is developing an experimental breeding program at their Guafal Biological Station in Arauca. Captive breeding for release into the wild is being done by the Universidad Nacional de Colombia at the Roberto Franco Biological Station in Villavicencio. Preliminary survey work has been carried out in neighboring Venezuela and a reintroduction programme has been started by a group of NGOs (Ross, 1998).

One of the main focuses of the IUCN Crocodile Specialist Group has been the development of sustainable use programmes (Thorbjarnarson, 1993; Ross, 1998). They convinced large international traders and manufacturers of the economic benefits of sustainable harvest. The support from the commercial sector in turn put pressure on the producers to set up sustainable management systems for these valuable species. In many cases, it was difficult to determine if harvesting schemes were indeed sustainable, although it is relatively easy to recognize when use is not sustainable as the resource soon becomes depleted. Illegal trade threatens the sustainable channel and has a detrimental impact on its economic viability. Combating illegal trade requires continued enforcement and regulation. The regulation of the international trade is under the remit of CITES, implementation in the region and the obligation to tag all crocodilian skins are both steps to help curtail the impact of illegal trade (Ross, 1998).
A primate species particularly susceptible to hunting pressure is the white-bellied spider monkey (*Ateles belzebuth*). It occurs in Colombia, Venezuela and mainly south of the Amazon River in Brazil, as well as Ecuador and Peru (Emmons, 1997). This primate is hunted for meat in Colombia (Bakker, 1999). Like the black spider monkey (*A. paniscus*), the white-bellied spider monkey has slow reproductive rate. Its main threats include agriculture, habitat fragmentation, hunting and illegal pet trade (IUCN, 2002). It is listed on Appendix II and all imports into Europe are regulated (CITES, 2002).

### 3.3 Plant Products

#### 3.3.1 Rubber

The extraction of NTFPs in the Colombian Amazon has a turbulent history. Towards the end of the 19th Century, rubber exploitation produced short but intense economic upheavals in different regions throughout the country. The rubber boom in the Colombian Guiana Shield lasted between 1890 and 1935. At the same time, there existed a trade in animal skins and the medicinal root of the sarsaparilla liana (*Smilax officinalis* and *S. syphilitica*), used to cure syphilis. The rubber exploitation started with *caucho* (*Castilla spp.*). Exploitation was destructive: trees were cut down and the latex collected afterwards. When this source was exhausted, extraction turned towards *Hevea* *spp.*, of which the bark can be tapped without felling the trees. *H. brasiliensis*, the purest and most manageable of all natural rubber species, can only be found in the southernmost part of the country. Other *Hevea* species (including *H. pauciflora*, found in Putumayo) produce less valuable latex. Demand increased and transport improved with river steamers (Broekhoven, 1996; Davis, 1996).

![Pacas (Agouti paca) harvested for bush meat. Photo: H. Muntingh](image)

A small project was started to repopulate indigenous territories with macaws (*Ara spp.*) and revive a limited trade between indigenous groups for traditional use of the feathers in head-dresses (Rodriguez, pers. comm.). Ara populations have declined in the territories of the Uitoto, Andoke and Nonuya, due to the disturbance of the breeding grounds and the decrease in enrichment planting of food trees (Rodriguez, pers. comm.). Parrots confiscated in Bogotá will be taken to the indigenous communities, where they will start captive breeding. The focus of this project is not commercial, but to increase traditional trade of macaw feathers between indigenous communities, a practice which has been lost over the generations. Pilot studies are being carried out by the Von Humboldt Institute on the sustainable management of *Ara* *spp.* with traditional techniques such as planting certain fruit trees which are favoured by macaws (Rodriguez, pers. comm.).

3.2.8 Bush meat

Until recently, the trade in bush meat was prohibited in Colombia, so there are few official data on commercial hunting and wildlife trade. Pulido and Caveller (2001) did not include animal products in their market survey, since this trade was illegal at the time of their study. However, the inclusion of wildlife would have given a much better impression of the NTFP commercialisation in the region. Hunting for bush meat occurs widely in the Colombian Guiana Shield. Colonists migrated into forested areas for economic reasons, resulting in high hunting pressure in forest edges and along roads. There are also professional commercial hunters coming to these areas for the trade in wild meat. Larger species, such as tapir, deer, peccary, primates, curassows and capybara tend to be affected by hunting first, followed by smaller species such as agouti, smaller primates and toucans (Bakker, 1999).

Several of the hunted species have potential for captive breeding. The Asociación para la Defensa de la Reserva de la Macarena, is developing breeding programmes for peccary, capybara and agouti (Muntingh and Veenings, 1999). A new project is being set up by the Von Humboldt Institute focusing on the management of capybara (*Hydrochaeris hydrochaeris*) in the Guiana Shield region of Colombia (Ramos, pers. comm.). At the moment, capybara meat is exported to Venezuela once a year. The project works with local communities on market issues and business plans to realise the economic value of the trade in capybara meat (Ramos, pers. comm.).

A new project is being set up by the Von Humboldt Institute focusing on the management of capybara (*Hydrochaeris hydrochaeris*) in the Guiana Shield region of Colombia (Ramos, pers. comm.). At the moment, capybara meat is exported to Venezuela once a year. The project works with local communities on market issues and business plans to realise the economic value of the trade in capybara meat (Ramos, pers. comm.).
Table 6: National production (volumes) of NTFPs in Colombia*

<table>
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</thead>
<tbody>
<tr>
<td>Rubber</td>
<td>Hevea spp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palm heart</td>
<td>Euterpe oleracea</td>
<td>13</td>
<td>18</td>
<td>14</td>
<td>112</td>
<td>265</td>
<td>749</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>Balsam</td>
<td>Myroxylon balsamum</td>
<td>1.2</td>
<td>&lt; 0.1</td>
<td>1.2</td>
<td>0.8</td>
<td>0.7</td>
<td>0.4</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Piassaba</td>
<td>Leopoldinia piassaba</td>
<td>830</td>
<td>850</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firewood</td>
<td>Various species</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

* Data are presented for the whole country, not just the Guiana Shield area.

Source: Broekhoven (1996)

The rubber fever brought with it the cruelest period for the natives. Slavery returned in its most inhuman form and the Indian population was wiped out by violence, disease and starvation (Davis, 1996; Broekhoven, 1996; Sánchez, 2001). The Huitoto Indians experienced the worst: they were almost totally exterminated (some 50,000 people died). Today, their population is estimated at 10,000. In the beginning of the 20th Century, rubber production from Asian plantations began to take over the world production. During World War II, when rubber export from Asia was hampered, there was a short revival of the rubber market (Davis, 1996). Due to better quality, however, Brazil remained in monopoly. In 1984, 982 tonnes of natural rubber were still produced in the Departments of Putumayo, Amazonas, Vaupés and Guaviare (Table 6), with an annual value of US$ 6.2 million (Table 7). Unfortunately, apart from Broekhoven (1996), no other data on rubber collection were available for Colombia. Duivenvoorden et al. (2001) do not mention any commercial rubber tapping along the Middle Caquetá River, although their local field guides pointed out the Hevea trees as latex source. Therefore, the actual status of rubber as a commercial NTFP in Colombia remains unclear.

The same accounts for the harvest of other natural gums and balsams. Apart from the species and volumes mentioned by Broekhoven (1996), no further information could be found on present-day harvesting of Myroxylon balsamum, Myroxylon oleracea and Copaifera canime in the Colombian Guiana Shield. The decline in production volumes and value in the 1980s suggests that these products are hardly commercialised anymore (Table 6 and 7).

Table 7: National production (value) of NTFPs in Colombia*

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</tr>
</thead>
<tbody>
<tr>
<td>Rubber</td>
<td>Hevea spp.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td>18</td>
<td>14</td>
<td>112</td>
<td>265</td>
<td>749</td>
<td>750</td>
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<td>0.8</td>
<td>0.7</td>
<td>0.4</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Piassaba</td>
<td>Leopoldinia piassaba</td>
<td>830</td>
<td>850</td>
<td></td>
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</tr>
</tbody>
</table>

* Data presented is from the whole country, not just the Guiana Shield area.

Source: Broekhoven (1996); Bernal (1992)

3.3.2 Foret fruits

According to Pulido and Cavelier (2001), a total of 11 species of wild forest fruits were marketed in Leticia in 1997-1998. The bulk of this merchandise consisted of fruits of Mauritia flexuosa (canangucha), Theobroma grandiiflorum (copúasu), and Euterpe precatoria (asahí). These fruits were either sold fresh or as pulp, used to make sweet drinks, compotes, ice cream or alcoholic beverages. Asahí has a similar taste and texture as the Brazilian açai, but the Colombian drink is made from the fruits of the single-stemmed palm Euterpe precatoria, instead of from the multi-stemmed Euterpe oleracea, which does not occur in this region. A total of 69.4 ton of these fruits were sold annually on the Leticia market in the years 1993-1995, but only 18% of this produce was harvested in Colombia (Table 8). The remainder came from Peru (67%) and Brazil (15%). Less important Colombian wild fruits marketed in Leticia were Genipa americana and the palm fruits Oenocarpus bacaba and Jessenia batsaua (Pulido and Cavelier, 2001).

Table 8: Mean annual volumes of NTFPs in tonnes commercialised in Leticia (Colombia)

<table>
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</thead>
<tbody>
<tr>
<td>Freshwater fish</td>
<td>mainly catfish</td>
<td>8,525</td>
<td>8,525</td>
<td>8,525</td>
<td>8,525</td>
<td>8,525</td>
<td>8,525</td>
<td>8,525</td>
</tr>
<tr>
<td>Canangucha</td>
<td>Mauritia flexuosa</td>
<td>16.8</td>
<td>40'</td>
<td>40'</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Copúasu</td>
<td>Theobroma grandiiflorum</td>
<td>4.9</td>
<td>14.1</td>
<td>14.1</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Asahí</td>
<td>Euterpe precatoria</td>
<td>0.6</td>
<td>15.3</td>
<td>15.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>

** Commercialised in Colombia, but 82% of this volume is harvested in Peru and Brazil.

** Only fruit pulp figures, no figures available for whole fruits.

Source: Duivenvoorden et al. (2001); Pulido and Cavelier (2001)
A confusing aspect of this study is that Pulido and Cavelier (2001) list some obvious NTFP species under the ‘cultivated fruits’ (e.g., Bertholletia excelsa, Poraqueiba sericea), while some species denominated as ‘wild forest fruits’ are in fact cultivated (Aesoporus altit, Luffa cylindrica). Theobroma grandiflorum (copuasú), often mentioned as a NTFP, may occur as a wild tree in Pará and Marañaná (Brazil), but outside this region the species is cultivated. Due to its state as pre-Columbian cultivar, however, it is sometimes hard to tell if the tree is occurring natural or propagated by humans (Villachica, 1996). The same accounts for Astrocaryum aculeatum.

3.3.3 Crafts and other NTFPs
Other wild species are commercialised in the form of handicrafts, such as Brosimum utile, B. rubescens and Ochroma pyramidalis (wood carvings), Brosimum utile and Ficus insipida (bark cloth), Heteropsis jennani and Astrocaryum chambrina (basketry). According to Bernal (1992), hammocks and hats made of cumare (Astrocaryum chambrina) are sold in many town stores in the Amazonas and Orinoco, as well as in the larger cities. The extraction of Astrocaryum fibers from the young palm can be destructive, often causing the death of the plant. A detailed study on indigenous craft making was carried out by Balcazar (2000) along the Rio Uvú. Several plant species were employed: Heteropsis flexuosa, H. jennani, H. spicua, Thorneocarpus bissectus, Dendromcus orthacanthos, and several Chusia species. Some of these crafts are sold at the market in Puerto Inírida.

Despite the strategic location of Florencia at the foothills of the Andes, even less Amazonian NTFPs were marketed in Florencia than in Leticia. All three ‘forest fruits’ mentioned in Pulido and Cavelier (2001) are agricultural products. The only NTFPs sold in this town were handicrafts: wood carvings of Brosimum utile and B. rubescens, basketry and weavings made from Ischnosiphon arouma and Astrocaryum chambrina. Most crafts were made outside of Amazonas. Firewood is hardly sold on the Florencia market. Medicinal plants, however, were sold in large quantities. Unfortunately, the authors were not able to identify the species. The general conclusion of Pulido and Cavelier (2001) is that commercialisation of NTFPs in the Colombian Amazon is marginal, except for catfish. The reasons for this phenomenon must be sought in the lack of commercialisation channels and the continuation of Andean production systems by immigrants, systems poorly adapted to the Amazonian environment. But if the researchers had included bush meat and medicinal plants in their survey, their conclusion would have been quite different.

3.3.4 Palm heart
Palm heart represents the most important export commodity for Colombia (Bernal, 1992). In 1990, the export value totalled US$3 million (Table 6 and 7). Palm hearts are in particular shipped to France. The palm in question, which is locally called naídi, was known in Colombia as Euterpe cuatrecasiana (Broekhoven, 1996), but recent studies identify the species as Euterpe oleracea (Bernal, 1992). The palm is very common in the flooded forests along the Magdalena River and in the Chocó region along the pacific coast. The species does not occur in the Guiana Shield area and is therefore not treated in detail in this report.

3.3.5 Piassaba
Piassaba fibre (Leopoldinia piassaba), locally known as chiqui-chiqui, is harvested in the Rio Negro and Orinoco Basins. It grows in dense stands on poor and sandy soils, usually associated with black water. The leaf fibres are used to manufacture ropes and brooms (Bernal, 1992). Of the total volume of fibre extracted, 30% comes from the Guainia-Negro Rivers, 46% from Atabapo, and 24% from the Inírida River. Fibre harvest generates a substantial income for a few hundred indigenous families. In May 1991, the price of the fibre in Bogotá was US$ 450 per ton (Etter et al., 1997). Fibres from the Atabapo and Inírida Rivers are processed in Bogotá, while those from the Rio Negro and Guainia Rivers are transported (through several intermediaries) to Manaus (Brazil). Palm fibre productivity in Guainia was in the order of 5-10 kg/ha per year (Etter et al., 1997). While in the 1960s up to 2,000 tonnes of fibre were extracted annually from Guainia, the production of piassaba has decreased because of the replacement by plastic brooms. In 1996, there were about 20 small fibre factories (mainly in Bogotá) that produced between 500,000 and 700,000 brooms per year. Etter et al. (1997) conclude that the future of the extractive system depends more on institutional factors, policy and market structure, than on fibre supply and harvest limits.

3.3.6 Medicinal plants
Medicinal plants are only permitted to commercialise in Colombia if the species are officially registered by the National Institute for Control of Medicines (INVIMA). So far, only 11 natural medicinal species have been registered, while more than 200 species are traded regularly in large volumes at local markets in Bogotá (Duque, 2001). In 2000, the BioTrade Initiative in Colombia (‘Bicomercio Sostenible’) of the von Humboldt Institute (www.humboldt.org.co/biocomercio/) organised a workshop on the sustainable use and trade in medicinal plants in Bogotá, to compile information on current legislation, trade
controls, research and industry related to medicinal plants in Colombia. After a detailed survey of the medicinal plant market in Bogotá, Duque (2001) found that only 41% of the traded medicinal species were native to Colombia. The majority of those plants was from Andean origin and cultivated. Only a few wild medicinal species originated from Amazonas and Putumayo: chuchuhausa (Maytenus laevi), sangre de drago (Croton lechleri) and uña de gato (Uncaria tomentosa). No further details on their trade were provided.

BioTrade and the von Humboldt Institute are also promoting a network for users and producers of NTFPs in Colombia, with a database under construction on the Internet (www.humboldt.org.co/biocomercio/bolsamazonia/). They are inviting community-based projects that want to trade biodiversity according to the BioTrade sustainability guidelines to submit their business plans for technical and financial support (www.biotrade.org). Bioprospecting is regarded with much scepticism in Colombia. Until now, the government has not given out any licences for the prospecting of medicinal plants, because of the unsolved issue of intellectual property rights. The agreement on a biosafety protocol is still pending (Muntingh and Veening, 1999).

3.3.7 Shaman’s Apprentice Programme

In June 1999, the Amazon Conservation Team (ACT) sponsored a gathering of 40 shamans from seven Indian tribes from the Colombian Amazon in Yurayaco, Caquetá. During this meeting, the indigenous healers discussed for the first time the future of their territories, their medicine and their people. They organised themselves into the Union of Yage Healers of the Colombian Amazon (UMIYAC), with the goal of unifying and placing in the service of humankind a knowledge inherited from generation through generation among the indigenous peoples of the Amazon. The organisation does not have any commercial or promotional interest that could distort the authentic essence of their knowledge and their control of the powers of yage (www.ethnobotany.org/actnew/umiya.html). Yage is the local name for the liana Banisteriopsis caapi, made into a hallucinogenic brew also known as ayahuasca, and used in shamans’ healing ceremonies (Schultes and Raffauf, 1990; Davis, 1996). Travel agencies advertise on the Internet with yage tours, while suppliers of ‘Amazon herbs’ sell bulk quantities of Banisteriopsis caapi, for as much as US$ 100/kg. Most of it is imported from Peru (www.yage.net/hosted/suppliers.php).

The UMIYAC plans to conceive and institute a certification procedure for traditional healers, apprentices and disciples. It also bans the consumption of alcoholic beverages during healing ceremonies, as well as the sale of yage or medicinal plants to outsiders. With the assistance of ACT, they published the book ‘Beliefs of the Elders’, which serves as a Code of Ethics of Indigenous Medicine of the Colombian Amazon (UMIYAC, 2000). ACT also helps UMIYAC to achieve other goals, such as the establishment of a fund to provide meals and emergency health care for the most elderly shamans, most of whom live in great poverty. They further support travelling health brigades that provide traditional medicine services to communities, the construction of traditional ceremonial houses and medicinal plant gardens (www.ethnobotany.org/actnew/umiya.html).

In collaboration with a Colombian physician, Ingano healers are teaching shamanistic practices and knowledge to young Inganos and neighbouring Correguajes, whose last true shamans died over a decade ago. In addition, primary health care is being provided to both Mestizo and Afro-Colombian communities that have little or no access to western medicine (Martin, 1997). In September 2001, UMIYAC received an award in the ‘Citizen Initiative Project in Environmental Stewardship’ category, from the then Colombian president Pastrana (www.ethnobotany.org/actnew/news-colenviroawards.htm).

3.4 The future of commercial NTFPs in Colombia

3.4.1 Milpesos

Another palm product from the Colombian forests that could provide a basis for an extractive system, is the oil from the milpesos palm, also known as seje palm. The milpesos or Jessenia bataua (a synonym of Oenocarpus bataua) is a common palm of the Amazon region and gallery forests of the Orinoco region. It is also very abundant in the pacific provinces. The fruits are made into a popular beverage, but also yield an oil similar to olive oil, which can be used for cooking and cosmetic purposes (Balick, 1988). According to Sernal (1992), the installation of small presses in the villages, palm-climbing equipment and an active marketing process could make seje palm oil into a successful extractive product. The high quality of this oil gives this palm a potential for domestication in agroforestry projects (Johnson, 1997). There seems to be a keen interest from cosmetic firms in the US to import this oil for a fairly high price (M. von Hildebrand, pers. comm.).

3.4.2 Other forest fruits and nuts

A botanical guide of forest fruits and their uses from the Duda River (Serranía de la Macarena) was published with financial aid from the NC-IUCN small grants programme (Stevenson et al., 2000). Such illustrated field guides can serve as a base for further projects in the field of nature conservancy, ethnobotany and commercialisation of NTFPs. The von Humboldt Institute is investigating the (inter-)national market for preserved Amazonian fruits and nuts. Provided that harvesters and producers follow their guidelines for sustainable management, they see a great potential to exploit the diversity of fruits and nuts of the Colombian forests (www.humboldt.org.co/biocomercio/).
The Amazon Treaty provides good online publications about the characteristics and preservation techniques of Amazonian fruits (www.tratadoamazonico.org). Examples of potential NTFPs occurring in the Colombian Guiana Shield are inchinuts (Caryodendron orinocense), guaraná (Paullinia spp.), camu (Myrciaria dubia) and canangucha (Mauritia flexuosa). Management plans including sustainable harvest levels need to be developed for the major wild fruit crops in the country. Some research has been done on the management of Mauritia flexuosa swamps (Urrego, 1987; Villachica, 1996; Hiraoka, 1999; Ponce et al., 2000). Population growth models for Mauritia have been developed by the Pontifica Universidad Javeriana and the Yamato Foundation for the Llanos (Zea, 1998).

3.4.3 Paper from natural fibres
Along the Rio Apaporis, the NGO Gaia Foundation has started a project in which indigenous communities produce a high quality paper from the fibres of a Ficus species, common in secondary forest and locally known as ‘marima’. The product proved to be successful in Bogotá, but new markets are required and the community needs training in accounting and management (Muntingh and Veening, 1999).

3.4.4 Ornamental plants
No quantitative information is available on the extraction of ornamental plants from Colombia. Colombia harbours a great diversity of orchids, some of which are very popular on both the domestic and international market. The extraction of Anthurium species is a recent development (Broekhoven, 1996). Colombia’s large variety of Heliconia species could also be interesting in this respect (Martinez and Galeano, 1994).

3.4.5 Political problems
Unfortunately, NTFP commercialisation and nature conservation are not top priorities for decision-makers in Colombia. The ongoing turmoil in violence and civil warfare is paralysing large segments of the political, economic and social system in Colombia (Muntingh and Veening, 1999). In fact, the FARC guerrillas control large parts of the Colombian Guiana Shield; the government has little or no influence. Foreigners are strongly advised not to enter the region without permission of the guerrilla. In order to be successful, new initiatives in this region should be coordinated and carried out by organisations that are ‘on speaking terms’ with the FARC. The NGO network COAMA seems to be a suitable partner for such projects, since they have firm roots in the region, they can count on much credit from the local population and know how to deal with the omnipresent guerrilla. Recent reports indicate, however, that currently no outsiders enter the region (P. von Hildebrand, pers. comm.). The coca trade with its attractive salaries and working conditions is the main economic activity for those living in the Colombian Guiana Shield (Mojica, pers. comm.).
4 FRENCH GUIANA

4.1 Commercial NTFP extraction

French Guiana became an Overseas Department of France in 1946 and is an integral part of France. The country is as large as Portugal (ca. 8.4 million hectares), and has a population of only 160,000, living mainly in the coastal area. French Guiana is covered for more than 80% with largely undisturbed tropical rain forest. People in the urban areas along the coast have a near European standard of living. In the hinterland, however, social circumstances are much poorer. French Guiana is populated by 10,000 indigenous peoples, forming seven ethnic groups (Arawak, Carib, Palikur, Wayápi, Wayana, Emerillon and Oyapik), and 22,000 Maroons, organised in four ethnic groups (Aluku, Ndjuka, Paramaccans and Saramaccans). Many of these Maroons are refugees from the Surinamese civil war in the 1980s (Kambel and MacKay, 1999).

Ethnobotanical studies have pointed out that Amerindians and Maroons in French Guiana use a wide variety of NTFPs (Moretti and Grenand, 1982; Grenand et al., 1987; Grenand, 1992; Grenand and Prévost, 1994; Cadamuro, 2000). The great majority of this species is used for subsistence; very few NTFPs are commercialised. The country’s official wages are based on the national wages in France, and thus are far higher than in the surrounding countries. Consequently, it is economically more interesting to import NTFPs from neighbouring countries than to extract them commercially in French Guiana. Podosirí (the juice of *Euterpe oleracea* fruits), wood crafts and basketry are all purchased from Surinamese merchants in the border town of Saint Laurent du Maroni. Many of the wood carvers in French Guiana are Ndjuka refugees from Suriname; they sell their wares along the road from Saint Laurent du Maroni to Kourou (Duplais, pers. comm.). Many of these products are resold for higher prices in the capital of Cayenne. Wildlife, particularly bush meat, appears to be the main commercial NTFP extracted in French Guiana.

4.2 Wildlife

4.2.1 Wildlife regulation and management in French Guiana

France signed the CITES convention in 1978. French Guiana enacted legislation in 1986 and issued outlining rules for wildlife protection in 1995. For the great majority of species, export out of French Guiana (including to France) is prohibited, with the exception of fish and some minor insect products. French hunting
law does not apply in French Guiana, as it does in the other overseas departments. Hunting permits are not required, perhaps to respect the traditional hunting rights of Maroons and Amerindians in the interior, and there is no closed season for hunting (Duplaix, 2001). There are some antiquated hunting bag limits that were set in 1975 (Duplaix, 2001). In fact, French Guiana has some of the most lax hunting restrictions of all the Guiana Shield countries (Richard-Hansen, 1998). Currently, there are three categories that wildlife fall into: fully protected species, species which can be hunted but not traded, and those which can be hunted and traded locally (Richard-Hansen and Hansen, 1998). However this law is not detailed enough (i.e., given numbers of catches permitted per hunter) to control certain allegations that come up regularly, such as the collection of toucans, parrots and troops of peccaries (Richard-Hansen and Hansen, 1998). Wildlife management in French Guiana is administered by the Office National de la Chasse et de la Faune Sauvage (ONCFS), the Direction des Douanes, the Direction Régionale de l’Environnement (DIREN) and the Office National des Forêts (ONF) (Richard-Hansen, 1998).

4.2.2 Illegal trade
Despite the restrictions on wildlife export, there is evidence of illegal trade of wildlife into and out of French Guiana, as border controls are weak. Parrots, small birds, bush meat, and sea turtle eggs are openly sold by Surinamese Amerindian and Maroon trappers in the border town of St. Laurent du Maroni. Bush meat from the Brazilian Oiapock River (Amapa) is regularly sold at St. Georges and Camopi. Commercial Brazilian hunters are travelling north along the new road into French Guiana to hunt for the markets of Regima and St. Georges (Ouboter-Renoux, 1995; Richard-Hansen, pers. comm.). Caimans are said to be hunted in the Coesewijne River (Suriname) destined for the restaurants of French Guiana. Special butchers on the Marowijne (Maroni) riverfront prepare the wildlife brought in before it is being transported to Kourou and Cayenne. Ground border controls may be weak, but French Guiana has stringent airport controls (Richard-Hansen, pers. comm.). In 1995, German wildlife traffickers were caught smuggling more than 500 specimens of reptiles and amphibians (mainly the frog *Dendrobates tinctorius*); they were jailed for three months and were fined more than 7,600 Euro (Hansen, 2001). In 1999, some rare hummingbirds were seized by customs and the ONCFS in the airport French Guiana (Hansen, 2001). Finding illegal pets (such as macaws and spider monkeys) and bush meat for sale in markets or in unlicensed restaurants is now less common, as the ONCFS is enforcing the regulations in the coastal zone (Duplaix, 2001).

### Table 9: Most commonly hunted and traded bush meat species in the Guianas

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Guyana</th>
<th>Suriname</th>
<th>French Guiana</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hunting Pressure</td>
<td>Hunting Pressure</td>
<td>Hunting Pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hunting Status</td>
<td>Hunting Status</td>
<td>Hunting Status</td>
</tr>
<tr>
<td><em>Ara ararauna,</em></td>
<td>blue and yellow/red and green macaw</td>
<td>***</td>
<td>Ex</td>
<td>***</td>
</tr>
<tr>
<td><em>Ara chloroptera</em></td>
<td>black capuchin</td>
<td>***</td>
<td>Ex</td>
<td>***</td>
</tr>
<tr>
<td><em>Ara macao</em></td>
<td>scarlet macaw</td>
<td>***</td>
<td>Pr</td>
<td>***</td>
</tr>
<tr>
<td><em>Cairina moschata</em></td>
<td>muscovy duck</td>
<td>***</td>
<td>G</td>
<td>***</td>
</tr>
<tr>
<td><em>Cauto salangus</em></td>
<td>black curassow</td>
<td>***</td>
<td>G</td>
<td>***</td>
</tr>
<tr>
<td><em>Ptilotus nuchalis</em></td>
<td>maroon guan</td>
<td>***</td>
<td>G</td>
<td>***</td>
</tr>
<tr>
<td><em>Ptilotus violaceus</em></td>
<td>grey-winged trumpeter</td>
<td>***</td>
<td>Pr</td>
<td>***</td>
</tr>
<tr>
<td><em>Ramphastos spp.</em></td>
<td>toucan</td>
<td>***</td>
<td>Ex</td>
<td>***</td>
</tr>
<tr>
<td><em>Tinamus major</em></td>
<td>greater ruffed guan</td>
<td>***</td>
<td>G</td>
<td>***</td>
</tr>
</tbody>
</table>

**Hunting Pressure:** *- *** (Duplaix, 2001)  Pr = Protected, Ex = Exportable, G = Game sp. (in Suriname = species with closed season under the 1954 Game Act).  F Pr = Fully protected, H = Hunting Legal but trade prohibited, H/L T = Hunting and Local Trade legal.

**Sources:** Craig-Clarke et al., 2000; Duplaix, 2001; Ouboter, 2000, 2001; Richard-Hansen and Hansen, 1998.
4.2.3 Bush meat

Bush meat appears to be the most important NTFP in French Guiana. The list of species that can be traded locally, but not exported, includes: the white-lipped and collared peccary (Tayassu pecari and T. tajacu), agouti (Dasyprocta leporina syn. D. agouti), nine-banded armadillo (Dasypus novemcinctus), great long-nosed armadillo (D. kappleri), tapir (Tapirus terrestris), capybara (Hydrochoerus hydrochaeris) and paca (Agouti paca). Game birds listed are the marail (Penelope marail), black curassow (Crax alector) and grey winged trumpeter (Psophia crepitans). The green iguana (Iguana iguana) also appears on this list. These same animals can legally be served in licensed restaurants in French Guiana (Richard-Hansen and Hansen, 1998). Controls have tightened with regard to monitoring bush meat in restaurants especially in Kourou and Cayenne. Illegal species, such as brocket deer (Mazama spp.) and caiman, are now rarely found on the menu (Richard-Hansen and Hansen, in press). Hunting pressure for the local trade and lack of a closed season are thought to be resulting in unsustainable collection levels for the tapir (T. terrestris), the red howler monkey (Alouatta seniculus) and the three game birds (Duplaix, 2001; Richard-Hansen and Hansen, in press.).

Duplaix (2001) recommends a review of the status of Crax alector and other heavily hunted game species. The status of the main traded bush meat species in the three Guianas can be found in Table 9 and a few are described in more detail in the sections below.

Hunting pressure is particularly high along the coast (Richard-Hansen, pers. comm.). Maroon hunters sell deer (Mazama spp.), agouti (Dasyprocta agouti), paca (Agouti paca) and armadillos (Dasypus spp.) along the road between Saint Laurent du Maroni and Kourou (Duplaix, pers. comm.). Increased hunting pressure is partly due to better access that the highway linking French Guiana to Brazil brings (Duplaix, 2001). The opening up of areas with roads soon leads to local extirpation of the most vulnerable species, such as spider monkeys (Ateles spp.) and game birds (i.e., Crax spp.), whilst other species can withstand hunting pressure, although densities can get very low (Richard-Hansen, pers. comm.). There have been several long-term market studies in French Guiana monitoring the occurrence of bush meat on markets (Richard-Hansen & Hansen, in press.). On the Cayenne market, the total amount of bush meat sold has greatly reduced since 1986. However, this might represent a shift away from bush meat traders selling on the market to selling direct to restaurants and individuals – a situation which is harder to regulate and monitor. The ONCFS is enforcing the regulations in the coastal zone, but capacity remains low (Richard-Hansen and Hansen, in press).

4.2.3.1 Tapir

The lowland tapir (Tapirus terrestris), the largest terrestrial mammal native to the Guiana Shield, is one of the top providers of game meat. Widespread throughout tropical South America, it is found in a variety of habitat types: tropical lowland rainforest, palm forest, savannah, tropical dry deciduous forests, albeit never far from permanent riverine forest. Tapirs consume an enormous variety of plants and are considered important seed dispersors. Due to its prized meat and its relatively low reproduction rate, the tapir has become scarce or extirpated in areas where it has been over-hunted (Brooks et al., 1997; Bevilacqua et al., 2002). The biomass of tapir meat hunted is on average more than a fifth of all meat harvested and often makes up a large part of a hunter’s income (Brooks et al., 1997). In French Guiana, tapir (along with peccary) made up most of the bush meat biomass found on the Cayenne market between 1986 and 1997 (Richard-Hansen and Hansen, in press). Sport hunting by hunters from urban areas also occurs in French Guiana. There have been several models and studies attempting to determine whether hunting for lowland tapir is sustainable in the Amazon region (Bodmer, 1995; Robinson and Redford, 1991b, 1994). The latter authors developed a population growth model to determine if a harvesting level is sustainable. These studies indicate that sustainable harvesting level would be 0.03 tapir per km² when the population is at its maximum production level. The general rule used by Robinson and Redford (1991b) for long-lived mammals, like the tapir, is 20% of the population’s production can be harvested to maintain a stable population. Tapirus terrestris is considered threatened by over-hunting across the Guiana Shield (Brooks et al., 1997; Bevilacqua et al., 2002; Duplaix, 2001). T. terrestris is listed as Vulnerable (A2cd, 3cd, 4cd) on the IUCN Red List (IUCN, 2002) and appears on CITES Appendix I. Many South American countries have developed legislation allowing for subsistence use (Table 9), as the vulnerability of tapir to over-hunting was overlooked when the legislation was drawn up (Brooks et al., 1997). The lowland tapir is also threatened by habitat loss due to logging, mining and other infrastructure developments (Brooks et al., 1997).

Tapir are considered important seed dispersors for Mauritia flexuosa and Maximiliana maripa. The over-harvesting of palm fruits and/or palm hearts by humans therefore has an effect on the availability of the preferred food resources of the lowland tapir. Local communities can help maintain tapirs in palm forest by dispersing the palm seeds to increase the productivity of these forests (Brooks et al., 1997). The Tapir Conservation Action Plan recommends the development of projects that reduce hunting, work directly with rural hunters to promote the sustainable harvest levels and reduce habitat loss with soundly managed agroforestry projects. There are definite long-term economic benefits to conserving tapir populations. For one, the economically important palm forests will be maintained for future use. Indeed, the benefits from productive palm forests might well outweigh the costs to local people of restricting tapir hunting (Brooks et al., 1997).

4.2.3.2 Peccaries

The collared peccary (Tayassu tajacu) is extremely widespread, from the southern
US to northern Argentina (Emmons, 1997). The collared peccary lives in herds of six to over 30. In general the collared peccary is not considered threatened due to its widespread distribution, high population densities, relatively high reproductive rate and varied habitat choice: from semi-desert to tropical rainforest (Emmons, 1997; Oliver, 1993). Indigenous hunting of collared peccary has been occurring for innumerable generations, making up an important protein component of their diets. Indigenous adaptations to forest habitat for agriculture are often favourable to the collared peccary, sometimes to the extent that they become a nuisance (Oliver, 1993). Peccaries are often hunted while local people are collecting other NTFPs, such as palm fruits (Bodmer et al., 1993). However, the widely hunted collared peccary is absent in parts of its range, due to heavy hunting pressure (Oliver, 1993). Despite not being a conservation priority, the Conservation Action Plan recommends that all populations are monitored for habitat loss and the potential for over-exploitation (Oliver, 1993).

The white-lipped peccary (Tayassu pecari) is distributed from southern Mexico to South America. Found in herds of 30 to more than 300 individuals, the white-lipped peccary is the only terrestrial species to form such large troops in Neotropical forests (Emmons, 1997; Oliver, 1993). White-lipped peccaries have a very patchy distribution and are most abundant in lowland rainforest (Oliver, 1993). They are less frequent than the collared peccary (Emmons, 1997). The white-lipped peccary plays an important role in forest ecology as a seed disperser and predator. The large herds have an impact of the composition of the lower forest stories (Oliver, 1993). It is recorded as one of the most important meat species for many indigenous groups across the Amazon and the Guiana Shield (Bevilaqua et al., 2002; Oliver, 1993). The status of this peccary is not well known, but it is thought to be threatened in parts of its range. Populations of the Amazon Basin and the Guiana Shield are thought to be the most important strongholds for the species (Oliver, 1993). This species has a low tolerance to deforestation, as there is less cover protecting it against hunting (Oliver, 1993). It is often extinct near human settlements, but Tayassu pecari is also naturally absent in parts of its range (Emmons, 1997). The white-lipped peccary is thought to be more susceptible to commercial hunting than the more adaptive collared peccary (Oliver, 1993). The Conservation Action Plan recommends developing projects that encourage self-regulation by subsistence hunters and curtailing large-scale commercial hunting and trade (Oliver, 1993).

Peccary meat and skins (collared peccary pelt is the most valuable) are sold on urban markets by rural hunters and provide an important source of income, although hunting for skins is no longer as prevalent (Bodmer et al., 1993). Peccary meat (along with tapir) made up most of the bush meat biomass found on the Cayenne market between 1986 and 1997 (Richard-Hansen and Hansen, in press). Local trade of both species is permitted in Guiana, Suriname and French Guiana and the species are under relatively high hunting pressure in all three countries (see Table 9). Commercial operations (e.g., logging and mining) are a problem for peccaries, as wild pig meat is a major source of food for the workers; this exerts a heavy hunting pressure on the surrounding peccary populations (Bodmer et al., 1993). With proper management, peccaries can bring economic benefits to local people, urban markets and the national economy (Bodmer et al., 1993). Both species are listed on CITES Appendix II.

4.2.3.3 Armadillos

The great long-nosed armadillo (Dasypus kappleri) is found in Brazil (North Pará), Bolivia, Colombia, Venezuela and the three Guianas. This animal is restricted to lowland rainforest, with a somewhat patchy distribution, common in some areas and scarce or absent in others. This armadillo is hunted for its meat and sometimes for its carapace, which is used to make musical instruments (Emmons, 1997; Bakker, 1999). The nine-banded long-nosed armadillo (Dasypus novemcinctus) is more widespread than D. kappleri, with a distribution extending from southern US to Argentina, including some Caribbean islands (Emmons, 1997). Found in all Guiana Shield countries, armadillo meat is hunted extensively by indigenous people. Armadillos were found on the Cayenne market (Richard-Hansen and Hansen, in press). The animal is also used in handicrafts and medicines (Bakker, 1999). The species can be scarce in areas where there is subsistence hunting, but it appears to be able to withstand heavy hunting pressure (Emmons, 1997). Both armadillos are under relatively high hunting pressure in the three Guianas (Table 9). Neither species are listed on the IUCN Red List nor on the CITES Appendices.

4.2.3.4 Curassows, guans and chachalacas (Cracididae)

This primitive family of Neotropical game birds plays an important role in the regeneration of tropical forests through seed dispersal and predation. They are considered important biological indicator species and possibly a keystone species (species upon which other species depend). Yet half of all species are threatened by habitat destruction and hunting (Brooks and Strahl, 2000). These birds often have strict habitat preferences and a relatively slow reproductive rate, making them vulnerable to human disturbance and over-exploitation (Silva and Strahl, 1991). Cracids provide an important protein source for indigenous people and could also be a focus for ecotourism. They make up the highest biomass of all birds hunted for meat and even when compared to biomass of mammals, cracids still rank highly. Unfortunately captive breeding techniques are poorly documented, although it has certainly been attempted on many occasions (Brooks and Strahl, 2000). The economic importance of this family of birds should be emphasised, as they have a considerable impact on the economies, especially subsistence economies of Latin America.

Two species of cracid birds are commonly mentioned as being part of the bush meat trade throughout most of the Guiana Shield: the black curassow (Crax
FRENCH GUIANA

4.2 Insects and Spiders

Although French Guiana has effectively banned wildlife exports, export of souvenirs (such as arachnids and Morpho butterflies) for personal use is permitted, as they are not covered by the French Guiana game law (Duplaix, 2001). Insects are not an important economic product for French Guiana, but it is a trade with potential (Garrouste, pers. comm.). An important insect collection area is Montagne de Kaw. This has been a favourite area for entomological collection for about 30 years and is especially popular for the collection of the large Coleoptera for trade, attracting collectors from Cayenne and Kourou (Garrouste, pers. comm.). One species collected for trade is one of the largest beetles in the world, Titaneus giganteus, which has a maximum size of 20 cm. This beetle is very difficult to find in the wild, although its status remains unknown. T. giganteus can fetch very high prices depending on its length; a specimen of 15 cm sells for approximately an equivalent of US$ 150, but the rare individuals of 18 cm long become virtually priceless (Garrouste, pers. comm.). A 16 cm T. giganteus collected in French Guiana was selling for US$ 1,200 on the Internet (www.camerleoncounters.com/tarantulas.html). Although indigenous groups use a wide variety of medicinal plants, there seems to be hardly any trade. Rosewood oil (Aniba rosaeodorea) is still harvested near Tumacumaque (Saúl). The species has been overexploited in the past and is officially protected by law, so it is probably cultivated there (de Granville, pers. comm.). Crab oil (Carapa guianensis) is also traded on a small scale in the coastal area.

Preserved tarantulas can legally be exported out of French Guiana as a souvenir, since tarantulas are not listed on the CITES Appendices. Although a large shipment of live tarantulas was once prosecuted (Duplaix, 2001). The largest species of tarantula, Theraphosa leblondi, commonly known as the Goliath bird eater tarantula, is most often killed and dried for souvenirs, while Avicularia spp. or pink-toed tarantulas, are more often sold live for the pet trade (Garrouste, pers. comm.). T. leblondi can be bought on the Internet for approximately US$ 150 (www.chameleoncounters.com/tarantulas.html). Tarantulas are also collected in the Cacao area (Garrouste, pers. comm.). The French Guiana pink-toe (A. avicularia) is a popular tarantula in the pet trade and is often sold as a good ‘beginners’ tarantula (www.gherp.com/gherp/pages/beginner.htm). A wild caught adult sells for US$ 10-25. It is possible to breed this arachnid in captivity. At present, DIREN is in the process of establishing quotas for tarantula export, but research is first being carried out to assess the impact collection has on tarantula populations (Garrouste, pers. comm.).

4.3 Plant Products

4.3.1 Palm products

Forest fruits are marketed on a very small scale in French Guiana. The juice and the entire fruits of the palms Jessenia bataua, Maximilliana maripa and Oenocarpus bacaba are locally commercialised in the interior. Fruits of Astrocaryum vulgare (awara) are sold for Easter to make a juice called ‘bouillon d’awara’ (de Granville, pers. comm.). Palms are sometimes cut down to obtain the fruits, a fairly destructive form of harvesting (Kahn and de Granville, 1992; Cadamuro, 2000). The leaves of several palm species are used for roof thatch in the interior. Some of these palm leaves (e.g., Euterpe oleracea, Maximilliana maripa, Manicaria saccifera) are commercialised for roof making in the tourist industry (Conseil d’Architecture d’Urbanisme et d’Environnement de la Guyane, 1991).

Euterpe oleracea forms extensive, monospecific stands in some coastal areas, especially in the Kaw floodplain, which has recently been declared a Nature Reserve. Several attempts at developing a palm heart canning industry in French Guiana failed, because of bad management and the high costs of labour in comparison to neighbouring countries (Riccì, 1987; de Granville, 1999).

4.3.2 Medicinal plants

An excellent pharmacopoeia of French Guiana was published by Grenand et al. (1987), which included the screening results of a great number of medicinal plants. Although indigenous groups use a wide variety of medicinal plants, there seems to be hardly any trade. Rosewood oil (Aniba rosaeodorea) is still harvested near Tumacumaque (Saúl). The species has been overexploited in the past and is officially protected by law, so it is probably cultivated there (de Granville, pers. comm.). Crab oil (Carapa guianensis) is also traded on a small scale in the coastal area.

alector) and the marail guan (Penelope marail). Both are heavily hunted in the three Guianas (Table 9; Duplaix, 2001) and curassows are listed as being a common food source in the Venezuelan Guayana (Bevilacqua et al., 2002). They can be served legally in restaurants in French Guiana, along with the other game bird the grey-winged trumpeter (Psophia crepitans) (Richard-Hansen and Hansen, 1998).
4.4 The future of commercial NTFPs in French Guiana

Although there is little commercial extraction of vegetal NTFPs in French Guiana, wild plants remain important for subsistence use. Wages in French Guiana are probably too high to support sustainable NTFP enterprises. It is cheaper to pay extractors from neighbouring countries. For the Amerindian populations in the south of the country, commercialisation of NTFPs is problematic because of the large distance to the market. Trade with Brazil is perhaps a better option. A new programme is being developed at the Institute of Research and Development (IRD) in which the economic potential of NTFPs in the country is investigated (Fleury, pers. comm.).

Since 1998, there has been active academic research in French Guiana on the scale and impact of bush meat hunting, and a new collaborative research programme is underway (Richard-Hansen and Hansen, in press). The ONCFS are enforcing regulations and this is having an impact. Illegal pets and bush meat on markets or in unlicensed restaurants is now less common. However, the ONCFS lacks the capacity to monitor all of the country’s borders and hinterland (Duplaix, 2001; Richard-Hansen and Hansen, in press). Smuggling remains a problem, as is the influx of commercial hunters from Brazil. Several species that are vulnerable to hunting pressure, specifically tapir and game birds, should be surveyed and legislation should be reconsidered based on these findings. Although hunters are nervous of possible new hunting regulations, according to Richard-Hansen and Hansen, hunters are starting to agree that there is a need to curb excessive hunting as finding bush meat in accessible areas is becoming difficult.

The export of insects and arachnids as pets and decorative items is an animal product with potential due to high value and small size. Trade in the popular species (Coleoptera and *Morpho* butterflies) is not monitored, although DIREN is beginning to set quotas for tarantulas.
5

GUYANA

5.1 Commercial NTFP extraction

Guyana is a poor and sparsely populated country that harbours large tracts of undisturbed rainforest. More than 80% of the country’s 19.6 million hectares is covered with forests, and much of this is still in a pristine state (Sizer, 1996; ter Steege, 2000). The country has a population of less than 800,000, of which the great majority lives on a narrow coastal strip. Guyana’s interior is sparsely populated by nine Amerindian tribes: the Arawak, Akawaio, Arikua, Carib, Macushi, Patamona, Wai-wai, Wapishana, and Warao. Their total population is estimated at 60,000 (Kambel and MacKay, 1999).

At present, many NTFPs are harvested from natural forests in Guyana. Only a few products are extracted on a commercial basis, and even fewer species are exported, with the exception of wildlife. Several ethnobotanical studies from Guyana have been published (Fanshawe, 1948; Lachman-White et al., 1987; Johnston and Culquhoun, 1996; Forte, 1996; Hoffman, 1997; van Andel, 2000), but only the latter two publications deal with commercial NTFPs. Guyana’s most important NTFPs are wildlife, palm heart, and nibi and kufa furniture. Minor export products are mangrove bark, crafts, ornamental and medicinal plants.

5.2 Wildlife

5.2.1 Commercial wildlife harvesting

Wildlife is by far the most important commercial NTFP in Guyana and the country’s wildlife exports are significant on a global scale (Broekhoven, 1996; Duplaix, 2001). Guyana and Suriname are the only South American countries to legally export wild animals (Duplaix, 2001). In 1992, Guyana was the world’s fifth largest bird exporter (Sizer, 1996). Other commercial animals are reptiles, amphibians, mammals and freshwater fish (for food and ornamental purposes). Wildlife export is directed mainly to Europe and the US. The annual revenue for legal wildlife exports varies between US$ 1.2 and 2 million (Tables 10 and 12). Profits generated by illegal export of five animals and bush meat would add significantly to this estimate (van Andel, 1998). Guyanese wildlife trappers and traders feel at a disadvantage to their Surinamese counterparts, because levies paid in Guyana are higher than those in Suriname, with the result that Suriname has a competitive advantage in the wildlife export business (Craig-Clarke et al., 2000).
Since the majority of wildlife trappers in Guyana are Amerindian, most harvesting takes place in indigenous regions, such as the North-West District and Southern Guyana (Forté et al., 1992; Edwards et al., 1994; van Andel, 2000; Craig-Clarke et al., 2000). The Essequibo, Demerara and Berbice watersheds (see Map) are also major trapping areas (Craig-Clarke et al., 2000). An area important for bird trapping is the north-east of Guyana near the border of Suriname (Edwards et al., 1994). Indigenous groups living in extremely remote areas, such as the Waiwai, are reported to walk for weeks along their forest trails to trade their captured parrots and songbirds on the closest market (Jansen-Jacobs, pers. comm.). Bush meat and freshwater fish are traded within communities, on village markets and with gold miners and loggers. Although the prices the trappers receive are very low compared to consumer prices outside Guyana, it is still a reasonably lucrative business. Somewhere between 6,000 and 54,000 people are involved in wildlife trapping (Thomas et al., 1996; Iwokrama, 1998).

### Table 10: Export values of wildlife from Guyana

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>CITES birds</td>
<td>913,140</td>
<td>919,472</td>
</tr>
<tr>
<td>CITES reptiles and amphibians</td>
<td>228,633</td>
<td>144,726</td>
</tr>
<tr>
<td>CITES mammals</td>
<td>151,658</td>
<td>104,682</td>
</tr>
<tr>
<td>CITES animals total</td>
<td>1,291,431</td>
<td>1,168,880</td>
</tr>
<tr>
<td>Non-CITES reptiles and amphibians</td>
<td>47,527</td>
<td>21,839</td>
</tr>
<tr>
<td>Non-CITES mammals</td>
<td>25,039</td>
<td>15,003</td>
</tr>
<tr>
<td>Non-CITES birds</td>
<td>15,260</td>
<td>4,890</td>
</tr>
<tr>
<td>Non-CITES animals total</td>
<td>87,826</td>
<td>41,732</td>
</tr>
<tr>
<td>Total CITES and Non-CITES animals</td>
<td>1,381,256</td>
<td>1,210,612</td>
</tr>
</tbody>
</table>

Note: Figures are based on Free on Board (FOB) values and realised export. Source: Duplaix (2001)

5.2.2 Wildlife regulation and management

The Wildlife Services Division (WSD), set up in 1986, registers and monitors the legal export of animals from Guyana and is the official Management Authority for CITES (Hoefnagel, 2001). The WSD was part of the Ministry of Agriculture and later part of the Environmental Protection Agency (EPA), but it now falls directly under the Office of the President (Hoefnagel, 2001). These shifts have resulted in substantial confusion as to who is managing the wildlife trade and who is licensing the traders, but this remains the WSD (Watkins, pers. comm.). Since signing the CITES convention in 1977, Guyana has had two CITES imposed bans on their wildlife trade. The first, January until October 1987, was to allow more comprehensive legislation and a quota system to be drawn up. The second, from February 1993 until November 1995, was again to pressure the Government to improve wildlife legislation. Traders and Amerindian trappers suffered economically during these wildlife trade moratoria (Duplaix, 2001). Harvest quotas have been set since 1988 for all species legally exported. The country has imposed closed seasons for wildlife trapping: for birds from January to April (Kratter, 1998) and for mammals from June to August (Edwards et al., 1994). Guyana’s wildlife legislation is now much stronger, with the Environmental Protection Act of 1996 and the Species Protection Regulations of 1999, as well as the long standing Wild Birds Protection Act. New Wildlife Management and Conservation Regulations of 2000 are currently under consultation (Duplaix, 2001; Hoefnagel, 2001).

Other wildlife management agencies include the Wildlife Division Veterinary Inspection, Customs and the Fisheries Department. Customs have the task of controlling illegal trade on the borders of Suriname and Venezuela, where they have four stations. The Fisheries Department of the Ministry of Fisheries, Crops and Livestock issues licenses to aquarium fish traders, although the relationship with the WSD is somewhat unclear (Hoefnagel, 2001). The Environmental Protection Agency (EPA), set up in 1998, is now fully functioning, but could undergo restructuring within the next year to include the WSD as prescribed in the new draft Wildlife Management and Conservation Regulations. Discussions about the establishment of a Ministry of Environment and Natural Resources are also taking place (Hoefnagel, 2001).

The structure of the wildlife trade industry in Guyana is made up of trappers, middlemen, exporters and the WSD. Guyanese exporters must have a license issued by the WSD: 30 wildlife exporters (excluding aquarium fish exporters) are listed in Duplaix (2001). Middlemen and trappers must also be licensed. Licensing generates revenue, which is then transferred to a Wildlife Fund, amounting to approximately US$ 112,000 per year (Duplaix, 2001). The Wildlife Fund is used to cover the costs of monitoring and enforcement by the Wildlife Division.

5.2.3 Illegal trade

Animals are smuggled into Guyana from all neighbouring countries. Differences between quota systems and levies between Guyana and Suriname are leading to wildlife traffic across the border, often to fill quotas in the other country (Duplaix, 2001). In Guyana, the general perception is that there is more leakage of animals from Guyana into Suriname (Craig-Clarke et al., 2000; Duplaix, 2001). Kratter (1998) claims that almost half of the birds harvested in Guyana are end-
ing up being exported from Suriname. Animals, particularly parrots, are being smuggled into Guyana from Venezuela via the Orinoco Delta (Bevilacqua, 2002). River turtles, arapaima and caimans are poached in the Rupununi for the Brazilian market (Parker et al., 1993; Forte and Benjamin, 1993). Live animals are shipped in cargo planes and flown from Lethem to Georgetown or further into Brazil. Plans to upgrade the road from Boa Vista (Brazil) to Georgetown could increase the flow of wildlife between Brazil and Guyana, unless adequate management systems are put in place. Easier transport could facilitate the supply for both the export and domestic market, given the popularity of birds and monkeys as pets and the growing demand for bush meat in Georgetown and Brazil (Forte, 1990; Iwokrama, 1998). Conservation International raised concern for the fate of the wildlife in the Kanuku Mountains (southern Guyana), as the Boa Vista-Georgetown road passes close to this area. In the early 1990s, local villagers had already complained of declining animal populations caused by over-harvesting, forest fires and improved hunting techniques (Parker et al., 1993).

5.2.4 Psittacines

The Psittacine family includes macaws, parrots, parakeets and parrotlets. It is the most important group for Guyana's wildlife trade, representing 72% of the total legal animal trade and over 90% of all birds legally traded in 1999. The Psittacines generated over US$ 850,000 in 1998 and 1999 based on FOB prices and export realised (Table 11). The two most important species with regard to income generation are the orange-winged parrot (*Amazona amazonica*) and the red-and-green macaw (*Ara chloropterus*), which together brought in more than US$ 450,000 revenue in 1998 and 1999 and a FOB value of US$ 288 per bird (Table 11). Trade in these birds dates back to pre-Columbian times, as Amerindians used live parrots and feather ornaments as trade commodities (Thomas and Brautigam, 1991; Snyder et al., 2000). Caged parrots, macaws, and parakeets can still be seen across the Guiana Shield region, as keeping birds remains a popular hobby. Parrots are also considered a delicacy food in many parts of the Guiana Shield. Occasionally, parrots are killed in Guyana because they are perceived as pests in orchards and agricultural areas (Kratter, 1998), especially during the 1999 parrot invasion of the Pomeroon fruit crops (Craig-Clarke et al., 2000).

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Amazona amazonica</td>
<td>orange-winged parrot</td>
<td>32.00</td>
<td>7,043</td>
<td>78</td>
<td>225,376</td>
<td>79</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Ara chloropterus</td>
<td>red-and-green macaw</td>
<td>288.00</td>
<td>807</td>
<td>90</td>
<td>232,416</td>
<td>88</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Ara ararauna</td>
<td>blue-and-yellow macaw</td>
<td>252.00</td>
<td>614</td>
<td>85</td>
<td>154,728</td>
<td>79</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Amazona ochrocephala</td>
<td>yellow-headed parrot</td>
<td>86.00</td>
<td>869</td>
<td>87</td>
<td>74,734</td>
<td>79</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Amazona farinosa</td>
<td>mealy parrot</td>
<td>72.00</td>
<td>798</td>
<td>80</td>
<td>57,456</td>
<td>79</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Ara manilata</td>
<td>red-bellied macaw</td>
<td>65.00</td>
<td>384</td>
<td>26</td>
<td>24,960</td>
<td>26</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Pionites melanocephala</td>
<td>black-headed caique</td>
<td>50.00</td>
<td>532</td>
<td>89</td>
<td>26,600</td>
<td>89</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Pionus menstruus</td>
<td>blue-headed parrot</td>
<td>36.00</td>
<td>678</td>
<td>75</td>
<td>24,408</td>
<td>75</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Ara nobilis</td>
<td>red-shouldered macaw</td>
<td>50.00</td>
<td>588</td>
<td>59</td>
<td>29,400</td>
<td>59</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Pyrrhura egregia</td>
<td>fiery-shouldered parakeet</td>
<td>36.00</td>
<td>2,000</td>
<td>89</td>
<td>26,600</td>
<td>89</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Brotogeris chrysopterus</td>
<td>golden-winged parakeet</td>
<td>22.00</td>
<td>15</td>
<td>6</td>
<td>330</td>
<td>6</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Forpus passerinus</td>
<td>green-rumped parrotlet</td>
<td>22.00</td>
<td>38</td>
<td>6</td>
<td>606</td>
<td>6</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Aratinga leucophthalmus</td>
<td>white-eyed parakeet</td>
<td>72.00</td>
<td>18</td>
<td>6</td>
<td>1,296</td>
<td>6</td>
<td>Duplaix 2001</td>
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<tr>
<td>Aratinga pertinax</td>
<td>brown-throated parakeet</td>
<td>14.00</td>
<td>46</td>
<td>9</td>
<td>644</td>
<td>9</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>Pyrrhura picta</td>
<td>painted parakeet</td>
<td>110.00</td>
<td>29</td>
<td>10</td>
<td>864</td>
<td>10</td>
<td>Duplaix 2001</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>12,459</td>
<td>67</td>
<td>856,133</td>
<td>12,550</td>
<td>67</td>
<td>Duplaix 2001</td>
</tr>
</tbody>
</table>

Source: compiled from Duplaix 2001
FOB = minimum Free on Board Price

Table 11: Export data for the Psittacines from Guyana for 1998 and 1999
No figures are available for the domestic market, although Kratter (1998) estimated that 10% of the Psittacines are sold on the national market. Export is mainly focused on the European market. Previously, the US was a major market for parrots, but this trade was cut off in 1992, when the Wild Bird Conservation Act (WBCA) was passed. This Act requires that birds are harvested from the wild sustainably, and until this can be proven no birds can be exported to the US. The US market is a potentially valuable one, with captive-bred blue and yellow macaws selling for US$ 900–US$ 1,400 and captive-bred scarlet macaw selling for US$ 1,200–US$ 1,600 on the Internet. Worldwide legal trade in parrots was greatly diminished during the 1990s, due to the introduction and tightening of legislation (Snyder et al., 2000). The introduction of national legislation, the significant trade review process by the CITES Animal Committee, stricter EU legislation, the WBCA in the US and transport restrictions put in place by commercial airlines, have all made headway into reducing live bird trade (Duplaix, 2001; Snyder et al., 2000).

Trapping parrots is fairly labour intensive, involving two people, a (sticky) perch, a long-pole with lasso and a ‘calling bird’. One trapper hides in a tree (often an *Euterpe* palm, a popular food source for parrots) with a captive ‘calling bird’, while the second person waits on the ground. Attracted by the captive parrot’s calls, the unsuspecting wild bird lands on the sticky perch, where it is caught with a lasso and sent to the trapper on the ground. Trappers are often farmers or palm heart cutters who trade wildlife to supplement their income during the low season (Duplaix, 2001). Trappers are often supplied with trapping equipment by the middlemen or others direct to exporters. Trappers bring the birds to villages where they are sold to middlemen or sometimes direct to exporters (van Andel, 2006; Kratter, 1998). The birds must then be checked at a quarantine station and a permit must be issued before they can be exported. Kratter (1998) estimated the mortality rate (including damaged parrots) at about 15%. Quotas for exporters are determined simply by dividing the total quota for a species by the number of licenses. For each bird exported a tax of 20% of the import value is collected for the Wildlife Fund. Parrot values substantially increase as you follow the export chain. Exporters sell the parrots for seven times the price bought from the middlemen, and 11 times the price bought from the trappers. This trade was estimated to directly benefit approximately 584 people in Guyana (Kratter, 1998).

A total of 28 parrot species occur in Guyana, all of which are listed on CITES Appendix II, except for the scarlet macaw (*A. macao*) which is listed on CITES Appendix I. Kratter (1998) suggested maintaining zero quotas for several rare Psittacine species, specifically the scarlet macaw (*A. macao*), chestnut-fronted macaw (*Ara severa*), sun parakeet (*Aratinga solstitialis*), dusky billed parrotlet (*Forpus scaltari*), tepui parrotlet (*Nanopsittaca panychlora*), lilac-tailed parrotlet (*Toit batawica*), sapphire-rumped parrotlet (*Toit purpurata*), caica parrot (*Pionopsitta caica*), festive parrot (*Amazona festiva*) and the hawk-headed parrot

**(Deroptyus acuipiritinus).** Kratter recommended a limited trade of two previously zero quota species: the dusky parrot (*Pionus fuscus*) and the blue-cheeked parrot (*Amazona dufresniana*). Guyana raised these small quotas in 2000: the dusky parrot went from the recommended 500 individuals to 780 and the blue-cheeked parrot from the recommended 200 to 520 individuals (Duplaix, 2001). Additionally, the previously recommended zero quota for the hawke-headed parrot went up to 780 individuals. Besides the legal trade for which CITES quotas are set, there is an active illicit trade in Psittacines with Venezuela, Suriname and possibly Brazil (Kratter, 1998; Duplaix, 2001). Duplaix (2001) mentions an anecdote of scarlet macaws (*Ara macao*) being transported from Suriname into Guyana through Nickerie. Guyana has a zero quota for scarlet macaws, but it was suggested that they might be exported out of Guyana as the similar red and green macaws.

Although there are many threatened parrots in the Neotropics (see Snyder et al., 2000), the blue-cheeked parrot (*A. dufresniana*) is the only parrot in the Guiana Shield region with an IUCN threat category. Although relatively widespread in the Guiana Shield (French Guiana, Guyana, Suriname and Venezuela), it is listed as Low Risk - Near Threatened on the IUCN Red List, as habitat loss and trade have caused a population decline (IUCN, 2002). Although it does not have an IUCN threat category, the sun parakeet (*A. solstitialis*) is now very rare and close to extirpation in Guyana. The sun parakeet is also found in eastern Brazil, Suriname and French Guiana with one historical record from southern Venezuela. This parakeet was common in the Rupununi and the decline is attributed to trapping for the wildlife trade in the early 1980s, as well as smuggling to Brazil (Kratter, 1998; Craig-Clarke et al., 2000). Trapping of the sun parakeet was made easy by their habit of using the same nest tree every year. A trapper claimed that declines are also due to habitat changes. This parakeet is fairly easy to breed in captivity, but there is still demand for wild sun parakeets to maintain the genetic diversity of the breeding stock (Kratter, 1998). There is a preliminary plan to reintroduce the sun parakeet with a captive breeding program followed by a ranching program (Wiley et al., 1992), which would also be sought after by bird watchers. The idea to set up a cooperative between an existing tourist ranch in the Rupununi and exporters has not been realized (Duplaix, 2001). However, populations of sun parakeets are so low in Guyana that breeding stock would have to be brought in (Kratter, 1998).

Duplaix (2001) states that Guyanese "exporters expressed an interest in receiving expertise and assistance in setting up captive breeding or ranching projects. They are willing to provide the facilities, but need training in captive management and husbandry techniques. This would be a costly proposition. Some exporters suggested exporting breeding stock to breeding facilities overseas to save time and reduce expenses." However, these facilities already exist. This raises again the Convention on Biological Diversity (CBD) and the benefit sharing question:
when direct economic benefits of a country’s biodiversity are being exploited outside the native range, shouldn’t some of the benefits be returned to the country? How will Guyana compete with US entrepreneurs breeding Guyanese birds?

5.2.5 Ramphastidae

The rest of the CITES bird trade is made up of toucans and aracaris. Five species are exported from Guyana for the pet trade: black-necked aracari (Pteroglossus aracari), green aracari (Pteroglossus viridis), toco toucan (Ramphastos toco), red-billed toucan (Ramphastos tucanus) and channel-billed toucan (Ramphastos vitellinus). In 1998, these birds made up almost US$ 50,000 of the wildlife export revenue and US$ 57,000 in 1999 (Duplaix, 2001). However, export quotas are never fully realised; out of a total quota of 842, only 451 were exported (Duplaix, 2001). It is possible to breed these birds in captivity; prices vary from US$ 1,000 for a captive-bred green aracari up to US$ 9,000 for a captive-bred toco toucan in the US (www.emeraldforestbirds.com).

5.2.6 Songbirds

Seed finches (Oryzoborus angolensis and O. crassirostris) are very popular songbirds in Guyana. These songbirds, as well as three species of Sporophila (S. schistacea, S. lineola and S. minuta), are entered into singing competitions for cash prizes up to GS 100,000 (~US$ 520). The best singers can be locally worth up to GS 200,000 or US$ 1,080 (Williams and Watkins, 2002). Most song birds are transported over great distances from the North-West District and the Rupununi savannahs to the coast (van Andel, 1998). International trade in the towa towa (O. angolensis) and the twa twa (O. crassirostris) is banned from Guyana, although it is not regulated by CITES. Nevertheless, songbirds are smuggled into Suriname and further afield to Trinidad and the US. There is growing concern about population declines in these songbirds due to the trade (Craig-Clarke et al., 2000; Williams and Watkins, 2002). A new project funded by the Audubon Society investigates the socio-economics of the songbird trade in Guyana (Williams and Watkins, 2002).

5.2.7 Reptiles and amphibians

Guyana has specialised in non-CITES reptiles and amphibians: currently some 38 non-CITES species are being exported, as well as 21 CITES listed species (Table 10). Guyana exports approximately three times the numbers of non-CITES reptiles than Suriname (Duplaix, 2001). The most economically valuable reptile in Guyana was the emerald tree boa (Corallus caninus), making over US$ 40,000 in 1999 (based on FOB values and realised exports). Guyana has a quota of 880 individuals for this CITES Appendix II snake. The emerald tree boa is also found in Brazil, French Guiana, Suriname and Venezuela and other Amazon countries. Its presence in Colombia has recently been confirmed (Rodriguez, pers. comm.). The slender tree boa (Corallus hortulanus), with a similar distribution to the emerald tree boa, is also exported from Guyana. Guyana has a quota of 3,000 for this species, which was worth almost US$ 11,000 in 1999 (Duplaix, 2001). The rainbow boa (Epicrates cenchria) is widespread in South America and is distributed throughout the Guiana Shield. This CITES Appendix II snake generated an income of just over US$ 5,000 in 1999 for Guyana (Duplaix, 2001). Trappers would make approximately US$ 10 for a rainbow boa, while the retail price in the US is more than US$ 200 (van Andel, 1998). Surveys of the boid snakes have been carried out by CITES and the EPA.

The yellow-spotted river turtle (Podocnemis unifilis), distributed throughout the Guiana Shield, is considered Vulnerable (Alaced) on the IUCN Red List (IUCN, 2002). It is a CITES Appendix II species. Guyana has a zero quota for this river turtle, whereas Suriname has a quota of 630 (CITES, 2002). The giant river turtle (P. expansa) is legally protected in Guyana, but considered to be locally threatened in the Rupununi due to exploitation for the Brazilian market (Craig-Clarke et al., 2000). A point of interest with regard to the CITES quotas for the red-headed river turtle (Podocnemis erythrocephala) is that Guyana had a quota of 50 individuals since 1997, despite the fact the species is not recorded as occurring in Guyana (CITES, 2002). It was, however, deleted from Guyana’s quota list for 2001. According to Edwards et al. (1994), none of the tortoises (Geochelone carbonaria and G. denticulata) should be exported (i.e., zero quotas set) until adequate field surveys are carried out. In 1998, both tortoises quotas (of 704) were filled and almost filled in 1999– an export worth in total about US$ 20,000 (Duplaix, 2001). These species are also consumed regularly in indigenous communities (van Andel, 2000).

Spectacled caiman (Caiman crocodilus) have been extensively surveyed under the auspices of CITES, resulting into a management plan with a monitoring scheme put in place by the Guyanese government (Edwards et al., 1994). Guyana’s quota for C. crocodilus is 20,000 skins and 10,000 live individuals. In 1999, export of live spectacled caiman generated about US$ 30,000 (Duplaix, 2001). The black caiman (Melanosuchus niger) is found in the Rupununi and the Upper Essequibo Rivers, and has a scattered but viable population (Ross, 1998). In the past, the Guyanese black caiman population was severely hit by skin traders from Boa Vista (Ross, 1998). It is listed on CITES Appendix I, which bans all international trade. Dwarf caiman (Paleosuchus palpebrosus) and the smooth fronted caiman (P. trigonatus) are both widespread in the Guiana Shield. These small caimans are not considered threatened (they are not interesting for the skin trade), and both are listed on CITES Appendix II. Primarily hunted for subsistence by Amerindians, these species are also commercially exploited in Guyana for the pet industry (Ross, 1998). A few hundred Paleosuchus spp. were exported in 1998 and 1999 worth approximately US$ 2,000 (Duplaix, 2001).
5.2.8 Primates
Currently, four primate species are legally exported from Guyana: the weeper capuchin (*Cebus olivaceus*), brown capuchin (*Cebus apella*), red-handed tamarin (*Saguinus midas*) and the common squirrel monkey (*Saimiri sciureus*). Guyana exports more primates than Suriname and is the only country exporting the weeper capuchin. The most traded primate is the squirrel monkey, exported for the pet trade and until recently for use in laboratories. In 1998, squirrel monkey export was valued just over US$ 100,000 (Duplaix, 2001). Several field surveys of the primates have been carried out in Guyana (e.g., Lehman, 2000; Sussman and Phillips-Conroy, 1995).

5.2.9 Ornamental fish
Guyana is not a major aquarium fish exporter like Brazil, Colombia and Venezuela, but the trade does have a long history and there is a steady demand for fish from Guyana (Watson, 2000b). Some 76 species of fish are exported live for aquariums by six exporters (DeSouza, 1997). This limited number of low-value aquarium fish exports leaves a significant unexploited potential to increase the range of fish exported, especially those of higher value (Watson, 2000b). Prices paid for ornamental fish vary; rare species fetch higher prices, such as the motoro stingray (*Potamotrygon motoro*), worth about US$ 2 per individual. Export is concentrated towards the US market (Watson, 2000b), although European importers have expressed interest in increasing their imports from the Guiana Shield region (Grossman, 2002). In 1992, the potential value of export quota for aquarium fish was calculated at just over US$ 250,000, making up 13% of the total wildlife export revenues; this value increased to over US$ 550,000 in 1997 (Table 12).

The ornamental fish harvest is concentrated in the Mahaica-Mahaicony area, near Soesdijke, Rockstone, the Berbice River and the Barima River in the North-West District (Craig-Clarke et al., 2000; van Andel, 1998). The main species harvested along the Barima River is the silver-hatchet (*Gasteropelecus sternicla*), which is captured by local people in creeks and ponds in the beginning of the dry season. Dealers maintained that this trade did little ecological damage, as the fish would die anyway during the dry season. However, no surveys had been conducted in the North-West District and little is known about the impact of the extraction on the populations of these species (van Andel, 2000). No harvest quota or closed seasons exist for ornamental fish in Guyana. Iwokrama is developing an aquarium fish project with communities in their surroundings. A holding station for aquarium fish has recently been built in the North Rupununi and preliminary results have been published on the potential of the trade (Geer, 2000; Watson, 2000b).

5.2.10 Arapaima
Reaching up to 3 metres in length, the ancient, air-breathing arapaima (*Arapaima gigas*) is the largest scaled freshwater fish in South America. It has a pan-Amazonian distribution and is considered a delicacy in the region. A large arapaima can fetch approximately G$ 40,000 (US$ 120) (Iwokrama, 2001). The arapaima is in high demand in Brazil, which has resulted in a decimation of its population in Guyana (Iwokrama, 2001). Arapaima is currently protected by fisheries regulations (Craig-Clarke et al., 2000). The species appear on CITES Appendix II, but is considered Data Deficient on the IUCN Red List (IUCN, 2002).

Although protected, the lucrative trade meant that regulations have often been ignored. Communities in the North Rupununi Wetlands have embarked on a new initiative to manage the arapaima trade with support from the EPA and the Fisheries Department. Together with Iwokrama, the North Rupununi Development District Board (NRDDDB) is looking at the possibilities for the sustainable harvest of arapaima. Regular surveys of more than 180 lakes are being carried out in the region by the NRDDDB, the Mamiraua Institute for Sustainable Development (Brazil), the Guyana Fisheries Department and Iwokrama. Results have shown that there are not many large fish remaining. Based on experiences in Brazil, the study came up with several recommendations for the management of arapaima in Guyana: 1) the government should permit limited local arapaima fishery in Guyana rather than in Brazil; 2) only local communities should be allowed to fish arapaima, to allow direct economic benefits for the indigenous communities; 3) local communities and the NRDDB should calculate the permissible harvest based on stock surveys by trained fishermen; 4) the minimum harvest size should be 1.5 meters in length; 5) arapaima fishery should be banned during the breeding season (Iwokrama, 2001).

5.2.11 Bush meat
Bush meat and freshwater fish have been traded for years between forest communities, gold miners and loggers (Forte, 1995, 1999). Nowadays, the trade in bush meat is increasing, and more focused on the Georgetown and Trinidad markets.
The growing bush meat trade in Guyana is focused on deer ("O. virginianus and Mazama spp") as well as labba ("Agouti paca") (Craig-Clarke et al., 2000). The white-tailed deer is hunted for its meat in many parts of the Guiana Shield and is considered threatened at the national level in many Guiana Shield countries (i.e., Brazil, Colombia and Venezuela). It is not, however, listed on the IUCN Red List. The widespread brocket deer ("Mazama gouazoubira and M. americana") are hunted across the Guiana Shield, but there remains very little information on the status of these species. Both species of brocket deer are listed as Data Deficient on IUCN Red List (IUCN, 2002). "A. paca has an extremely widespread distribution and is usually found near water and swampy habitats where it feeds on grass and fallen fruits. Labba is the most prized Neotropical game animal for its tender, real-like meat (Emmons 1997). Like many other bush meat animals, labbas are rare or locally extinct in accessible areas (O’bouter, 2000). Labba meat is found on markets in parts of the Guiana Shield (Richard-Hansen and Hansen, in press). Due to their preference for fairly inaccessible habitats, they cannot be considered threatened. It should therefore be possible to sustainably hunt this species from its natural habitat (Emmons, 1997).

5.2.12 Spotted Cats
Across the Guiana Shield, the ocelot, margay, oncilla and jaguar all suffered heavily from the fur trade of the 1970s and early 1980s. Today they are all listed on CITES Appendix I, prohibiting international trade. National legislation forbids the hunting of the spotted cats in all countries of the Guiana Shield (Craig-Clarke et al., 2000; Nowell and Jackson, 1996). The widely distributed ocelot ("Leopardus pardalis") was heavily hunted for its fur until the mid 1970s. Since its CITES Appendix 1 listing in 1989, hunting pressure was greatly reduced and there are signs of population recovery (Nowell and Jackson, 1996). The smaller margay ("Leopardus wiedii"), from which almost 14,000 skins were exported between 1976 and 1984, is also a widespread species (Nowell and Jackson, 1996). Margay fur is less valuable than ocelot fur, but margays were often caught in traps set for ocelots (Emmons, 1997). There are reports of illegal hunting and trade for the black mar-

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5.3 Plant Products

5.3.1 Palm heart

Palm heart from *Euterpe oleracea* supplies a canning industry worth US$ 2 million annually in export value, and is Guyana’s most important vegetable NTFP (Table 12). Canned palm heart is hardly sold on the national market; most is exported to France. The multi-stemmed palm species, known locally as ‘manicole’, grows in large numbers in the brackish coastal wetlands, particularly in the country’s North-West District. Some 1,000 palm heart harvesters are active in this region, the majority of which are Amerindians. This region produces 60% of the national palm heart production. The French-Guyanese company AMCAR has recently opened a canning factory along the Berbice River, where 40% of the national production takes place.

To assess the sustainability of current palm heart extraction by AMCAR, the Tropenbos-Guyana Programme carried out a four-month pilot study in north-west Guyana. Vegetation structure, regeneration and mortality were compared between areas with a high and with low harvest intensity. An undisturbed area was taken as a control. In *Euterpe* populations that had been harvested for several years, stems were significant smaller in size and diameter than populations harvested only once or twice. Palm heart weight and yield were much lower in high-pressure areas, whereas clump mortality was almost three times higher than in the control plot. In areas where people combined subsistence farming with palm heart harvesting, fallow periods tended to be longer and less damage was done to the vegetation. Neglect of traditional farming and dependency on the palm heart industry has led to overharvesting and socio-economic problems in several regions (van Andel et al., 1998; van Andel, 2000).

On request of the Guyana Forestry Commission (GFC), Peña-Claros and Zuidema (2001) developed a Code of Practice for palm heart harvesting. Based on the field data of van Andel et al. (1998), they developed a harvesting model, which clearly showed that very short cutting cycles (less than 1 year) and a high harvesting intensity (95% of the mature stems) result in a rapid decline in density of harvestable stems. A detailed management plan is needed to ensure the future supply of palm hearts. Peña-Claros and Zuidema recommend that only palms higher than 7 m should be cut, harvesting intensity should be around 50-75% and fallow periods should be at least 5 years. An extensive survey of palm heart resources has to be carried out in the region, and harvest activities must be monitored regularly. Maintaining a minimum diameter for palm heart is a powerful method to prevent the extraction of immature stems. Permanent sample plots should be established to obtain basic information on growth, survival and reproduction rates of manicole in natural stands. Once these measurements are followed, the abundance and rapid growth of *Euterpe oleracea* offers good opportunities for sustainable extraction, which is of vital importance to employment in the region. A socio-economic study on the livelihoods of palm heart extractors is also planned by the GFC (Evans, pers comm.). Since the potential for conflicting land uses (commercial agriculture, mining or logging) is minimal, the extraction of NTFPs seems to be the most viable form of land use in *Euterpe* swamps (van Andel, 2000).

5.3.2 Nibi and kufa

After wildlife and palm hearts, the most important NTFPs in Guyana are the aerial roots of several hemi-epiphytes. They provide the raw material for a furniture industry that is best compared with the rattan manufacture in East Asia. The main species are nibi (*Heteropsis flexuosa*) and kufa (*Clusia grandiflora* and *C. palmicida*). The hemi-epiphytes grow in the canopy of non-flooded primary forest, although *Clusia* is occasionally found in swamp forests (van Andel, 2000; Hall et al., 2001). The hemi-epiphytes hardly occur in secondary forests. Germination takes place in the tree crowns, after which aerial roots descend towards the forest floor. Kufa roots are bent ... frames, while the pliable nibi roots are woven between these frames. Nibi is also used in basketry (van Andel, 2000).

Nibi and kufa are harvested in the Pomeroon and Mabaruma regions; some extraction takes place near Mabura Hill (van Andel, 2000; Hall et al., 2001). From the 1930s, Arawak and Carib communities in the Pomeroon region have been harvesting kufa and nibi roots for commercial furniture making. Nowadays, Amerindians are still the main extractors of this resource. In the 1970s, the first roots were transported to Georgetown for furniture production, and export to the Caribbean Islands began. Since then, the furniture market has been unstable, partly due to political turmoil in Guyana (Hall et al., 2001). Furniture for the local market is still made in the Pomeroon, but Georgetown factories are taking over the export market. Guyanese furniture supplies the tourist industry on the Caribbean Islands with Barbados as the biggest importer. Only a small percentage is exported to the US and Canada (van Andel, 1998; Hall et al., 2001). Furniture is sold on the national market for US$ 20 per chair, export pieces can cost up to US$ 1,000. Export values for furniture and other nibi crafts vary between US$ 125,000 and US$ 200,000 (Table 12).

Liana Cane Interiors Ltd. is a major furniture exporter in Guyana. The company strives to conduct a business that is responsible in both social and environmental aspects. They only buy certain diameter sizes of nibi and kufa roots and work with a permanent team of collectors and middlemen. In 1997, the company already expressed the need for applied research on growth rates of nibi and kufa roots to calculate sustainable harvest levels (Hoffman, 1997). After 1998, the overharvesting of kufa roots and logging of host trees resulted in a decline in diameter and availability of roots from the Pomeroon. Kufa is nowadays extracted along the road to Mabura Hill (central Guyana), while nibi is still extracted along the Pomeroon River (Dow, pers. comm.).
In general, the individual epiphytes are not killed during harvesting. In the case of nibi, the roots are easily pulled down from the trees. Only a very small proportion of the roots are fit for harvesting. For kufa, however, collectors have to climb the trees to harvest the roots. This is a dangerous job, so more roots are harvested to make the climbing worthwhile. If no more than 50% of the roots of kufa are harvested and the largest root is unharmed, the plants have a good chance of survival (Hoffman, 1997). Standing primary forest is needed to harvest nibi and kufa. A host tree for these epiphytes can provide more money in the long run than after a single logging event. As long as reasonable prices are paid for these roots, their extraction can actually prevent deforestation (van Andel, 2000).

The Guyana Forestry Commission (GFC) recently set up a draft Code of Practice on nibi and kufa harvesting (Hall et al., 2001). The GFC organised workshops for collectors, middlemen and furniture manufacturers. It was decided to maintain a regeneration period of ten years after harvesting of nibi and kufa roots. Minimum and maximum diameter sizes for the roots were set, to ensure the survival of the plants and sustainable harvesting (Hall et al., 2001). There still remains a need for more baseline information on the ecology, distribution, preferred forest types, host preferences and growth rates of nibi and kufa plants. Permanent sample plots should be established in which regeneration is studied after experimental extraction of nibi and kufa roots (Alphonso, pers. comm.). The GFC has plans to undertake a pilot project on nibi and kufa roots (Evans, pers. comm.). Opportunities for eco-certification of the furniture business should be investigated, as this might have a positive influence on the export market. Although nibi and kufa furniture will probably never compete on the global market with the cheaper rattan furniture from Southeast Asia, markets could be expanded in the Caribbean and the US, as export taxes for Guyana are reduced (Hall et al., 2001).

5.3.3 Mangrove bark

The bark from Rhizophora mangle and Avicennia germinans, used for tanning leather, is commercially harvested in the coastal swamps of the North-West District. Entire mangrove trees are cut down and skinned; the bark is sold to middlemen in Mahurama who ship the produce to the capital, where the actual leather production takes place. Since the 1970s, mangrove has lost its economic importance, probably as a result of the decline in cattle production in southern Guyana. In 1998, the production remained at 35 tonnes (van Andel, 2000). The GFC does not want to hand out more harvesting permits before a proper management plan is developed. Although mangroves occur in near monospecific stands along the coast, felling of trees could increase the damage on seashore and riverbanks by tidal movements. The GFC is now undertaking a study to develop a Code of Practice for mangrove bark harvesting (Evans, pers. comm.).

5.3.4 Crafts

The majority of the Guyanese handicrafts are made in the Amerindian villages of Santa Rosa (Moruca), Karakaburi (Pomeroon), Santa Mission (Demerara), St. Cuthberts (Mahaica River) and the Rupununi Savanna (see Map). Most crafts are sold in shops in the Georgetown. Export of crafts (Table 12) is predominantly directed to the Caribbean Islands, were they are resold in tourist shops for much higher prices (van Andel, 2000). Except from nibi and kufa, several other NTFPs are used in craft production. Tibisiri is a fibre obtained from the young leaves of Mauritia flexuosa. The twine is woven into hammocks, basketry, car seats and carpets. The palm occurs in large quantities on the flooded coastal plains, in swamp forests and the Rupununi savannas. Tibisiri harvesters complain that the frequent burning of savannahs in the dry season forces them to travel further each year to obtain their raw material. Although probably beneficial at first, (the surrounding vegetation is eliminated and seed germination is enhanced), the burning of the savannah eventually becomes fatal to Mauritia saplings (van Andel, 2000).

Mokru is a strong fibre split from the stems of Ischnosiphon aromana and I. obliquus shrubs that grow in secondary forest. The fibre is woven into household basketry and tourist souvenirs (van Andel, 2000). Furniture and basketry from Guyana are now offered for sale on the Internet (www.artscraftsGuyana.com). Balata, the latex of the bulletwood tree (Manilkara hubertata), used to be Guyana’s most important...
It was exported as raw material for the rubber industry, but has lost its economic importance since the invention of synthetic substitutes and the establishment of Hevea plantations in Asia (Pennington, 1990). In the 1990s, a successful project of Conservation International in the Kanuku Mountains reintroduced the use of balata for making handicrafts, which are now sold at Georgetown tourist shops (Conservation International, 1997).

5.4 The future of commercial NTFPs in Guyana

5.4.1 Expanding the export of NTFPs

The current state of the economy in Guyana is critical and has been unstable over recent years. This has detrimental effects for the international trade in NTFPs. Companies active in forest product trade have a hard time finding financial resources to stay in business and build a socially acceptable and ecologically sound enterprise (Hall et al., 2001). There is an urgent need for the development of sustainable harvesting levels for palm heart, nibi and kufa, products that have a great potential for sustainable harvesting. Guyana is a member of the CARICOM, which might offer opportunities for creating markets in the Caribbean, especially for crafts and furniture. More attention should be given to community-based commercial NTFP enterprises. The recent activities of the Guyana Forestry Commission in developing draft Code of Practices for NTFPs are promising and should be stimulated.

5.4.2 Potential plant products

For some reason, the Guyanese do not like the juice of Euterpe oleracea fruits. The palm heart processing company was not interested in processing these fruits (van Andel et al., 1998). The same accounts for the fruits of Mauritia flexuosa, harvested only occasionally by Amerindians, but not processed commercially like in Venezuela and Colombia. Products with such an enormous potential, occurring in large quantities in areas not suitable for agriculture or logging, remain unused because they lack opportunities on the domestic market. Palm heart and tibisiri fibre harvesting does not necessarily have negative consequences for fruit collection, as long as sufficient mature stems per clump are left to supply the extractor with fruits (in the case of Euterpe oleracea) and Mauritia palms are not chopped down to harvest leaves or fruit (Peters et al., 1989b). Since malnutrition is not uncommon in the Guyanese interior (Forte, 1995), the use of palm fruits in the local diet should be promoted. Once a stable external market is found, Guyana might reconsider developing a conserving system for fruit pulp export. Using the existing infrastructure for palm heart collection, the revenues from the coastal swamps could increase significantly, resulting in more employment for local people.

Medicinal plants are definitely an underdeveloped resource in Guyana. Hundreds of medicinal species are used in the country for subsistence (Lachman-White, 1987; Reinders, 1993; van Andel, 2000). A total of 85 species are offered for sale on the herbal market in Georgetown, but just a handful of species are exported (van Andel, 2000). Guyana’s neighbouring country Suriname exports substantial volumes of medicinal plants to the Netherlands (van’t Klooster, 2000). Many of these species successfully marketed by Suriname also occur in Guyana, but it seems that this country still has to discover its commercial potential on the world market. Guyanese medicinal plants, barks, roots, oils, and resins could have a much larger potential for the national and regional market if they would be processed in a more sophisticated manner, such as ready-to-use tonics, powders, tablets, ointments, or pre-packed herbal teas and baths. Of the 294 medicinal plant species recorded in the North-West District by van Andel (2000), only one was commercialised on a regular basis. Crab oil, extracted from the seeds of the crabwood tree (Carapa guianensis), is the sole herbal medicine offered for sale in the interior shops. The oil is used throughout the country as mosquito repellent, hair and medicinal oil. Its complicated processing method makes crab oil relatively expensive (US$ 7 per litre). Iwokrama recently initiated a study on the production and market prospects for crab oil in Guyana (www.iwokrama.org).

Bioprospecting was mentioned as an opportunity to obtain extra benefits from the country’s biodiversity (Sizer, 1996; Iwokrama, 1997). The Environmental Protection Agency (EPA) is now developing a policy and institutional framework to regulate the collection of specimens by scientists and pharmaceutical companies in Guyana (EPA, 2000). Recently, Iwokrama has developed a bioprospecting programme through a partnership with CABI Bioscience, the Royal Botanical Gardens in Kew, the Institute of Applied Science and Technology (University of Guyana) and the University of the West Indies. To date, the main focus of the programme has been the establishment of a national biodiversity screening laboratory in Guyana, and research on bioactive metabolites of pharmaceutical and insecticidal significance from fungi and their host plants. Local Amerindians have been recruited to carry out field surveys and laboratory activities. Any commercial exploitation is capped until Iwokrama has intellectual property rights and benefit sharing agreements in place (Iwokrama, 2002).

The Amazon Conservation Team has plans to expand their Kramalasamutu Brazil nut project in Southern Suriname to the neighboring Wai-wai communities in Guyana, where a 150 km strip of Brazil nut trees exists. The possibility of linking the two initiatives increases the potential for economic sustainability of the project. Some of the advantages include easier access to markets, an increase in脑海 and decrease in relative transport costs (ACT, 2000). However, it remains to be seen if the high transport costs will not be an obstruction to make this project economically viable.

Live orchids (e.g., Brassia verrucosa, Catasetum spp., Encyclia diurna, Oncidium baueri, Rodriguezia lanceolata, and Zygosepalum labiosum) from the North-West...
District are sold to merchants in Parika (Issequibo) for up to US$20 per plant (van Andel, 2000). The Guyana Forestry Commission authorises the export of orchids (all orchids are listed on the CITES Appendix II) and bromeliads. The above-mentioned species are rather common elements in the coastal wetlands. Taxes paid by orchid exporters were reported as very low, while the specimens were valued at hundreds of dollars in the US (Edwards et al., 1994). No official figures exist on the marketing of wild ornamental plants from Guyana.

5.4.3 Sustainable wildlife harvesting
According to Ziegler and Zago (1993), the export of wildlife from Guyana, if properly regulated, could be a profitable and sustainable use of renewable natural resources. Edwards et al. (1994) state that the economic potential of the wildlife trade may be the only viable counter-argument to the massive deforestation that will surely result from the anticipated timber harvests. Sizer (1996), however, argues trapping does lasting damage to the forest and is thus inherently unsustainable.

Since 1996, there have been significant advancements with regard to management and regulation of the wildlife trade (Duplaix, 2001). A common criticism of wildlife management in Guyana has been the lack of baseline data on population sizes, spatial distribution and breeding seasons, making it difficult to estimate the impact of the wildlife trade on animal populations (Edwards et al., 1994; Sizer, 1996; Nasir et al., 1997). Several surveys have been carried out in recent years, such as the brief survey of the Psittacines by Kratter (1998). Surveys are a requirement of CITES; if no population data is available for high volume species, then further trade bans could result under the CITES Significant Trade Review process (CITES, 2001). The stated prerequisite for baseline biological studies before management is thought by some to be a misguided assumption, as biological surveys often do not provide suitable data for management purposes, not to mention the high costs of carrying out these surveys (Watkins, pers. comm.). Research is certainly necessary, but should be an integrated part of the management system. Particularly needed in Guyana are socio-ecological studies of wildlife trappers, market surveys and the design of management systems that work economically as well as socially and culturally (Watkins, pers. comm.). WWF–Guianas is actively working on dialogues between the wildlife management authorities and exporters in Guyana and Suriname to make headway on harmonisation of quotas as part of their Wildlife Trade Management Programme for the three Guianas. Iwokrama leads the way with innovative projects on the sustainable harvesting of wildlife in collaboration with local communities. These programmes, set up to provide alternative mechanisms for sustainable harvesting and equitable benefit sharing, will hopefully provide insights into wildlife management and trade that can be shared with other nations of the Guiana Shield.
6.1. Commercial NTFP extraction

Suriname, a country where more than 90% of its surface (163,820 km²) is covered with dense tropical rain forest, has only 450,000 inhabitants. The population is concentrated in the capital of Paramaribo and the coastal zone. This population consists of Creoles, Maroons, East Indians, Javanese, Chinese and small groups of Syrians, Lebanese and Europeans. Brazilian immigrants, legal and illegally employed in the gold mining industry, have recently become part of the population as well. The forested interior is inhabited predominantly by Amerindians and Maroons or Bush negroes, descendants of African slaves who fought their way to freedom creating their own societies. The Maroons are the largest group (about 45,000): they have settled along the Suriname, Saramacca, Tapana hony and Marowijne Rivers in the east and central part of the country (Kambel and MacKay, 1999). Their community is divided into different ethnic groups: Saramaccans, Paramaccans, Ndju ka (Aucans), Matsutari, Aluku (Boni) and Kwinti. The indigenous population (estimated between 10,000 and 22,000) is found in the most southern part of the country (Trion, Wayana and Akurio). Some tribes (Arawak, Carib) live in the savanna belt in the coastal region (Kambel and MacKay, 1999). The population living or working in the interior of Suriname (including gold miners and loggers) is estimated at between 60,000 and 80,000 (de Dijn, pers. comm.). These figures may increase in the future because of massive gold mining and timber exploitation activities (Sizer and Rice, 1995; Colchester, 1995; Amazon Cooperation Treaty, 1996).

The civil war between 1986 and 1992 and the economic crisis of the last decade has hit the Surinamese society very hard. It has left a completely devastated economy and a disintegrated interior (Colchester, 1995; Teunissen et al., 1999). As a result, project activities are mostly concentrated on the rehabilitation of villages, basic needs and transportation facilities. At the same time, there is an increased assertiveness of the Maroon and indigenous population in respect to their rights in cultural, social, economic and political terms (Amazon Cooperation Treaty, 1996).

Quite a number of publications have stressed the importance of wild plants for subsistence use in the country (Stahel, 1944; Ostendorf, 1962; May, 1982, Heyde, 1990, Raghoenandan, 1994), but little is published on commercial NTFPs in Suriname (Peneux, 1999; van’t Klooster, 2000). Except for wildlife, Suriname does not appear in South American export statistics of NTFPs (Broekhoven, 1996). Export of NTFPs from Suriname is covered by the Law on Forest
Management, but this law covers only plant products and excludes wildlife (de Dijn, pers. comm.). Scientists working in Suriname state that there exists a lively national market in forest products. From the scattered published information and personal comments of experts, we can say that Suriname’s main commercial NTFPs are wildlife, podosiri (*Euterpe oleracea*) and other palm fruits, medicinal plants, crafts and Brazil nuts.

6.2 Wildlife

6.2.1 Commercial wildlife harvesting

Wildlife can be legally exported from Suriname. Along with Guyana, they are the only two South American countries exporting considerable quantities of wildlife, generating a significant income (Duplaix, 2001). Revenues of wildlife export fluctuate around US$ 1 million per year (Table 13), with CITES-listed birds, reptiles and amphibians making up the bulk of the export (Duplaix, 2001; Ouboter, 2001). Since 1997, the trade in CITES-listed species has declined. Primates were no longer exported in 2000 (Duplaix, 2001). For most CITES-listed species, realised exports are much lower than the allowed quota, due to a decreased demand, new international restrictions and transport problems (Ouboter, 2001). The trade in bush meat and live animals is very important in Suriname’s interior. Maroon and Amerindian trappers sell birds, frogs, reptiles and fish to traders from Paramaribo, who market the meat in French Guiana and export the live animals to Europe and the US (Duplaix, 2001; Boven, pers. comm.). There is a small-scale domestic trade in live animals in Paramaribo, although no quantitative data are available on this, but it is thought most live animals are destined for the export market (De Dijn, pers. comm.). A possible exception may be the domestic trade in songbirds.

Key wildlife collection areas in Suriname are Apura, Wasabo, Tepu and Kwamalasamutu (Boven, pers. comm.; Duplaix 2001). Psittacines are trapped in the Apura region on the Corantyne River and in the extreme south of Suriname in the Sipaliwinj savannah, like Palumeu, Peleleutepu, Kwamalasamutu and the Sipaliwinj airstrip (Duplaix, 2001; Ottema, Playfair, Teunissen, pers. comm.). Bird trade from Kwamalasamutu was hampered because of restricted access by indigenous people, who are now bringing the birds to Paramaribo themselves (Boven, Ottema, Teunissen, pers. comm.). Reptiles are caught across the entire country, including close to Paramaribo (Playfair, pers. comm.). Most wildlife exports, especially birds, have been traditionally exported to the Netherlands, from where they are often immediately re-exported (Duplaix, 2001). Recently, wildlife exports are directed towards Belgium, since the main airline (KLM) does not accept wildlife cargo anymore (Duplaix, 2001). Wildlife exporters also cooperate closely to charter private planes to ship their animals to Europe (Teunissen, pers. comm.).

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<tbody>
<tr>
<td>CITES birds</td>
<td>884,129</td>
<td>727,077</td>
<td>676,845</td>
<td>591,440</td>
</tr>
<tr>
<td>CITES reptiles and amphibians</td>
<td>134,439</td>
<td>122,044</td>
<td>77,515</td>
<td>126,844</td>
</tr>
<tr>
<td>CITES mammals</td>
<td>290,778</td>
<td>151,387</td>
<td>133,309</td>
<td>86,575</td>
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<td>CITES animals total</td>
<td>1,309,346</td>
<td>1,000,808</td>
<td>857,656</td>
<td>804,863</td>
</tr>
<tr>
<td>Non-CITES reptiles and amphibians</td>
<td>24,077</td>
<td>11,636</td>
<td>17,722</td>
<td>133,591</td>
</tr>
<tr>
<td>Non-CITES mammals</td>
<td>900</td>
<td>822</td>
<td>0</td>
<td>2,160</td>
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<tr>
<td>Non-CITES birds</td>
<td>68,407</td>
<td>49,678</td>
<td>36,874</td>
<td>99,594</td>
</tr>
<tr>
<td>Non-CITES animals total</td>
<td>93,384</td>
<td>62,136</td>
<td>54,646</td>
<td>234,765</td>
</tr>
<tr>
<td>Total CITES and Non-CITES animals</td>
<td>1,402,730</td>
<td>1,062,944</td>
<td>942,302</td>
<td>1,039,568</td>
</tr>
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Source: Duplaix (2001)

6.2.2 Wildlife regulations and management

Suriname ratified CITES in 1981, after which the Government established an export quota system. Export is only allowed for those species mentioned on the quota list and quotas are determined annually, although Ouboter (2001) concluded that the quota list should be revised and based on scientific studies and conservation approaches. All plants and animals (including dead specimens and parts) leaving Suriname require an export permit; permits for CITES and non-CITES species are granted by the Nature Conservation Division (NB) of the Suriname Forest Service (LBB). The LBB, with funding from WWF-Guianas, has produced a guidebook with animal pictures in full colour explaining the wildlife export rules. The Surinamese Game Law of 1954 determines when hunting can occur and permits will not be issued during closed hunting season. However the Game Law applies only to the coastal areas, not to the interior of Suriname.

The export of aquarium fish is regulated by the Fisheries Department (Ministry of Agriculture). Fishing in the interior is not regulated at all (Ouboter, 2001). Although wildlife export is by many accounts well regulated in Suriname, the LBB-NB still lacks financial and technical support. They have too few officers in order to cover all the accessible areas to counteract smuggling and breaches of the closed seasons (Colchester, 1995; Ouboter, 2001). WWF-Guianas maintains a Wildlife Trade Management Programme for the three Guianas. Their main goal is to strengthen regional institutional capabilities, legal mechanisms and national structures for the sound management of wildlife trade, and promote the appro-
private framework for the sustainable use of wild resources in the Guianas. Their headquarters are located in Paramaribo.

6.2.3 Illegal trade
Wildlife is smuggled across the Suriname border with all neighbouring countries: Guyana, French Guiana and Brazil (Duplaix, 2001; Ouboter, 2001; Hoogmoed, pers. comm.). Parrots, game birds, bush meat and sea turtle eggs are offered for sale across the Marowijne River in St. Laurent du Maroni (French Guiana). Here, specialised butchers prepare the wildlife before it is transported to Cayenne. Animal exporters often cross the Guyana-Suriname border to meet quotas in the other country (Duplaix, 2001). Poachers from French Guiana enter Suriname to hunt the scarlet ibis (Eudocimus ruber) between the nature reserves of Galibi and Wia Wia (Spaans and Teunissen, pers. comm.). Capturing birds during the closed season and in designated areas of Suriname (e.g., around the Brokopondo Lake), is illegal, but continues to occur. Birds trapped during the closed season are sometimes kept in captivity until the season opens again (Duplaix, 2001).

6.2.4 Psittacines
Psittacines (macaws, parrots, parakeets and parrotlets) are the most economically valuable group of Suriname’s wildlife trade (Duplaix, 2001; Ouboter, 2001). They represent more than 90% of the export value of CITES-listed birds and on average 60% of the export value of all wildlife. However, with other exported animal species, the export realised within this group is much below the export quota (Table 14). In 2001, the earnings for export of the parrot family dropped further to US$ 450,000; a 45% decline over 5 years. The blue and yellow macaw (Ara ararauna) and orange winged parrot (Amazona amazonica) generate by far the most income (Table 14).

A total of 20 species are commercialised. All species are listed on CITES Appendix II, except for the scarlet macaw (Ara macao) which is listed on Appendix I. Suriname maintains a quota of 100 for the scarlet macaw and registered exports in 1997 and 2000 (Duplaix, 2001). The scarlet macaw is also the most valuable per individual with an FOB value of US$ 873 (Table 15). When compared to neighbouring Guyana, Suriname has much lower quotas and realised exports, but conversely has higher FOB prices (Broekhoven, 1996; Duplaix, 2001). For many of the commercial Psittacine species listed for Guyana, Suriname has zero or low export quotas. For example, the 2001 quota of blue-cheeked parrot (Amazona dufresniana) was 70 individuals in Suriname, whilst in Guyana the quota was 520. For a few species Suriname has higher quota, for example the 2001 quota of the brown-throated parakeet’s (Aratinga pertinax) was 2,710 for Suriname and 500 for Guyana.

Suriname’s 2002 CITES quotas show an increase across the board from their 2001 quotas. Particularly notable is the quota for Amazona dufresniana, which jumped from 70 to 786, making it higher than Guyana’s quota for this parrot. The quota for Amazona amazonica went up from 4,800 to 6,140 (www.CITES.org). Captive breeding of macaws and parrots is not common in Suriname, despite captive bred parrots having a higher value in the pet trade. A couple of species (Pionites melanocephala and Amazona dufresniana) are now being bred in captivity by exporters (Ouboter, 2001).

The exact status of Psittacines in the country is not known, but the general impression is that most populations are stable (Ouboter, 2001). There are a few exceptions: the blue cheeked parrot (Amazona dufresniana) is less common than other parrots, golden-crowned conure (Aratinga auriceps) has a distribution limited to the Sipaliwini savanna in Suriname and exporters are reporting a decline in the red and green macaw (Ara chloropterus). It is clear that population surveys of psittacines should be carried out, especially because their trade is regulated by CITES (Ouboter, 2001).

The trapping of parrot species is allowed between July and December (Ouboter, 2001). Most bird trade is legal. However, differences between the quotas and differences in parrot populations between the countries increases illegal cross border trade (Kratier, 1998; Duplaix, 2001). Duplaix witnessed Guyanese trappers catching scarlet macaws in the Apura region, along a creek near the Corantyne River, which entered Guyana via Nickerie (Duplaix, 2001). Another report by the chief French Customs Inspector mentions smuggling of parrots between Suriname and French Guiana across the Marowijne River; the birds are then sold on the roadside between Saint Laurent du Maroni and Kourou (Duplaix, 2001).
Indigenous groups traditionally use parrots feathers for ornamentation and rituals (Thomsen and Brautigam, 1991). The Wayana and Tirio Indians use many feathers to make head-dresses, arrows and "aboriginal plumage art" (Boven, pers. comm.; Thomsen and Brautigam, 1991). Sometimes tail feathers are removed every year from captive raised parrots, but parrots are also killed for both the feathers and the meat. An increased commercialisation of the craft for the tourist market has occurred in parts of the Amazon (Thomsen and Brautigam, 1991). The large head-dresses made out of many different feathers are sold for US$ 1,000 (Boven, pers. comm.). However, this ceremonial usage is very small compared to the pet trade.

6.2.5 Ramphastidae
The rest of the CITES bird trade is made up of toucans and aracaris. Four species are exported from Suriname for the pet trade: the black-necked aracari (*Pteroglossus aracari*), the green aracari (*Pteroglossus viridis*), the red-billed toucan (*Ramphastos tucanus*) and the channel-billed toucan (*Ramphastos vitellinus*). Unlike Guyana, Suriname does not export *Ramphastos toco*. The export was worth on average US$ 50,000 between 1997 and 2000 (Duplaix, 2001). The channel-billed toucan made up half of the trade ... Export quotas are far from being realised. Most of toucans and aracaris are exported to the Netherlands (Duplaix, 2001).

6.2.6 Songbirds
Surinamese men are very fond of their songbirds, so much so that possibly the most expensive bird for sale in Suriname is the tawattaw (*Oryzoborus crassirostris*), a small black seed finch. The tawattaw fetches prices up to US$ 40,000, provided it is a top class singer (Duplaix, 2001). A close second in popularity is the pikolet (*Oryzoborus angolensis*). The gelebek (*Sporophila schistacea*) and rowti (*Sporophila minuta*) are also popular caged songbirds, but are of lesser importance economically and in contests. Although less valuable than both the twattaw and pikolet, the gelebek can still fetch prices of US$ 65,000 at the local airport. It is difficult to walk around Paramaribo without seeing at least one songbird in a cage.

Seeing a tawattaw in the wild in Suriname is another story. Due to the popularity of this hobby, and the high value of the tawattaw, it is not surprising that this species is almost extinct in Suriname (Otte and Spaans, pers. comm.). It is no longer found in the coastal areas and it is depleted in the savannah area as well (Ouboter, 2001). In the Coesewijne Nature Reserve, Amerindians burn large areas

### Table 14: Export Data for the Psittacines from Suriname 1999-2000

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<tbody>
<tr>
<td>Blue and yellow macaw</td>
<td><em>Ara ararauna</em></td>
<td>300.00</td>
<td>537</td>
<td>83</td>
<td>161,100</td>
<td>559</td>
<td>86</td>
</tr>
<tr>
<td>Orange winged parrot</td>
<td><em>Amazona amazonica</em></td>
<td>33.00</td>
<td>4,840</td>
<td>101</td>
<td>159,720</td>
<td>3,618</td>
<td>75</td>
</tr>
<tr>
<td>Red and green macaw</td>
<td><em>Ara chloropterus</em></td>
<td>342.00</td>
<td>232</td>
<td>93</td>
<td>79,344</td>
<td>251</td>
<td>100</td>
</tr>
<tr>
<td>Yellow-headed parrot</td>
<td><em>Amazona ochrocephala</em></td>
<td>86.00</td>
<td>455</td>
<td>78</td>
<td>39,130</td>
<td>484</td>
<td>83</td>
</tr>
<tr>
<td>Hawk-headed parrot</td>
<td><em>Deroptyus accipitrinus</em></td>
<td>251.00</td>
<td>158</td>
<td>53</td>
<td>39,658</td>
<td>195</td>
<td>65</td>
</tr>
<tr>
<td>Mealy parrot</td>
<td><em>Amazona farinosa</em></td>
<td>79.00</td>
<td>384</td>
<td>85</td>
<td>30,336</td>
<td>338</td>
<td>75</td>
</tr>
<tr>
<td>Black-headed parrot</td>
<td><em>Pionites melanocephala</em></td>
<td>45.00</td>
<td>1,014</td>
<td>74</td>
<td>45,630</td>
<td>795</td>
<td>58</td>
</tr>
<tr>
<td>Blue-cheeked parrot</td>
<td><em>Ara severa</em></td>
<td>306.00</td>
<td>66</td>
<td>94</td>
<td>20,196</td>
<td>60</td>
<td>86</td>
</tr>
<tr>
<td>Blue-headed parrot</td>
<td><em>Pionus menstruus</em></td>
<td>28.00</td>
<td>923</td>
<td>62</td>
<td>25,844</td>
<td>299</td>
<td>45</td>
</tr>
<tr>
<td>Red-bellied macaw</td>
<td><em>Ara manilata</em></td>
<td>56.00</td>
<td>102</td>
<td>22</td>
<td>5,712</td>
<td>142</td>
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<tr>
<td>Scarlet macaw</td>
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<tr>
<td>Chestnut-fronted macaw</td>
<td><em>Ara severa</em></td>
<td>139.00</td>
<td>121</td>
<td>48</td>
<td>16,819</td>
<td>167</td>
<td>67</td>
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<tr>
<td>Painted parakeet</td>
<td><em>Pyrrhura picta</em></td>
<td>39.00</td>
<td>119</td>
<td>14</td>
<td>4,641</td>
<td>242</td>
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<tr>
<td>Brown-throated parakeet</td>
<td><em>Aratinga pertinax</em></td>
<td>7.00</td>
<td>556</td>
<td>21</td>
<td>3,892</td>
<td>885</td>
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<tr>
<td>Red-shouldered macaw</td>
<td><em>Ara nobilis</em></td>
<td>46.00</td>
<td>67</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>Green rumped parrotlet</td>
<td><em>Forpus passerinus</em></td>
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<td>62</td>
<td>25,844</td>
<td>1,243</td>
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<tr>
<td>White-eyed parakeet</td>
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<td>1,155</td>
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<td>28</td>
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<tr>
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<td>629</td>
<td>79</td>
<td>28,305</td>
<td>299</td>
<td>37</td>
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<tr>
<td>Golden-crowned conure</td>
<td><em>Aratinga aurea</em></td>
<td>17.00</td>
<td>132</td>
<td>13</td>
<td>544</td>
<td>16</td>
<td>16</td>
</tr>
</tbody>
</table>

**TOTALS** | 3,500.00 | 10,883 | 49 | 668,584 | 10,174 | 46 | 637,151 | 7,855 | 36 | 552,839 |
Apart from songbirds, Suriname exports many other non-CITES birds: 86 species in total (Duplaix, 2001; Ouboter, 2001). Voluntary quotas for these birds are set and represent an important proportion of the non-CITES trade (Table 13).

6.2.7 Reptiles
Suriname exports 11 CITES-listed reptile species and 16 non-CITES species, all for the pet trade (Ouboter, 2001). The most valuable is the emerald tree boa (Corallus caninus) making US$ 40,715 in 2000. The reptile traded in the greatest quantities is the green iguana (Iguana iguana), with 5,574 individuals exported in 2000 (Duplaix, 2001). Iguanas are collected mainly from the coastal areas (Hoogmoed, pers. comm.). There is concern that the emerald tree boa is being over-exploited in accessible areas for the export trade, based on Ouboter’s (2001) discussions with exporters. The rare rainbow boa ( Epicrates cenchris ) is also exported for the pet trade. Population assessments are needed for the emerald tree boa and the rainbow boa and export quotas adjusted to prevent over-exploitation (Ouboter, 2001).

Song birds are coming into Suriname from Guyana, French Guiana and Brazil and possibly further afield from Venezuela and Trinidad. Birds originating from Sipalawi savannah are much preferred to foreign birds. Several songbird owners advised to find out the origin of the songbirds, as those from Guyana and French Guiana die quickly and can result in embarrassingly low scores in contests. Many twatwas are collected by the Tirio Indians in the Paru Savannah (Brazil), which borders to the Sipaliwini Savannah in Suriname, and are exported by pilots of charter planes to Paramaribo. Brazilian authorities recently prohibited the catching of twatwas in the Paru Savannah (Teunnissen, pers. comm.). Oryzoborus spp. songbirds are very popular in Brazil as well, but since the 1980s, captive breeding has greatly reduced the pressure on the wild populations. Captive-bred songbirds are legally exported from Brazil (Tostes and Preto, 2001). The export of twatwas and pikolets from Suriname is prohibited, but birds are smuggled in hand luggage to the Netherlands (Duplaix, 2001; Ouboter, 2001). Caged seed finches are frequently seen and bred in the Netherlands (e.g., Amsterdam Zuid-Oost), as they are popular with Surinamese immigrants. Ouboter (2001) recommends listing the twatwa on CITES Appendix III and suggests a ban on the capture of this bird.

Poison dart frogs (Dendrobatidae) are extremely popular in Europe and the US. All Dendrobatidae are listed on CITES Appendix II. Two CITES-listed poison frogs are exported from Suriname; the dyeing poison frog ( Dendrobates tinctorius ) is the most traded species (Table 15), followed by the three-striped poison frog ( Phobobatus trivittatus ). These two species together were worth about
US$ 13,000 in 1998, US$ 9,000 in 1999 and US$ 18,500 in 2000 (Duplaix, 2001). In 2001, Suriname was hit with a CITES ban for *D. tinctorius*, because trade numbers rose above certain levels and questions on the species’ population status were not answered (www.cites.org; Hoogmoed, pers. comm.). Despite the CITES restrictions, Suriname has increased the export quota for this frog in 2002 (Table 15).

The impact of the pet trade on frog populations remains unknown. The Global Amphibian Assessment is currently evaluating all amphibians against the IUCN threat categories (Long, 2001), but data are not yet available for the Guiana Shield. The spectacular okopipi frog (*Dendrobates azureus*) only occurs in the Sipaliwini Nature Reserve and in one location west of the Sipaliwini in Guyana (Duplaix, 2001). The blue frog is protected in Suriname, but Guyana allows an export of 500 individuals per year, which stimulates smuggling across the border (Duplaix, 2001). There is a colour morph of *Dendrobates tinctorius* that closely resembles the protected *D. azureus*; this variety is also protected and cannot be exported for commercial purposes (Duplaix, 2001). Ouboter (2001) recommends that more surveys on the distribution and abundance of the most important colour morphs of *Dendrobates tinctorius* are carried out and that the quotas be set accordingly for different varieties.

On the Oelemari and above Litani, Wayana Indians are selling poison frogs to traders for US$ 5 per frog. The Wayana now claim that they are getting very difficult to find (Boven, pers. comm.). The Tirio in southern Suriname used to sell *D. azureus* to traders for as little as US$ 0.20 per frog, but stopped this practice once they realised the frogs were being sold on for US$ 300 in the US, not to mention the rarity of the species (de Beer, 1997).

### Table 15: Export of *Dendrobates tinctorius* from Suriname

<table>
<thead>
<tr>
<th>Year</th>
<th>Quota</th>
<th>Numbers</th>
<th>% Realised</th>
<th>Value [US$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>1,886</td>
<td>845</td>
<td>45</td>
<td>7,605</td>
</tr>
<tr>
<td>1998</td>
<td>1,886</td>
<td>1,059</td>
<td>56</td>
<td>9,531</td>
</tr>
<tr>
<td>1999</td>
<td>1,886</td>
<td>695</td>
<td>37</td>
<td>6,255</td>
</tr>
<tr>
<td>2000</td>
<td>1,886</td>
<td>1,448</td>
<td>19</td>
<td>13,032</td>
</tr>
<tr>
<td>2001</td>
<td>1,886</td>
<td>banned</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2002</td>
<td>2,104</td>
<td>banned</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

Sources: Duplaix (2001), www.cites.org

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**Non-CITES amphibians exported are species of the genera *Phyllomedusa*, *Ceratophrys*, *Hyla*, *Bufo* and *Phrynophyas* as well as the species *Pipa pipa* (Duplaix, 2001). Their export value varies between US$ 6,000 (1998) and US$ 26,000 (2000). Suriname has a voluntary quota system for non-CITES amphibians, mostly listed at the generic level (Duplaix, 2001).

### 6.2.9 Primates

Three primate species used to be exported from Suriname: the brown capuchin (*Cebus apella*), red-handed tamarin (*Saguinus midas*), and the common squirrel monkey (*Saimiri sciureus*). The squirrel monkey is the most traded and brought in US$ 213,300 in 1997. Exports dropped substantially afterwards, and in 2000 no primates were exported (Duplaix, 2001). ... CITES Appendix II. Export is for the pet or laboratory trade, although many of these species are also hunted as bush meat.

Capuchin monkeys (*Cebus* spp.) are an important food source for communities in the interior, as well as the larger spider monkeys (*Ateles paniscus*) and howler monkeys (*Alouatta* spp.). (Ouboter, 2001; Teunissen, pers. comm.). The brown capuchin monkey (*Cebus apella*) is widespread in South America. It is threatened by intensive hunting for meat in most parts of its range, including the Guianas (Table 9), but has greater reproductive potential, habitat flexibility and recuperative capacity than larger monkeys (Emmons, 1997; IUCN, 2002). The wedge-capped capuchin monkey (*Cebus olivaceus*) occurs in Venezuela, the Guianas, and in Brazil east of the Rio Negro and the along the Amazon River, where it lives in mature evergreen forest and gallery forest (Emmons, 1997). It is hunted heavily for its meat in the three Guianas and the Venezuelan Guayana (Duplaix, 2001; Bevilacqua et al., 2002). In Suriname, the smaller *Cebus* species are not as popular as the larger monkeys (Ouboter, 2000).

The black spider monkey (*Ateles paniscus*) is found in Brazil and the three Guianas. In Suriname, it is rare or absent in accessible forests due to over-hunting (Ouboter, 2000) and this holds true for the rest of the Guianas (Table 9). It can still be commonly found in areas with little human population (Emmons, 1997). The black spider monkey is vulnerable to hunting pressure, as it has a slow reproductive rate (Emmons, 1997). The red howler monkey (*Alouatta seniculus*) is widely distributed across northern South America, but intensively hunted for its meat in many areas. In the Upper Amazon Basin, the red howler is rare or non-existent near human settlements (Table 9). In Suriname, the species is traded as bush meat, but is still found in most forested areas (Ouboter, 2000; 2001).
6.2.10 Bush meat

Bush meat is a very important source of protein for the local communities in Suriname's interior. However, increasing populations are putting pressure on bush meat species around villages (Duplaix, 2001; Ouboter, 2001). Commercial bush meat trade is a burgeoning industry in Suriname with professional hunters working year-round in the interior (Duplaix, 2001; Ouboter, 2001). Unfortunately, there are no figures available on this trade in Suriname (Ouboter, 2001). Bush meat can regularly be found on local markets in Paramaribo and most bush meat is consumed in Paramaribo and Saint Laurent du Maroni, French Guiana (De Dijn, pers. comm.). Wild meat is also sold on markets in the border towns of Orealla and Springlands (Guyana) (Duplaix, pers. comm.). Over the last five years, a lot of bush meat appears to be collected in the interior and sold to mining and logging crews, to Brazilians in East Suriname and Asian immigrants in West Suriname (De Dijn, pers. comm.). Wayana Indians are selling bush meat to small-scale gold miners along the Lawa River and to restaurants in Maripasoula (French Guiana) (Boven, pers. comm.).

Commercial hunting is putting pressure on game species in the more accessible areas (Duplaix, 2001; Ouboter, 2001). Control on hunting in Suriname is lax due to the scarcity of game wardens and adequate equipment, leaving this trade virtually unregulated (Ouboter, 2001). In the Apura–Wasabo region of Suriname, there have been difficulties reported in finding bush meat (Duplaix, 2001). Ouboter (2001) observed that the most popular hunted animals have become very rare in accessible areas. The main bush meat species include peccaries (Tayassu spp.), tapir (Tapirus terrestris), agouti (Dasyprocta spp.), paca (Agouti paca), tortoises (Geochelone spp) and Iguana iguana (Table 9). Tapir is now very rare in the Apura area where it was common 25 years ago (Duplaix, pers. comm.). Paca is being bred by a couple of exporters in Suriname (Ouboter, 2001). Agouti paca was once deemed to be too difficult to domesticate, as pacas in the wild are monogamous, territorial and have a low reproductive rate, and rarely breed in captivity. Fortunately, a methodology for domesticating paca has been developed, involving the shifting pacas into polygynous groups. This technique requires high capital investment and has to be carried out on a large scale to make it economically viable (Smythe, 1991).

The red-rumped agouti (Dasyprocta leporina) is widespread and usually very common throughout South America. The species is found in most forest types, including disturbed forest. The species is hunted for its meat across its range (Emmons, 1997). Both agouti species (D. leporina and D. cristata) suffer from high hunting pressure in the three Guianas (Duplaix, 2001). Only the Suriname agouti (D. cristata), restricted to Suriname, is listed on the IUCN Red List as Data Deficient (IUCN, 2002) and none of the aforementioned Dasyprocta spp. are listed on the CITES Appendices. In Suriname, however, declines in Dasyprocta spp. have been reported by exporters (Ouboter, 2001). Suriname and Guyana both have voluntary export quotas for agouti. Guyana has a quota of 350 for D. agouti (= D. leporina) and Suriname a quota of 250 for D. leporina and 200 for D. cristata. This export is never fully realised; Suriname exported only 25% of its quota to the US in 2000 (Duplaix, 2001).

Game birds, such as black curassow (Crax alector), marai (Penelope marail) and kamikami (Psophia crepitans) also play an important role in the national bush meat trade. Export is negligible for the game birds, except for the kamikami of which 20 birds are exported annually to the Netherlands (Ouboter, 2001). Ouboter (2001) recommends that the birds with quotas but no realised export (e.g., C. alector and P. marail) be removed from Suriname’s export list. These hunted birds are all but wiped out from easily accessible areas (Ouboter, 2001).

The greater tinamou (Tinamus major) and P. crepitans are important protein sources in the interior. P. crepitans is sometimes kept by rural communities (Ouboter, 2001). Breeding programmes could be encouraged for those communities that eat these game birds, to boost protein supply in the interior (Ouboter, 2001). Hunting pressure on these species is considered to be high in all of the Guianas (Table 9).

In the Bigi Pan region, Matapica area and around Weg-Naar-Zee, hunters are shooting hundreds of shorebirds every year for the local trade (Ottema and Spaans, pers. comm.). Most shorebirds are legally protected in Suriname. In spite of this, several species are declining rapidly due to hunting for food, such as the jabiru (Jabiru mycteria), wood stork (Mycteria americana), and the roseate spoonbill (Platalea ajaja) (Ottema and Spaans, pers. comm.). The muscovy duck (Cairina moschata) used to be common in the coastal swamplands, but has become rare in Suriname over the last 10 to 20 years (Ouboter, 2001). This duck is listed on CITES Appendix II, although no export was registered between 1997 and 2000 (Ouboter, 2001). Hunting is permitted during the open season.

6.2.11 Scarlet ibis

The bright feathers of the scarlet ibis (Eudocimus ruber) are fashioned into decorative flowers in French Guiana. The birds are hunted along the Suriname coast smuggled into French Guiana (Teunissen, ... 1998). Even though such handicrafts are banned from trade, they might accidentally be offered to tourists as souvenirs.

6.2.12 Freshwater fish

Members of the armoured catfish family (Callichthyidae) are the most important commercial freshwater species (Ouboter, 2001). Official export figures mention only small amounts (62 individuals in 1999), but frozen armoured catfish (locally known as kwikwi) are frequently found in Surinamese shops in the Netherlands. There are indications that species of the genus Hoplosternum and...
6.3 Plant Products

6.3.1 Podosiri

Podosiri is the Surinamese term for acai, the fruit juice of the pina palm (Euterpe oleracea). Podosiri is probably the most important vegetal NTFP in the country. The palm is very abundant in the coastal swamps, forming almost pure stands, while in the interior the species is restricted to swampy places along creeks on sandy soil (Wessels-Boer, 1965). Throughout Suriname, the entire fruits and the processed podosiri drink are commercialised. Maroons and Amerindians harvest the fruits by climbing the palms and cutting the infructescences. Cars pass several times per week along the Periaka-Moengo road to collect full bags of ripe fruits, which are processed and sold in Paramaribo. Recently, a small factory in the capital started bottling podosiri (de Dijn, pers. comm.). Ndjuka women used to trade podosiri juice on the border with French Guiana (Boven, pers. comm.). In some places, people also cultivate E. oleracea for its fruits. As long as people climb the trees to collect the fruit instead of cutting the stems, podosiri production should be sustainable. Remarkably, palm heart is not a commercial product in Suriname. According to Playfair (pers. comm.), some palm heart from the coastal and riverine swamps was exported, but no information about processing factories was available.

6.3.2 Other forest fruits

Along the road to Bigi Poika (Zanderij), there exists a lively market in the palm fruits maripa (Maximiliana maripa) and awara (Astrocaryum vulgare). Both palms are said to occur in the wild in Suriname (Wessels-Boer, 1965), but they are increasingly cultivated for their fruits, which are consumed fresh and made into drinks and cooking oil. Another palm fruit that is commercialised in the Surinamese interior is kumbu (Oenocarpus bataua), of which the fruits are made into a similar drink. The yellow-orange mopé fruits (Spondias mombin) are exclusively harvested from the wild. They are made into a popular juice, which is widely sold. A small shop in the international airport sells many types of wild fruits and nuts to Surinamese travelling to the Netherlands. Some of these species are NTFPs, such as loki pods (Hymenaea courbaril) and sawarinoto (Caryocar nuciferum).

6.3.3 Brazil nuts

In the Tirio village of Kwamalasamutu in Southern Suriname, the Amazon Conservation Team (ACT) is stimulating the harvest and marketing of Brazil nuts. This region probably represents the northern boundary of Bertholletia excelsa (Mori and Prance, 1990), although smaller clusters are found more north in Kabalebo and Apura (Teunissen, pers. comm.). ACT assisted the Tirios to create a detailed map of their traditional lands, including the location of Brazil nut groves (ACT, 2000; Boven, 2001). A sustainable exploitation plan for Brazil nuts will be developed, as well as an inventory of other NTFPs with market potential (ACT, 2000). In March 2001, ACT has sold four tonnes of Brazil nuts from Kwamalasamutu on the Paramaribo market (Teunissen, pers. comm.). Since the village can only be reached by plane, it remains to be seen if the nuts can compete with cheaper nuts from Brazil. Nonetheless, as a result of the mapping process, the Tirio seem to have fortified their control over gold miners and started other initiatives to preserve their territory and their culture (www.amazonteam.com).

6.3.4 Crafts

The Surinamese Maroons are renowned for their decorative woodcarvings. For combs, spoons and paddles, the plank roots of the tall parelhout tree (Aspidosperma spp.) are used. Mature trees often have a deeply fluted trunk, so cutting pieces out of the buttress roots will not seriously affect the tree (van Andel, 2000). However, the cedar (Cedrela odorata) is more often used for wood carvings, and this requires cutting of the tree (Teunissen, pers. comm.). These products are actually not considered as NTFPs, as they are side products of commercial timber harvesting. The carvings are sold within interior villages and in Paramaribo craft stores. Amerindian crafts based on several NTFPs find a growing market in Suriname. Wayana Indians sell their crafts on the French Guianese border, where they find their way to Cayenne and Paris. In Matta, hammocks from the fibre of Mauritia flexuosa are woven for the Paramaribo market (Boven, pers. comm.). An increase in tourism in Suriname will certainly have a positive influence on the craft trade.

6.3.5 Medicinal plants

The presence of many different ethnic groups in Suriname corresponds to a wealth of ethnobotanical knowledge. Several attempts have been made to document this knowledge (Stahel, 1944; Ostendorf, 1962; Heyde, 1995; May, 1982, Raphoendanand, 1994), but only few of these publications have verified the scientific names of the local plant names by collecting botanical specimens (Stahel, 1944; Raphoendanand, 1994; van ’t Klooster, in press). Suriname exports substantial volumes of fresh, dried, and frozen medicinal plants to the Netherlands, where they seem to play a key role in the health care of Surinamese immigrants.
A local NGO named Stichting Panda is developing a small ecotourism project on Tonka Island in the Brokopondo Lake. The project is led by the Saramaccan field botanist Frits van Troon and serves as a cultural centre where people can transmit information on herbal healing, handicrafts, and traditional forest management. This project received financial assistance from the Tropical Rainforest Programme of the NC-IUCN. To reward his contribution to numerous ecological and (ethno-) botanical inventories of international rainforest researchers, van Troon received the Order of the Golden Ark from Prince Bernhard of the Netherlands in March 2001. A book about the medicinal lianas of Suriname by van Troon, van Roosmalen and Hoffman still awaits publishing (www.amazon.team.org).

6.3.6 Bioprospecting:
In 1993, the International Cooperative Biodiversity Group (ICBG) launched a five-year bioprospecting project, in which several US-based research institutes and a pharmaceutical company (Bristol Myers Squibb, New York) cooperate with a local pharmaceutical company (Bedrijfs Geneesmiddelen Voorziening, Suriname), the National Herbarium of Suriname (BBS), Conservation International and a local NGO called Forest People of Suriname (Guérin et al., 1998). This ethnobotany-based initiative identifies and screens tropical plants for potential medicinal uses on international scale. Anticipated results of the initiative are economic alternatives to deforestation and conservation of biodiversity, financial benefits from any drug discoveries to Suriname and its native peoples, and technology transfer from the US to the conservation-based pharmaceutical industry in Suriname. In 1998, the project received funding from the National Institute of Health (US) for an additional five years.

Sales-based royalty payments are being deposited in a special ‘Forest Peoples Fund’, controlled by the leaders of the country’s traditional peoples. The Fund is used to promote sustainable forest use and conservation, and 50% of the royalties returned to Suriname from the future sales of any new identified drug will be disbursed through the Fund (Sizer, 1996). Traditional healers and local parataxonomists also receive payment for their services and training in collection and identification techniques. The staff of the National Herbarium of Suriname received extra training in herbarium curation and botanical research (www.mobot.org/mobot/research/appliedresearch/icbgsuriname.shtml). The ICBG programme requires both near and long-term benefits flow back to the collaborating communities, regardless of whether ethnomedicinal knowledge is utilised in the research or not. The pharmaceutical company involved in this project receives encoded samples without further botanical information.

Meanwhile, medicinal plant uses are stored in a database by Conservation International. No other institution receives information regarding the identity, description, locality and traditional uses of these plants. According to Guérin et al. (1998), this method ensures that no company can look for samples elsewhere and that Suriname and its local people are compensated for their contribution. The Initiative is focused on identifying new medicines from Surinamese plants with anti-HIV and anti-cancer properties. Several new compounds have already been found and published (Gunatilaka et al., 2001, www.mobot.org/mobot/research/appliedresearch/icbgdiscoveries.html). It is hoped that in a later stage of the project, the collected information is made available to a wider public. In this way, scientists, NGOs and local communities from outside the project area can also learn from this bioprospecting experience.

6.3.7 Shaman’s Apprentice Programme
In the Tirio village of Kwamalasamutu, the Amazon Conservation Team is promoting an integrated approach to health care, by using the best of both western medicine and traditional practices. The Tirios have built a ‘Shaman’s Apprentice
Clinic, run by three shamans and six apprentices, with collaboration of the Medical Mission, the agency responsible for the provision of primary health care in the interior of Suriname (ACT, 2000; Boven, 2001). By creating incentives for young members of Suriname’s indigenous societies to learn the traditional uses of plants from their elder medicine men, the programme helps to keep critical indigenous knowledge within the tribes. Tribal elders, encouraged and assisted by ACT, are now teaching youngsters everything from traditional healing and medicinal plants to legends, music and handicrafts. The programme started in Kwamalasamutu and recently included the village of Pelelepetu. Currently there are six shamans, as well as 28 male and female apprentices involved (www.amazonteam.org). The project was selected as one of the Best Practices in the field of indigenous knowledge by Nuffic and UNESCO (Boven, pers. comm.).

6.4 The future of commercial NTFPs in Suriname

To fully understand their contribution to the national economy, there is a great need for detailed research on commercial NTFPs in Suriname. At this moment, there are no quantitative data available on vegetal NTFPs traded in the country. Future studies on NTFPs should make use of the botanical collections and knowledge present in the National Herbarium of Suriname. New research opportunities may arise when Tropenbos-International starts a programme in Suriname. According to Sizer and Rice (1995), promoting NTFPs from well-managed forests could pay off handsomely for the Surinamese government and the public. The examples of commercial NTFPs in other Guiana Shield countries portrayed in this report may provide some ideas for new projects in Suriname.

Quantitative research is also needed on the rapidly growing bush meat trade. The wildlife export from Suriname is relatively well monitored, but revenues have declined and could drop further the near future due to changing attitudes toward keeping wild animals, new regulations and captive breeding in importing countries. Suriname will have to look for alternatives to exporting wild animals or use means to increase values of the species traded (lower numbers exported while increase prices), but this must be done in cooperation with Guyana. The decrease in CITES exports was coupled with an increase in non-CITES animal exports in 2000. Exporters would like to see more non-CITES species added to the quota list, but the status of new animals should be investigated (at species level) before any new quotas are set (Ouboter, 2001).

Research on the population status of several CITES and non-CITES animals is needed, especially for those species whose trade is regulated under CITES, such as Dendrobates tinctorius and the important Psittacines (e.g., Ara chloropterus and Aratinga aurea). Another priority is to monitor the scale of the songbird trade. Ranching programmes and possibly captive breeding should be encouraged, as this will take the pressure of wild populations. These types of initiatives are uncommon in Suriname (Ouboter, 2001). The most often quoted reason for not setting up these enterprises is the effort and capital required. Target groups are psittacines, song birds and certain bush meat species. Innovative parrot ranching projects, such as the Ele Project in Argentina (see Discussion), could open the door to the US market by meeting the criteria of the 1992 Wild Bird Conservation Act. It must be ensured that these projects benefit local trappers in the interior. Insects are also a product with potential; there is now one active butterfly farm in Lelydorp exporting of live pupae to the US and UK (de Dijn, pers. comm.).

Suriname harbours many native plants with a great ornamental potential, such as orchids, bromeliads, Strelitziaceae and various species of Heliconia. If more effort would be devoted to the selection and hybridisation of wild species, Suriname could profit from the growing demand for exotic plants in Europe and the US (DeFilipps, 1992). To expand the legal trade in orchids from Suriname, illustrated manuals are needed to identify the species and distinguish cultivated orchids from common or rare wild species (Ouboter, 2001). At present, customs officials have trouble identifying non-flowering orchids and smuggling of orchids is known to occur (Ouboter, 2001). Collection of data on the limited orchid exports would be useful (Ouboter, 2001).
VENEZUELA

7.1 Commercial NTFP extraction

The Venezuelan Guiana Shield, often referred to as the Venezuelan Guayana, covers half of the national territory, includes the States Delta Amacuro, Bolívar and Amazonas (see Map). Located south of the Orinoco River, the Venezuelan Guayana comprises the largest remaining block of intact forests in the country, harbouring most of the nation’s rich biodiversity and indigenous peoples (Bevilacqua et al., 2002). Unfortunately, these forests are at risk from logging, mining, and encroachment of colonist farmers and ranchers. The southern half of Venezuela now has one of the highest rates of deforestation in the Neotropics (Kambel and MacKay, 1999). The Guayana region is characterised by a diverse topographical landscape, from extensive swamps at sea level to unique tepuyes, tabletop mountains nearly 3,000 m high, which contain many plants and animals found nowhere else in the world. Savannahs dominate the south-east of the country near the borders with Brazil and Guyana (Bevilacqua et al., 2002).

More than 85% of Venezuela’s 24 million inhabitants live in the urban areas north of the Orinoco River. The sparsely populated Guayana region is inhabited by approximately 1 million people, of which some 300,000 are indigenous peoples. There are some 28 different ethnic groups, such as the Warao, Yekuana, Piaroa, Pemon, Yanomami, and Guajibo Indians (Kambel and MacKay, 1999). Approximately 30% of the country’s forests are protected; the largest of these lay in the Guayana region. The legal status for half of the conservation areas remains unclear, because of conflicting objectives and uncertain boundaries published in official documents (Bevilacqua et al., 2002).

Ethnobotanical studies show that the indigenous groups living in the Venezuelan Guayana use a wide variety of NTFPs (Anderson, 1978; Wilbert, 1986; Prance et al., 1987; Hernandez et al., 1994; Melyn and Bell, 1996). The majority of NTFPs is used for subsistence only. No quantitative accounts exist for the national market for NTFPs, although Amerindians often sell seje palm oil, wild honey, crafts, and smoked bush meat to buy ammunition and other manufactured goods (Bevilacqua et al., 2002). NTFPs from the Venezuelan Guayana are marketed in the towns of Tucupita, Ciudad Guayana, and Ciudad Bolívar (National Academy of Sciences, 1975; Paoletti, 1999). The total export value of Venezuelan NTFPs was estimated at US$ 5 million in 1998 (Bevilacqua et al., 2002). Information on extracted volumes is generally lacking, although some government sectors appear to be interested in stimulating the commercialisation of NTFPs (Altuve et al.,
There are also some illegal exports to Trinidad (Ochoa, pers. comm.). There have been reports of over-exploitation of parrots in Venezuela and ‘rampant illegal export’ from Venezuela to Guyana (Kratter, 1998). This smuggling route was extensively used during the 1980s, but reduced export quotas in Guyana are now making wildlife transport from Venezuela less profitable. The Warao Indians of the Orinoco delta are known to poach fauna to sell to both Venezuelans and non-Venezuelan traders (GEF Project Brief, 1999). The trade in live animals is not considered to be a problem in the Caura region of Venezuela (Ochoa, pers. comm.).

7.2 Wildlife

7.2.1 Commercial wildlife harvesting

Subsistence use of wildlife is very important in the Venezuelan Guayana (Bevilacqua et al., 2002). Commercial extraction does occur, but on a smaller scale than in Guyana and Suriname. Commercial fishing (for food and the aquarium fish trade) is particularly important in the state of Amazonas, whilst commercial extraction of caiman (Caiman crocodile) for the skin trade and capybara (Hydrochoerus hydrochaeris) for bush meat takes place in the Llanos region. Despite being illegal, wild meat can be found on markets and in restaurants. Live animals for the pet trade are traded illegally with neighbouring Guyana and occasionally with Trinidad. Since much of the trade is illicit, no information on traded volumes is recorded, so few quantitative data are available on the commercial wildlife trade in the Venezuelan Guayana (Altuve et al., 1999; Bevilacqua et al., 2002).

7.2.2 Wildlife regulations and management

Export of wildlife from Venezuela is prohibited by law. The legislation applying to wildlife management in Venezuela is the Wildlife Protection Act (1970), the Environmental Crime Law (1992) and various resolutions (1979) that protect certain species. Hunting is allowed with a government permit in certain cases, but the trade in bush meat is not permitted. Commercial fishing is managed and regulated by the Ministry of Agriculture. The National Guard assists the Ministry of Environment and Natural Resources (MARN), the National Parks Service (INPARQUES) and Ministry of Agriculture with enforcing environmental laws, including the control of illegal trafficking of flora and fauna (Ochoa, pers. comm.). Recently, the trade was legalised for spectacled caiman and capybara. Governmental institutions, such as the Venezuelan Wildlife Service (PROFAUNA), are focused mainly on northern Venezuela and have limited or no presence in the Guayana region (Ochoa, pers. comm.).

7.2.3 Illegal trade

Evidence exists of wildlife trafficking into Guyana, as this country legally exports live animals. There are reports of extensive collection of parrots, macaws, toucans and other species for the pet trade in the Venezuelan Guayana. A large proportion of these animals are transported illegally across the Orinoco delta into North-West Guyana (Ojasti, 1995; GEF Project Brief, 1999; Bevilacqua et al., 2002).

7.2.4 Commercial freshwater fish

At least 40 species of fish are marketed in the Venezuelan Guayana. Several areas along the Orinoco are important in terms of commercial fish production: near Cabruta and Caicara, the areas surrounding Las Majadas, near Ciudad Bolivar and the delta Amacuro near Tucupita (Novoa, 1982). The Caura River is also important in terms of commercial fishing. The principal fish market is Puerto Ayacucho. Some of the main commercial species are the large catfishes (Brachyplatystoma spp., Pseudoplatystoma fasciatum, P. tigrinum, Goslynea platynema, Phractocephalus hemiolopterus), as well as the tambaqui (Colossoma macropomum), Piaractus brachypomum and trahira (Hoplias malabaricus). Peacock bass (Cichla arguvena), which is restricted to the Essequibo Basin, is primarily harvested along the Cuyuni River in Venezuela. Based on a recent survey, fish diversity and abundance has declined in the Lower Caura River (Chernoff, pers. comm.). People from Marida-Trincheras travel up river with large nets and ice chests to fish in the periphery of indigenous territories. Amerindian communities have detected a reduction in populations of the main consumption fish (Ochoa, pers. comm.). Destructive fishing techniques, such as trawling and unselective equipment causing high levels of by-catch, threaten fish diversity in the Orinoco delta (GEF Project Brief, 1999). Colombian fishermen fish across the border in Venezuela and sell their catch in their own country (Mojica and Lasso, pers. comm.).

7.2.5 Ornamental Fish

There is a significant export of ornamental fish from Venezuela. The Ministry of Agriculture and PROFAUNA are responsible for the regulation of the trade and the licensing of exporters. The Ministry of Agriculture has maintained records of fish production since 1990. Fish collection increased from less than 400,000 individuals in 1988 to almost 2 million in 1992, although these figures are questionable and probably represent an underestimate. The total revenue of aquarium fish exported from Amazonas State in 1989 was over 5 million bolivares (~ US$150,000) (Royero, 1993). Important areas for the collection of aquarium fish in the Venezuelan Guayana are the Orinoco River Basin around Puerto Ayacucho and the Caicara del Orinoco area. The Puerto Ayacucho area is the most important area in Venezuela in terms of numbers and volumes of traded species. In 1988, approximately 60 species were harvested, which made up 82% of
Bush meat satisfies most of the protein needs of traditional indigenous communities and forms an important part of the diet of small-scale farmers living in the Venezuelan Guayana (Bevilacqua et al., 2002). The most commonly hunted species are the tapir, white-lipped peccary, large rodents, capuchin monkeys, cracid birds and armadillos (Bevilacqua et al., 2002). In the Delta Amacuro area, local hunting methods can be quite destructive, such as tree felling and setting forest fires (GEF Project Brief, 1999). Subsistence hunting, the bush meat trade and forest conversion due to shifting cultivation, logging, and mining are the primary activities threatening the wildlife in the Venezuelan Guayana (Bevilacqua et al., 2002). Bush meat can be found on the markets in cities (Puerto Ayacucho, Ciudad Bolívar, Ciudad Guayana and Tucupita) and smaller (mining) towns (Puerto Paez, El Callao, Tumeremo Guasipati, Upata, Caicara, Trincheras and Maupa) (see Map). Despite being illegal, wild meat can be found in restaurants (Ochoa, pers. comm.), Warao Indians poach bush meat for the Mabaruma market in north-west Guayana (van Andel, 2000). The absence of guards and governmental institutions in many areas is the reason for the lax control of illegal hunting (Ochoa, pers. comm.).

Some large mammals subject to high hunting pressure, such as the giant armadillo (Priodontes maximus), tapir (Tapirus terrestris) and the capybara (Hydrochaeris hydrochaeris), are becoming scarce in the Guayana region (Bevilacqua et al., 2002). The giant armadillo, widespread in South America, is hunted for food, medicine and handicrafts. It is considered at greatest risk for extinction in the near future in the Venezuelan Guayana (Bevilacqua et al., 2002). In many parts of its range, the giant armadillo has been wiped out due to hunting for its meat, especially in savannah areas and near human settlements (Emmons, 1997). The species is considered Endangered (A1cd) at the national and international levels (Rodríguez and Rojas-Suárez, 1999; IUCN, 2002) and appears on the CITES Appendix I. The giant anteater (Myrmecophaga tridactyla) has also been eliminated from parts of its range, as it is killed for its meat and skin (Emmons, 1997). The giant anteater is Vulnerable (A1cd) on the IUCN Red List and the Venezuelan Red List (IUCN, 2002; Rodríguez and Rojas-Suárez, 1999). It appears on CITES Appendix II.

Famous for being the world’s largest rodent, the capybara (Hydrochaeris hydrochaeris) is extremely widespread in Latin America and can be locally common. They are always found near water and prefer more open habitats, particularly seasonally flooded areas such as the Llanos (Emmons, 1997). The capybara is extensively hunted for its meat across the Guiana Shield and can be scarce in populated areas. The species is subject to high hunting pressure in the Venezuelan Guayana and are the least abundant in this part of the country (Bevilacqua et al., 2002). Venezuela and Colombia commercially trade capybara on a large scale on urban markets, as there is high demand for salted capybara.
In the Caura watershed region, Creole people are entering into indigenous territory, clearing out the nests of the terecay (*P. unifilis*) and killing adults for food (Ochoa, pers. comm.). There is a project supported by the Wildlife Conservation Society, which is working with the indigenous people to promote the restoration of the *P. unifilis* population in the Caura Watershed area (Ochoa, pers. comm.). *P. unifilis* is considered to be not threatened, but the chimpire (*P. ery throcephala*) is listed as Near Threatened for Venezuela (Rodríguez and Rojas-Suárez, 1999). All three *Podocnemis* species are listed on CITES Appendix II and the EC has restricted import of wild *P. erythrocephala* from Venezuela and Colombia.

### 7.2.8 Caiman skins

Extensive work has been done in Venezuela on the sustainable management of the spectacled caiman (*Caiman crocodilus*). Since 1983, Venezuela has carried out the largest scale-cropping programme for any crocodilian, centred on controlled culling by private landowners, mainly in the Llanos region. A quota and permit system was set up allowing the ranchers to take up to 20% of the adult males longer than 180 cm every year (Ross, 1998). ... based on population studies showing that only 3% of the individuals in this region are harvestable animals (Ross, 1998).

### 7.2.9 Psittacines

As mentioned previously, there is evidence of illegal trade of birds, mainly of the parrot family, from the Venezuelan Guayana across the Orinoco delta into Guyana (Ojasti, 1995, Bevilacqua et al., 2002). Psittacines are being transported from as far as Puerto Ayacucho to Guyana (Rojas, pers. comm.). Several species were mentioned specifically: the blue and yellow macaw (*Ara ararauna*), the yellow crowned parrot (*Amazona ochrocephala*), the orange winged parrot (*Amazona amazonica*), the blue-headed parrot (*Pionus menstruus*) and the black-headed parrot (*Pionites melanocephala*). Of these species, only the blue and yellow macaw ranks as Near Threatened on the Venezuelan Red List (Rodríguez and Rojas-Suárez, 1999).
In the Delta Amacuro, Warao Indians trade wild birds, particularly the larger parrots. Capture figures ranging from 15,000 to 60,000 birds were mentioned (GEF Project Brief, 1999). There are reports that destructive harvesting methods were being used, such as tree felling to obtain nestlings (GEF Project Brief, 1999). Several problems with parrot conservation were identified in Venezuela, such as a lack of long-term monitoring of populations, harvesting and trade (domestic and international), weak enforcement of legislation regulating bird trade, legal loopholes allowing for domestic ownership (but not trade for certain threatened species), nesting sites having open access, lack of adaptive management skills and, finally, a pricing system which does not favour "sustainably produced" nestlings (GEF Project Brief, 1999).

PROFAUNA executed a research project in which they collected crucial preliminary data on life cycles and habitat requirements of parrots and determined sustainable use ratios for the Monagas region of Venezuela (PROFAUNA, 1998, 1999). As a result of this research, Venezuela has now one legal parrot export project operated by Warao Indians and based on sustainable harvest (Ochoa, pers. comm.). The United Nations Development Programme (UNDP) and the Global Environment Facility (GEF) have funded a nine-year project in the Orinoco Delta with components focusing on community-based sustainable use management models and producing a long-term strategy to control the trade in wild birds, including census taking, an assessment of demand and the development of a conservation plan with Waraos and scientists (GEF Project Brief, 1999).

7.2.10 Otters
The giant otter (*Pteronura brasiliensis*) is found in and along rivers and oxbow lakes throughout the Guiana Shield, from the eastern Andes in Colombia, southern Venezuela, the Guianas, Brazil and south to northern Argentina (Emmons, 1997). They feed primarily on large amounts of fish and can be quite common where there is little disturbance. Giant otter populations were hit very hard by the international demand for their fur. Intense hunting nearly extirpated giant otter populations in vast areas of the Orinoco and Amazon Basins. In Venezuela, severe hunting pressure was exerted on the *P. brasiliensis* in the Caura and Nichare Rivers. The skin trade no longer exists and the giant otter is protected by national legislation and its listing on CITES Appendix I. There are indications that populations are improving, since this measure has been taken. Unfortunately, the giant otter is extremely sensitive to disturbance, including ecotourism. Historically, hunting was the main threat, but currently the species is threatened by increased human colonisation (IUCN, 2002). Otters compete with humans for fish, but also suffer from mercury contamination by gold mining activities. This otter is still considered Endangered (A1cde) on the IUCN Red List. WWF-Guianas has set up a three-year giant otter conservation programme for the three Guianas.

7.2.1 Palm heart

The Orinoco Delta is characterised by large tracts of permanently flooded swamp forests with huge amounts of *Euterpe oleracea* (Huber, 1995). Palm heart of *Euterpe oleracea* is the most important commercial NTFP of Venezuela. Between 1997 and 2001, five nationally owned companies were harvesting palm heart on 44,000 ha of concessions allocated by the Ministry of Environment (Stauffer, 1999; MARN, 1999). At present, there are only three companies producing palm heart in the Delta Amacuro State (Catalán, pers. comm.). National production figures for palm heart are all but clear. According to MARN (1999) Venezuela exported almost 2 million palm hearts in 1998, with an approximate value of US$ 99,000. Catalán (pers. comm.) mentions figures of 18 million palm hearts harvested between 1997 and 2001, resulting in an export value of US$ 4.8 million. The product is exported to Europe and the US. No research has been done on the impact of current extraction on the regeneration of *E. oleracea*, nor on the plant and animal species that depend on this species for their survival (Bevilacqua et al., 2002). There exists an urgent need for sustainability studies like those carried out in Guyana (van Andel et al., 1998; Peña-Claros and Zuidema, 2001) and Brazil (Anderson, 1988; Anderson and Jardim, 1989; Pollak et al., 1995).

Indications of unsustainable palm heart harvesting were a motive for the World Bank to fund a project that aims at the conservation of biological diversity in the Orinoco Delta Biosphere Reserve and Lower Orinoco River Basin (GEF project brief, 1999). Demonstration projects are set up to assess the impact of palm heart harvesting and to integrate conservation aspects into the extraction methods. Together with local Warao collectors, producers and the government, a plan is set up to reduce the impact of palm heart extraction on the regional biodiversity (GEF project brief, 1999). None of the available references on palm heart harvesting mention the marketing of *Euterpe* fruit juice.
7.3.2 Moriche
The moriche palm (Mauritia flexuosa), is considered the most important palm for both indigenous and non-indigenous peoples in the Venezuelan Guayana (Ponce et al., 2000). People use the roots, leaves, shoots, fruits, seeds, stem, starch and even the larvae of a beetle feeding on the rotten palm trunks for food, medicine, handicrafts and house construction (Wilbert and Layrisse, 1980; Ponce et al., 2000). Mauritia flexuosa occurs in large quantities in the flooded swamps of the Orinoco Delta. These so-called ‘morichales’ play an important role in watershed protection and are essential for a wide variety of animals that feed on the fruits. Unfortunately, the palm is quite vulnerable to water pollution caused by the petro industry and commercial agriculture (Ponce et al., 2000). Palm swamps in the Guiana Shield also suffer from the indiscriminate burning of swamps in the dry season (Janssen, 1974; Teunissen, 1993; van Andel, 2000). Palms are felled or damaged for the trapping of parrots, the collection of fruits or shoots for craft fibres, used in the tourist industry. Moreover, morichales in Venezuela are drained for agriculture or drinking water (Kahn and de Granville, 1992; Rodriguez, 1999b; Ponce et al., 2000). In spite of the ecological and cultural importance of Mauritia swamps, little is known about their morphology, regeneration strategy and the actual condition of standing groves (Johnson, 1997; Ponce et al., 2000).

Notwithstanding its multiple uses, Ponce et al. (2000) still consider Mauritia flexuosa an underdeveloped NTFP. Although the fruit pulp is sold for about US$2 per kg in Puerto Ayacucho and Ciudad Bolivar, the palm could provide much greater economic benefits to Venezuela if it was harvested (Paolieli, 1999; Ponce et al., 2000). In the Peruvian Amazon, Mauritia fruit pulp is processed into juice, ice cream and fermented drinks, and contributes substantially to the local economy (Padoch, 1988). The yellow, fibrous mesocarp is rich in nutrients and the seed kernels yield a good quality oil (Balick, 1979). As long as harvesters climb the trees instead of felling the trunks, fruit collection can be done in a sustainable way (Peters et al., 1989b). The same accounts for fibre harvesting for the craft industry. Overall, more scientific information on regeneration patterns is needed to contribute to sustainable management (Clay and Clement, 1993). New markets should be developed for fruits and fibres: hammocks made from Mauritia fibre can be sold in Caracas for US$69, and the fruits also have a potential for pig food (Peters et al., 2000). At the same time, there is a need for community development projects such as the Mapire project (Flores, 1999; Rodriguez, 1999b), to create a greater awareness of the ecological and economic value of the morichales among local people and to stimulate their conservation and wise management.

7.3.3 Chiquechique
Fibres forming the leaf base of the chiquechique palm (Leopoldinia piaassa) were harvested intensively along the Rio Negro, the Casiquare and Upper Orinoco. Fibres were also sold in Colombian border towns (Putz, 1979). The broom factory in San Carlos de Rio Negro that processed these fibres closed down recently.

7.4 The future of commercial NTFPs in Venezuela
The overall chiquechique trade has decreased, most likely because of increasing guerrilla activity along the Colombian border. The extraction and trade now has moved north towards Puerto Ayacucho (Aymard, pers. comm.). Drinks are made from the fruits and the leaves are used to thatch roofs, which are extremely durable and can last up to 20 years. The impact of this extraction on the natural populations remains unknown (Stauffer, 1999). According to Johnson (1997), exploitation is probably sustainable, as long as trees are not damaged during harvesting. Fibre cutting is mostly done during the dry season, since swamps become impassable in the wet season.

7.3.4 Crafts
The aerial roots of the hemi-epiphyte mamure (Heteropsis spruceana) are used for baskety and furniture, in a similar way as the roots of Mauritia flexuosa in Guyana. The roots are harvested and traded along the Orinoco River (Berry, pers. comm.). Locally, Heteropsis roots are said to be in decline and threatened by over-exploitation (Bevilacqua et al., 2002). Crafts from Ischnosiphon obliquus, made by local communities in the Gran Sabana, are sold to local tourists or shipped to Caracas and Ciudad Guayana (Hernandez, pers. comm.). The species, traded in other parts of Venezuela as well, is said to be in fast decline (Bevilacqua et al., 2002). More attention should be given to sustainable harvesting techniques for Heteropsis and Ischnosiphon fibres. Local extinction of these plants can have detrimental effects on the economy of indigenous communities, as they not only market the crafts, but also use this basketry in the processing of their staple food cassava (Manihot esculenta).

7.3.5 Coumarin
The seeds of sarapia (Dipteryx odorata) are extracted in the north Caura region. The oil from the seeds (coumarin) is used in industrial flavouring and is processed in a factory in Upata. From there the coumarin is transported to Cuidad Guayana. The extraction seems to be sustainable, although no research has been conducted on this topic (Aymard and Rosales, pers. comm.).

7.4 The future of commercial NTFPs in Venezuela
According to Global Forest Watch, parts of the Venezuelan Guayana have been relatively well researched, while others, such as the Imataca Forest Reserve and Delta Amacuro State, have not. Data on the abundance, use, and economic value of NTFPs (including wildlife) are particularly lacking (Bevilacqua et al., 2002). Huber (2003) states that the commercialisation of NTFPs in the Venezuelan Guayana is handicapped by the poor infrastructure, since transport is by boat or small plane. Huber thinks that bioprospecting, ecotourism and scientific collection should be stimulated in the region, but strict rules are necessary to prevent environmental damage. NTFP commercialisation along the border with
Colombia is hampered by guerrilla activities; armed groups sometimes enter Venezuela to flee from the Colombian army.

Venezuela has been leading the way with long-term research on sustainable use and conservation of certain animal species (caimans, river turtles, capybaras and parrots). These projects can serve as an example to other parts of Venezuela and other Guiana Shield countries. Many active organisations (e.g., Fundación Polar, Fudeci, Provita, Acoana, Wildlife Conservation Society and PROFAUNA) are working on the sustainable extraction and conservation of NTFPs. According to Global Forest Watch, a significant proportion of NTFPs (including wildlife) are used by indigenous and local communities is threatened, indicating critical resources for traditional livelihoods could disappear, impoverishing the lives of local indigenous peoples (Bévilacqua et al., 2002). Over-population and increasing sedentary lifestyles of some indigenous communities represent a factor in the reduction of certain NTFPs around traditionally colonised areas (Ochoa, pers. comm.).

Some authors mention the potential commercial value of wild fruits from the Southern Venezuelan forests, such as Solanum sessiliflorum, S. stramoniifolium and Duguetia lepidota (Paoletti, 1999). Others promote the oil-producing palm fruits of Maximiliana maripa, Attalea butyracea, and Acrocomia aculeata (Johnson, 1997). Oil from the seeds of Jessenia bataua and Oenocarpus bacaba is harvested on a small scale in the Reserva Forestal Sipapo (Aymard, pers. comm.). Bévilacqua et al. (2002) mention that some medicinal plants have been evaluated in pharmaceutical tests to identify active agents with potential promise for Western medicine, but give no further details. The great horticultural potential of the Mount Roraima area was brought up by DeFilipps (1992). Local populations of the wild bromeliad Vriesia splendens seem to have more visual appeal in their bronze leaf-bands than the selected forms now in cultivation. Several species of rare and spectacular orchids from Mount Roraima are being cultivated and marketed by the Sociedade Orquidófila de Roraima (SORR) in Boa Vista, Brazil.

8.1 Lack of quantitative data on NTFPs

Calculating the actual harvested volumes and value of commercial NTFPs for the Guiana Shield countries is an arduous task. Production figures are often based on issued permits, not on the actual volumes extracted. Only legal export is registered; revenues generated from illegal export remain unknown. To avoid taxes, exporters declare their commodities often substantially lower than their actual values. The domestic market in NTFPs is in most cases not monitored at all. The provenance of NTFPs in export or production statistics is not always clear. Frequently, no distinction is made between species harvested from the wild and those harvested from plantations, agroforestry or, in the case of wildlife, from captive breeding (Richards 1993; Broekhoven, 1996; van Andel, 2000). The various references and national statistics used for this report often revealed different production data for the same NTFPs. Values and volumes presented in this report should thus be seen as estimations, which might differ from actual numbers, but at least make certain trends visible.

To obtain an accurate overview in production figures and monetary values of NTFPs, detailed field studies are required, in which products are followed along their chain of custody. Tracking a NTFP should therefore always be carried out in cooperation with local and international Herbaria and Zoological research institutes.

Sustainable extraction levels are only available for a limited number of animal species (Robinson and Redford, 1991a), açai (Anderson and Jardim, 1989) and palm heart (Strudwick, 1990). The lack of ecological information on growth rates and population recovery after harvest hampers the design of adequate harvest models for the great majority of NTFPs. The potential yield from wild species is frequently over-estimated (SCBD, 2001). If NTFPs are already being harvested and undisturbed populations are not available anymore, monitoring the harvest-
ing regime still provides useful information on the long-term impacts of extraction on the species (Nasi, 2001).

8.2 Patterns in NTFP commercialisation throughout the Guiana Shield

Many commercially interesting NTFPs occur throughout the Guiana Shield, but the scale of their harvest and marketing differs greatly from country to country. The marketing of a certain NTFP may be prohibited in one country, while it is a major export product in another country. For example, Guyana and Suriname are exporting large quantities of wildlife, and have established export quota for both CITES-listed and non-CITES animals. The export of these animals is generally prohibited in the other Guiana Shield countries.

Euterpe oleracea is occurring in harvestable quantities throughout the Guiana Shield, but there is no palm heart processing industry present in Suriname and French Guiana. The wages in French Guiana are probably too high to compete with neighbouring countries, but in Suriname the canning industry could provide a much needed source of income. The juice from Euterpe fruits is marketed throughout the Guiana Shield, except in Guyana and Venezuela. A large NTFP resource with good possibilities for sustainable harvest is thus left untouched because it lacks a domestic market. These countries should focus on the export market, not initially towards Europe and the US, but rather to the CARICOM countries or countries within the Guiana Shield.

Hemi-epiphytes of the genera Clusia and Heteropsis are also widespread throughout the Guiana Shield, but they are only extracted for the furniture industry in Guyana (van Andel, 2000; Hall et al., 2001) and on a small scale in Pará and Amapá (Whitehead and Godoy, 1991). An enormous potential for furniture production in the region thus remains unused. Workshops should be organised, in which Guyanese and Brazilian craftsmen could share their techniques with interested people in neighbouring countries. According to Whitehead and Godoy (1991), exploring the potential of exporting rattan substitutes to international markets could increase the income of poor rural citizens. Since standing forest is needed to supply these NTFPs, aerial root harvesting could protect host trees from logging, provided that reasonable prices are paid for these roots (Hoffman, 1997; van Andel, 2000).

International trade restrictions, such as the CITES Appendices and EU import restrictions, and national legislation have effectively contributed to the recovery of certain vulnerable species. The spotted cats, caimans and otters all experienced massive declines in the first half of the 20th Century. Ever since the international skin trade has been restricted, these species have shown signs of recovery. International trade limitations have also contributed to the development of captive breeding and ranching programmes. These can play a key role in reducing the impact of hunting on wild populations.

Bush meat is a region-wide NTFP, with commercial hunting on the increase in Guyana and Suriname. Demand for bush meat is growing with increasing human population in the remote interiors, along with increasing immigration for the mining and logging industries (Duplaix, 2001; Ouboter, 2001). There is a growing demand from the urban centres for wild meat and bush meat is served in urban restaurants in all parts of the Guiana Shield. This results in increased hunting pressure on the main commercial bush meat species across the Guiana Shield. Some of the most prized bush meat species are vulnerable to over-exploitation and are listed as threatened under the IUCN Threat Categories (e.g., tapir and giant armadillo) and many are listed on the CITES Appendices (see Appendix 1). Throughout the Guiana Shield, there is a low capacity for enforcement of the various laws and regulations for hunting and commercial use of wildlife.

Freshwater fish, particularly the large catfish, are an important food source across the Guiana Shield. The most important market for catfish appears to be Leticia (Colombia). Fish are also being transported from neighbouring Brazil and Venezuela for the Colombian market. Ornamental fish are commercially harvested across the Guiana Shield, with the exception of Suriname, for export to the US and Europe. Brazil is the largest exporter of aquarium fish (mainly cardinal tetra), followed by Colombia, Venezuela and Guyana. The present export probably represents only a small fraction of the diversity of ornamental fish species available in the Guiana Shield. All European importers interviewed by Grosman (2002) were interested in increasing their imports from the Guiana Shield region, in particular species of the Callichthyidae, Characidae, Cichlidae, Gasteropelecidae, Loricariidae and Poeciliidae families, and to a lesser extent Aplocheilidae and Lebiasinidae (Grosman, 2002). However, approximately 90% of internationally traded ornamental fish comes from fish farms in the Far East and Florida. To maintain the aquarium fish trade from the Guiana Shield, it is therefore important to diversify into those high-value species that are not easily bred in captivity (Watson, 2000b).

Brazil is by far the largest producer of commercial NTFPs. Although the trade in some NTFPs may have declined over the last decades, there is still a large market for other products. The total export value of NTFPs from Brazil varied between US$ 10 million in 1986 and US$ 53 million in 1990 (Richards, 1993; Broekhoven, 1996). Although these figures must be regarded as tentative estimations, they are certainly higher than the US$ 4 million of export revenues for NTFPs earned by Venezuela (in 1998), Colombia (1990) and Guyana (1996). Exports of NTFPs from the Guiana Shield still remain very small compared to those of other commodities such as oil, timber, rice and sugar.
NTFPs are principally commercialised on the domestic market, and still represent a ‘hidden harvest’. However, they certainly contribute to the national economy and provide an income for a large number of forest inhabitants, among which many indigenous people. Many NTFPs that used to be extracted commercially throughout the Guiana Shield (e.g., balata, rosewood oil, cumaru, copalba bal-sam), but were not economically viable in the long run, are still marketed in Brazil today. This country has the advantage of having large cities surrounded by sheer endless forests (e.g., Manaus, Belém), a relatively good infrastructure and large supplies of cheap labour willing to engage in collection activities. Furthermore, Brazil is one of the few countries in the world with an active government policy on subsidising NTFP extraction and establishing extractive reserves. Brazilian institutions also have ample experience with providing technical support to community-based NTFP enterprises (Allegretti and Schwartzman, 1986).

8.3 Sustainable extraction of NTFPs

8.3.1 Ecological sustainability

The sustainable extraction of NTFPs depends on ecological sustainability, economic feasibility and socio-political acceptability (Ros-Tonen et al., 1995). Extraction is generally considered ecologically sustainable if it has no long-term deleterious effect on the regeneration of the harvested population, and when the yield remains more or less constant throughout the years (Strudwick, 1990; Hall and Bawa, 1993; Pollak et al., 1995). The ecological impact of extraction depends strongly on the nature of the harvested product. Collecting leaves, eggs, honey, fruits or seeds dearly has a smaller impact than taking the bark, roots, trunk or the entire plant or animal (Boot, 1997). Harvesting pregnant females (e.g., river turtles that come ashore to lay their eggs) obviously has a negative impact on the survival of a population. On the other hand, a decreased competition due to a lessened density of individuals can sometimes stimulate the population growth. In that case, reproductive rates can be higher in exploited areas than in undisturbed areas (Broekhoven, 1996). In general, extraction should be in balance with the reproductive rate of a species; harvest should not exceed production (Robinson and Bennett, 2000). The species most vulnerable to over-exploitation are those which are in high demand, slow to reach maturity, have specific habitat requirements and a limited distribution (Cunningham, 1997). Therefore, fast reproducing species with general habitat preferences (e.g., agouti, paca) are more likely to stand a certain degree of harvesting.

Extraction techniques can make a substantial difference: climbing trees to collect fruits, eggs, parrot chicks or leaves are preferred to chopping down the tree and thereby losing all future supply. Reducing the post-harvest loss (e.g., mortality of live animals during transport, perishable fruits) could also greatly enhance sustain-

8.3.2 Economic feasibility

Assuming that a natural population is adequate to provide a regular harvest, a NTFP must have a lasting market appeal to be economically successful. Harvesters should receive a good price for the product in order to avoid destruc-
tive extraction techniques or abandoning the product altogether (Pollak et al., 1995). However, very valuable products can lead to massive over-exploitation for short-term gain, possibly leading to economic extinction of the species. The high demand-high value scenario is more difficult to manage, as it can lead to increased (illegal) collection as collectors are willing to take more risks and invest more effort in finding the species. Those species with very high economic value have historically been decimated by uncontrolled harvesting (e.g., rosewood, giant otter). Extremely high prices of certain desirable species have resulted in a link between illegal wildlife trade and organised crime (Cook et al., 2002).

It remains by all means necessary to assign an economic value to NTFP-producing forests and to weigh their advantages against alternative land uses (Peters et al., 1989b; Godoy and Lubowski, 1992). Buyers must be guaranteed a consistent supply of the product, which requires that the harvest is also ecologically sustain-
able (Pollak et al., 1995). The amount of intermediaries in the product chain from harvest to marketplaces should be reduced to ensure that more revenue is earned by the harvesters themselves.

Volatile markets and price fluctuations are risk factors in the marketing of NTFPs (Rubino et al., 2000). It is best to focus on those NTFPs that have a market (Clay,
Rather than exporting the raw material, it is preferable to capture the value that is added as the product travels through the market system. This can be done by small, community-based industries that process the NTFPs near the extraction sites. Examples are the furniture workshops along the Pomeroon River in Guyana (van Andel, 2000) and the fruit-preservation cottage industries in Amazonian Brazil (Peters et al., 1989b). A diversification of marketed products reduces the dependence on a single product (Clay, 1996). The development of commercial NTFPs can be stimulated by creating new markets for existing products and by improving market structures and facilities (Broekhoven, 1996). When searching for new markets, the immigrant populations in Europe and the US should not be underestimated. There is a sizeable Latino population in the US, with a considerable demand for products from their home countries (e.g., açai, guaraná and other forest fruits). Surinamese immigrants in the Netherlands are also keen to buy songbirds, medicinal plants and typical fruits and vegetables from their home country.

The main reasons for the lack of market development for NTFPs include the absence of good infrastructure, high transport costs, limited access to market information and unfamiliarity with products on the part of consumers (Broekhoven, 1996; van Andel, 2000). The organisational capacity of local communities and NGOs is weak, particularly in relation to formulating business plans and marketing strategies (Clay, 1996). Forest-based enterprises often do not have adequate entrepreneurial and management skills. According to Rubino et al. (2000), uncontrolled extraction and the lack of market-analysis, processing technologies and training required to ‘add-value’ to the products, are also constraints faced by small biodiversity businesses. NTFP production may not be profitable enough by itself as an economic activity to support local communities. In most cases, commercialisation of NTFPs must be seen as one of the options for increasing sustainable livelihoods and creating a sustainable income base. Additional activities might be needed to reduce negative impacts on the income from fluctuations on the market side and in the natural resource base. Stimulating community-based ecotourism or animal ranching might be good additional activities (SCBD, 2001). One could think of parrot ranching projects near tourist lodges to attract bird watchers and ecotourists and ornamental fish collection expeditions.

8.3.3 Socio-political acceptability
Commercial extraction of NTFPs depends for a great deal on the knowledge and skills of local people, as well as on their possibilities and willingness to engage in the collection and trade of NTFPs (Ros-Tonen et al., 1995). Rural communities, which have been relying on a variety of plant and animal species for their livelihoods, should have a direct stake and interest in the sustainable extraction of NTFPs (Posey, 1992; Hall and Bawa, 1993). Unfortunately, a crucial factor limiting the potential of NTFPs to improve local people’s income is that extractors are seldom paid in cash for their work. Instead they are advanced market goods by buyers or middlemen on credit at inflated costs, while low prices are offered for the extractive products. In these systems of bonded labour or debt-peonage, labourers find themselves unable to escape from the contractual obligations with their employers (Hoffman, 1997; Forte, 1999). These in-debt relationships are found in more and less exploitative forms among rubber tappers (Richards, 1993), Brazil nut harvesters (Assies, 1997), palm heart cutters (van Andel, 2000; Forte, 1999) and aerial root collectors (Hoffman, 1997), but are definitely not confined to NTFP extractors. This highly regressive credit and marketing system is also prevalent in cash crop agriculture and gold mining throughout South America (Richards, 1993; Broekhoven, 1996; van Andel, 2000). The system surely maintains extractors in severe deprivation, but Richards (1993) points out that it also has the capacity to bridge the gap between remote subsistence economies and the market economy. Furthermore, the system forces extractors to maximise the time devoted to the collection of NTFPs and leaves little time for subsistence agriculture. According to Richards (1993) this structure is thus more environmentally sound than the alternative, more autonomous labour relationships.

These arguments may be valid for Brazil, but the situation in northwest Guyana is just the reverse, since deforestation due to subsistence agriculture is not a major problem here. Bonded labour and the consequent neglect of traditional agriculture have led to the destruction of palm heart resources in the coastal swamp region (van Andel, 2000). NTFP extraction should not be seen as a viable alternative to shifting cultivation, since extractors often need to combine NTFP harvesting with subsistence agriculture in order to provide food security (Mori, 1992; de Beer and McDermott, 1996; Assies, 1997; van Andel, 2000). Commercial NTFP extraction can therefore hardly be defined as an exclusive land use type (Ros-Tonen, 1999). To secure a good base for increasing livelihoods of local communities, it is best to have product diversification and multiple product management (Richards, 1993). A great social advantage of NTFP extraction is that it can be combined with subsistence activities like hunting, fishing, and slash-and-burn agriculture. This allows most harvesters to earn a living while spending most of their time within their traditional dwelling-grounds, an opportunity not offered by other means of employment in many rural areas of the Guiana Shield. NTFPs can offer indigenous people an income, while staying close to their families, a fact that contributes to the preservation of indigenous cultures. The traditional knowledge of indigenous groups, with a historical tradition of extractivism and swidden farming, could provide a firm basis for sustainable forest management, incorporating multi-species extractivism and traditional swidden management techniques (Richards, 1993).
8.4 Extractive Reserves

In the late 1980s, the National Council of Rubber Tappers in Brazil (CNS) called for the formation of extractive reserves. Their main goal was to provide a framework for the sustained use and protection of NTFPs through the definition of property rights in favour of local communities (May, 1990). Extractive reserves are unique to Brazil, and remain under the joint control of the CNS and the Brazilian Environmental Institute (IBAMA). According to Browder (1992), the objective of extractive reserves was to maximise human welfare, not necessarily to preserve biodiversity. However, the fact that the land is leased by the State to the extractors avoids the normal process of deforestation that has followed the privatisation in the Amazon in the last decades (Richards, 1993). This was illustrated by the situation in Acre, where the Brazilian government allowed commercial farmers to remove the rubber tappers from their forests, which resulted in massive deforestation (Richards, 1993).

Broekhoven (1996) states that commercial rubber tapping in Brazil is probably sustainable, since many rain forest areas have been occupied and exploited by rubber tappers for over 60 years, indicating that land and resource rights are as essential to both income generation and conservation. Still, the effect of this long-term occupation on the forest biodiversity is unclear (Schwartzman, 1989). According to Hardner and Rice (1997), extractive reserves may provide sufficient income to local people only if their area is sufficiently large for continuous use. Therefore, restrictions on land use may be necessary, especially for clearing forest for agriculture. Most rubber tappers are nowadays no longer tied to a patron for all transactions under the traditional debt peonage system, but many of them are still in debt to intermediaries who advance goods and cash against future rubber production. Due to continued conflicts over land rights and exact boundaries of extractive reserves, progress has been slow and NTFP commercialisation has not yet made its major contribution to forest conservation as was expected at first (Richards, 1993; Broekhoven, 1996).

8.5 Subsidising NTFP extraction

Improving the harvesters' socio-economic situation can be achieved by granting them land tenure and by improving facilities for transport, processing and marketing. Governments can contribute by developing management guidelines and promoting health care and education in the area. Marketing arrangements with international NGOs or private companies interested in sustainable production of NTFPs may triple the price paid to extractors. Such arrangements could be a useful mechanism to successfully promote NTFP enterprises, as the service organisation assists with marketing and offers technical assistance. Examples of such partnerships are the programmes supported by the Biocomercio Sostenible (BioTrade Initiative) in Colombia, WWF-Guianas, Cultural Survival, Body Shop, POEMA and Bolsa Amazônica in Brazil. Richards (1993) however, has serious doubts about the dependency effects and economic feasibility of these artificial marketing arrangements.

The Brazilian Government subsidizes the extraction of Brazil nuts, babassu and rubber, providing an income to people that would otherwise be engaged in less sustainable forms of land use (logging, slash-and-burn agriculture). However, extractive activities should be firmly incorporated into regional and national land-use planning to reduce counter-productive government subsidies, like the promotion of cattle ranching in NTFP-producing forest areas (Broekhoven, 1996). Securing long-term financing can be difficult for small NTFP enterprises, so more effective credit programmes are needed in rural areas (Rubino et al., 2000). Clay (1996) stresses that when community investments are required, loans not grants must be used to enhance responsibility.

The International Finance Corporation (IFC) sees real investment opportunities in Latin America for small and medium sized businesses in agriculture (including aquaculture), forestry, ecotourism, and sustainably harvested NTFPs (Rubino et al., 2000). The Terra Capital Fund, a private equity fund, invests in and catalyses private enterprises that generate conservation benefits through sustainable use of biodiversity in countries which have ratified the Convention on Biological Diversity (this counts for all Guiana Shield countries). This fund also focuses on enterprises in NTFPs and has a stake in Muund Alimentos, the company that exports palm hearts from FSC-certified forest (www.ifc.org/enviro/EMG/Biodiversity/Terra/terra.htm).

The Food and Agriculture Organization of the United Nations (FAO) has developed a Market Analysis and Development field manual, which provides a framework for planning tree and forest product enterprises for sustainable development, formulating development plans and prepares for the implementation of these plans.

8.6 Domestication of NTFPs

8.6.1 Plant domestication

For rare species with high commercial value, domestication or captive breeding might be a feasible solution to reduce pressure on natural stands, while ensuring...
the future trade. Domestication of plants may have a positive effect on the conservation of wild populations, while breeding can increase the quality of the desired product (Lange, 1997). However, the value of maintaining wild relatives for their germplasm is not always recognised, so after domestication there is generally less reason to preserve the forest previously used to harvest these NTFPs. The argument that domestication leads eventually to forest conversion may be true for large-scale palm oil plantations, although these can be considered as cash-crop agriculture (Ros-Ten et al., 1995). NTFPs should preferably be domesticated in agroforestry systems, like Amerindians have done for thousands of years. Small-scale plantations may be a solution for very rare and valuable NTFPs, such as rosewood oil (Coppen, 1995b). A problem is that not all plants are easy to cultivate; some have very slow growth rates or their active ingredients (in the case of medicinal plants) are reduced in cultivation (Lange, 1997).

8.6.2 Captive breeding and ranching of animals

The commercial breeding of wild animals in captivity can provide an economic alternative to domestic livestock production and can provide incentives for the species' conservation (CITES, 1992). Breeding is often focused on CITES-listed animals, as they are the species with the greatest demand and economic value. In captive breeding systems, the original parental stock comes from the wild and is maintained without the introduction of specimens from the wild, except for the occasional addition of animals to avoid detrimental inbreeding (CITES, 1997). It is a costly system, only suitable for very valuable species that breed easily in captivity. The term ranching is used for the rearing of wild animals in a controlled natural environment or the careful management of wild populations, such as the removal of eggs, juveniles or adults (CITES, 2000). From a conservation viewpoint, ranching is preferred, as the link with wild populations and natural ecosystem remains strong. Of great importance to these management systems is that all products, including live specimens, must be effectively identified with clear markings and documents to avoid confusion with truly wild specimens (Ross, 1998; CITES, 2000).

Just a few captive breeding and ranching programmes exist in the Guiana Shield, principally focused on parrots, caimans, and capybara (see previous Chapters). Given their economic value and continued demand, the ranching of Psittacines should be a priority. In parrot ranching projects, management techniques include: raising eggs that would not survive in the wild, removing only one chick per nest, setting up large PVC pipe nest boxes to promote breeding, or capture only those parrots that feed on agricultural lands (Thomsen and Brautigam, 1991; Kratter, 1998; Branchs, 2001).

An innovative ranching project, located in the Chaco region of Argentina, provides an example of the potentials and problems with ranching parrots. Since 1997, the Elé programme’s aim was to conserve and manage the blue-fronted parrot (Amazona aestiva). The project emerged directly from studies on the biology and trade of the parrot and a project determining the possibility of using the species sustainably. The programme works currently with 324 families that are legal owners or occupants of the land where parrots nest. At the beginning of the season, each area is assigned maximum collection quotas. Collectors must leave at least one nestling in the nest and mark each nest from which chicks have been removed; one nest is spot-checked at random for each collector. Juvenile parrots are also collected in agricultural areas, but only those birds that land on cultivated plants are allowed to be captured. Each parrot harvested comes with a Certificate of Origin specifying the management requirement (Branchs, 2001).

The Elé programme established a Preservation Fund for the blue-fronted parrot, into which exporters are obliged to contribute money. This covers the costs of the programme, making it economically sustainable. The need for enforcement for each stage in the system, especially regarding quotas and harvesting methods, is very important. Success factors of the project have been attributed to the institution network that has developed and the desire of the local people to participate (Ostrosky, pers. comm.). The programme has reduced illegal collection by extending the programme, including properties where there was previously significant illegal trade (Branchs, 2001). A couple of limitations so far include: ongoing habitat loss, illegal parrots out-competing legal parrots (due to lower costs associated with illegal trade) and a lack of awareness by consumers to distinguish between illegal and legal parrots (Branchs, 2001). Other limitations for parrot ranching are the high capital investment and maintenance costs, as young parrots are often susceptible to disease and parasites (Thomsen and Brautigam, 1991). On the other hand, additional revenues could be earned by ecotourism, as ranching projects increase the ease of observing rare species in a wild setting.

Captive breeding of Psittacines is already practised in Europe, Asia and the US. An advantage is that captive bred parrots have a higher market value, because they are preferred to wild birds as pets (Kratter, 1998). As with ranching projects, breeding stations are costly to set up and run, as costs for medicine and food are particularly high in developing countries. They are also fairly labour intensive. These high costs plus transport make competing with breeders in Europe and the US very difficult (Duplaix, 2001; Voitia, pers. comm.). Breeding success in captivity of certain Psittacines has not been great either.

8.7 Promising products for sustainable harvesting

Extractivism is more likely to be successful in forests where a few marketable species dominate (Browder, 1992). Examples of these so-called ‘oligarchic forests’ in the Guiana Shield are the Brazil nut groves (Balée, 1986; 1987) and the extensive swamps dominated by palms like Euterpe oleracea, Mauritia flexuosa or
or threatened species and takes into account the need for wildlife refuges in timber concessions. Forest management should also not reduce the resources of indigenous peoples. However, more attention should also be paid to hunting and NTFP collection in FSC-certified timber concessions (Bennett and Robinson, 2001).

Preliminary research shows that aquarium keepers are willing to pay a slightly higher price for (certified) sustainably harvested fish (Grosman, 2002; Watson, 2000b). A certification system has recently been launched for the marine trade called MAC (Marine Aquarium Council), which is an international certification system aimed at ensuring the quality of organisms in the marine aquarium trade (www.aquariumcouncil.org). A similar system could be set up for the freshwater aquarium trade, although a system of this kind incurs costs for monitoring and direct marketing to consumers.

8.8. Certification of sustainably harvested NTFPs

One of the market tools available to promote sound ecological and social practices is the certification of NTFPs (Clay, 1996; Maas and Ros-Tonen, 2001; Mallet and Karmann, 2001). The certification of forest products incorporates aspects from different sectors, including (agro-) forestry, organic agriculture and fair trade (Mallet, 1999). Several certification programmes can be applied to NTFPs. The programme of the Forest Stewardship Council (FSC) focuses on sustainable forest management, while the International Federation on Organic Agriculture (IFOAM) is mainly concerned with organic agriculture, but also has criteria for products harvested from the wild. The Fair-trade Labelling Organisation (FLO) concentrates on socio-economic criteria, such as workers rights and benefits. Although the certification of NTFPs has received a lot of international attention in recent years, few products have been incorporated into existing certification programmes to date (Mallet and Karmann, 2001).

If sustainable forest management and biodiversity conservation is the main goal, the most appropriate certification programme seems that of the FSC (www.fscoax.org). Although the main focus of the FSC is timber harvesting and certifying forest management plans, field trials are undertaken to adapt the FSC principles and criteria for NTFPs (Mallet and Karmann, 2001). In the near future, the Rainforest Alliance will publish their guidelines on how to adapt the management and chain of custody of NTFPs towards certification (Shanley et al., in press). At the moment, the FSC approves NTFPs on a case by case basis (Pierce et al., 2002). Brazil is the only country in the Guiana Shield with FSC-certified forests and trials for NTFP certification. The Brazilian certifier Imafóra and the Smartwood network of the Rainforest Alliance are presently involved in the certification of *Euterpe* swamps on the island of Marajó (Amazon delta), where açai and palm heart are extracted (Smartwood Program and Imafóra, 2000). These Brazilian experiences might serve as examples for future certification projects in the Guiana Shield. The FSC has principles which promote the protection of rare
CONCLUSIONS

From this inventory we may conclude that Brazil is the most important country in the Guiana Shield concerning the commercialisation and export of NTFPs.

The major centres for the marketing of NTFPs from the Guiana Shield are Manaus, Belém, Macapá, Santarem, Bogotá, Caracas, Georgetown, Paramaribo, Cayenne, Ciudad Guayana, Boa Vista and border towns like Mabaruma, Lethem, Leticia, Puerto Ayacucho, San Carlos de Rio Negro, Saint Laurent du Maroni and Nickerie (see Maps).

The main commercial NTFPs harvested in the Guiana Shield are parrots, freshwater fish (for consumption and aquaria), bush meat, palm heart, rubber, Brazil nut, açai and craft fibres.

Many thousands of people within the Guiana Shield region, including many indigenous groups, earn their living by collecting and marketing NTFPs. A much larger number of people collect NTFPs on a daily basis for subsistence use.

Many commercially interesting NTFPs occur throughout the Guiana Shield, but the scale of their harvest and marketing differs from country to country. This is caused by differences in access to markets and market information, national legislation, labour and transport costs, and familiarity with products on the part of the consumers.

The trade in NTFPs still represents a ‘hidden economy’. For many products, data on harvested quantities, provenance, domestic trade, export volumes and revenues are unreliable or simply do not exist. Monitoring the market chains of NTFPs is essential to obtain insight in their role in the national and regional economy of the Guiana Shield.

By preventing (further) deforestation, commercial NTFP extraction can certainly contribute to forest conservation. When standing forest is needed to supply NTFPs, for instance rubber tapping, Brazil nut gathering and aerial root collection, harvesters often deliberately protect NTFP-producing trees from logging. When NTFP harvesting is no longer economically viable, or when extractors are expelled from their collection sites, people may shift again to more destructive activities such as logging, cash-crop agriculture or cattle ranching.

Commercial NTFP extraction does not always contribute to biodiversity conservation. Harvesting vulnerable species or using destructive harvesting techniques obviously has a negative impact on the populations of NTFP-producing species, may lead to local species extinction and eventually even affects the entire ecosystem.

The most promising products for sustainable extraction come from forests where a few marketable species dominate, like Brazil nuts, açai, palm heart, piassaba fibres, Mauritia fruit pulp and fibres.

Abundant, fast reproducing animals with general habitat preferences are more likely to stand a certain degree of harvesting. Sustainable extraction levels are available for only a limited number of animals. The lack of ecological information on growth rates and population recovery hampers the design of adequate harvest models for the great majority of species.

Transport costs are a major bottleneck for the marketing of NTFPs from remote (indigenous) areas. High value NTFPs, such as wildlife, are often the only NTFPs, worthwhile to transport across greater distances.

The knowledge and experience in NTFP extraction and marketing differs greatly between countries in the Guiana Shield. Currently there is limited exchange of knowledge or technology between the countries.

Throughout the Guiana Shield, the control on the illegal harvest and trade of NTFPs is limited. The lack of finance and human resources results in poor enforcement of existing laws.

The harvesting of NTFPs needs to be incorporated in land use planning and forest management.

More baseline scientific research is needed on abundance and diversity of NTFPs, growth rates and sustainable harvest levels.

Since we are dealing with a wide array of biologically very different NTFPs (varying from palm fruits to live snakes), there exists no ‘one size fits all’ model that can be used for their sustainable management.
We recommend that more investments should be made in community-based projects that deal with inventories and sustainable harvest of NTFPs. Indigenous monitoring schemes should also be promoted.

International donors should make more small grants and loans available for forest-based NTFP businesses.

To obtain insight in their role in the regional and national economy, market chains of NTFPs, from harvest to consumer, should be monitored. This monitoring should take place in the major centres for NTFP commercialisation listed in the Conclusions. This research is needed in each Guiana Shield country, but data on commercial NTFPs are particularly lacking for Venezuela and Suriname.

There is an urgent need for applied research on NTFPs throughout the Guiana Shield. To assess the importance of NTFPs in a region, inventories are needed on local plant and animal use, both for commercial and subsistence purposes. To calculate sustainable harvest levels, research on abundance, distribution, growth rates and regeneration after harvesting is needed for the vast majority of NTFPs. The focus should be on those NTFPs already traded.

Governments of the Guiana Shield should be stimulated to enforce their control on the illegal harvest and trade of NTFPs. Local communities should be given an active role in these controls.

Informal and formal networks within the Guiana Shield for the research and development of NTFPs should be stimulated. Networks like the International Network for Bamboo and Rattan (www.inbar.int) could be useful examples for commercial NTFPs in the Guiana Shield.

Workshops should be organised throughout the Guiana Shield, in which local NGOs, government institutes, craftsmen or private enterprises share their techniques and experiences with processing and commercialising NTFPs. Topics could include wildlife management, preserving forest fruits or palm hearts, and making furniture or other crafts.

Projects that entail ranching and/or captive breeding of vulnerable animal species should be stimulated, since these systems can reduce the pressure on wild populations. Local communities should be involved in these projects.

Care should be taken that the harvest of NTFPs (plants and animals) is incorporated in land use planning and forest management plans. More attention should be paid to hunting and NTFP collection in FSC-certified timber concessions. Research should also focus on the domestication of NTFPs in indigenous forest management.
REFERENCE LIST


International Books, Utrecht.


Mallet, P. 1999. Analysis of criteria addressed by forestry, agriculture and fair trade certification systems. Falls Brook Centre, Knowlesville, New Brunswick, Canada. (www.fallbrookcentre.ca)


RENTAS. 2001. 1° Relatório Nacional sobre o Tráfico de Fauna Silvestre. RENCTAS, Brasilia.


Rijssooit, J. van. 2000. Non-timber forest products (NTFPs): their role in sustainable management in the tropics. Theme Studies Series 1 – Forests, Forestry and Biological Diversity Support Group, National Reference Centre for Nature Management (EC-LNV) and International Agricultural Centre (IAC), Wageningen.


REFERENCE LIST


Rjssooit, J. van. 2000. Non-timber forest products (NTFPs): their role in sustainable management in the tropics. Theme Studies Series 1 – Forests, Forestry and Biological Diversity Support Group, National Reference Centre for Nature Management (EC-LNV) and International Agricultural Centre (IAC), Wageningen.


**REFERENCE LIST**


UNEP. 2000. International trade in species listed in both the protocol concerning specially protected areas and wildlife (SPAW) and the Convention on International Trade in Endangered Species (CITES). (www.caribbeanenvironment.net/SPAW-CITES%20Report.pdf)


Watson, I. 2000a. The role of the ornamental fish industry in poverty alleviation. NRI Report No. 2504. Natural Resources Institute, Chatham Maritime, Kent, UK.

Watson, I. 2000b. Improving livelihoods through fisheries-related activities – a report to the Iwokrama Project (NRI Report 2574). Natural Resources Institute, Chatham Maritime, Kent, UK.


### Appendix 1
### Animal Species

This table lists all the scientific names, common names and main commercial use of animal species mentioned within the report. This is not a comprehensive list of all animals species (or names) being commercially used in the Guiana Shield. Language: Dutch (du), English (e), French (fr), Portuguese (po), Spanish (sp) or local country names: Brazil (Bra), Colombia (Col), Guyana (Guy), French Guiana (FG), Suriname (Sur), Venezuela (Ven). Use: Skins (historical) means that the skins of the species were heavily traded in the past; the trade is now greatly reduced usually due to listing on CITES Appendix 1.

#### MAMMALS

<table>
<thead>
<tr>
<th>Latin name</th>
<th>Family</th>
<th>Common Name</th>
<th>Use</th>
<th>CITES Listing</th>
<th>IUCN Threat Category</th>
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<tr>
<td>Agouti paca</td>
<td>Agoutidae</td>
<td>paca (e, Bra); pac (fr); guagua, buruca, lapa (Col); pak (FG); labba (Guy); waterhaas, be (Sur)</td>
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<td>Alouatta seniculus</td>
<td>Cebidae</td>
<td>red howler monkey (e); mono colorado, cotudo, roncalador, araguato, berreador (Col, Ven); baboon (Guy); brulaap, baboen (Sur)</td>
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<td>Pet (local)</td>
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<td>Atelidae</td>
<td>black spider monkey (e); macaco-arahna, coati (Bra); kwata (FG, Sur); mico maicero (Col); macaque noir (FG); ringtail (Guy); keskesi (Sur)</td>
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<td>Cebidae</td>
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<td>Mazama</td>
<td>Cervidae</td>
<td>common woolly monkey; Humboldt's woolly monkey (e); chom, barriagado (Sp); mayaco-barriagado (Bra); chooya, chausco, chulaos (Col)</td>
<td>Bush meat,</td>
<td>11</td>
<td>L. cana &amp; peyguyis VU (Alt)</td>
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<tr>
<td></td>
<td></td>
<td>Pet (local)</td>
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<tr>
<td>Mazama</td>
<td>Cervidae</td>
<td>red brocket deer (e); groot boshert (Du); venado colorado, venado rojo (Sp); veado-pardo, veado-mateiro (Bra); ocho Cordero (Col); biche (FG); rededia, prasaradia, prasaradia (Sur); locho (Ven)</td>
<td>Bush meat</td>
<td>–</td>
<td>DD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>brown brocket deer; gray brocket deer (e); kleen boshert (Des); venado plomo, veando gris (Sp); veado bist, veado catingueiro (Bra); soche gris (Gal); maricain (Col, Ven); caraicou (FG); lariakoe (Guy); kasiakoe, bukakobata (Sur)</td>
<td>Bush meat</td>
<td>–</td>
<td>DD</td>
</tr>
<tr>
<td>Myoprocta</td>
<td>Dasyproctidae</td>
<td>red acouchi (e); cutiara (Bra); acouchi, mamboola (Sur)</td>
<td>Bush meat</td>
<td>–</td>
<td>DD</td>
</tr>
<tr>
<td>Myrmecophaga</td>
<td>Myrmecophagidae</td>
<td>giant ant eater (e); reuzenmiereneter (Des); banderin cabilla, hommigueno gigante (Sp); tamandua bandeira, tamandua-açu, papa-formigas (Bra); oso caballeno, oso palmero, oso pajina (Col); grand fourmiliere, tamannao (FG); barome (Guy); tamanao (Sur)</td>
<td>Bush meat</td>
<td>11</td>
<td>VU (Alt)</td>
</tr>
<tr>
<td>Panthera</td>
<td>Felidae</td>
<td>jaguar (e); jaguar (Sp); onça-ença-pintada, jaguartê (Bra); tigre real, tigre mariposao (Col); tig (FG); tigre (Guy); penitigri, pakinkiri (Sur)</td>
<td>Skins (historical), Pet (local)</td>
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<td>NT</td>
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<tr>
<td>Priodontes</td>
<td>Dasypodidae</td>
<td>giant armadillo (e); reuzenmiereneter (Des); armadillo-gigante, caracacha manan, cuanon, tatu carreta, tati-gigante, tati-guarí (Sp); tatu canastra, tatu açu di (Bra); oaxars, jusa trumo (Col); tatu gaint, cabusous (FG); gramangkapas (Sur)</td>
<td>Bush meat</td>
<td>–</td>
<td>DD</td>
</tr>
<tr>
<td>Panthera onca</td>
<td>Felidae</td>
<td>jaguar (e); jaguar (Sp); onça-ença-pintada, jaguartê (Bra); tigre real, tigre mariposao (Col); tig (FG); tigre (Guy); penitigri, pakinkiri (Sur)</td>
<td>Skins (historical), Pet (local)</td>
<td>1</td>
<td>NT</td>
</tr>
<tr>
<td>Pristolophus</td>
<td>Myrmecophagidae</td>
<td>giant ant eater (e); reuzenmiereneter (Des); banderin cabilla, hommigueno gigante (Sp); tamandua bandeira, tamandua-açu, papa-formigas (Bra); oso caballeno, oso palmero, oso pajina (Col); grand fourmiliere, tamannao (FG); barome (Guy); tamanao (Sur)</td>
<td>Bush meat</td>
<td>11</td>
<td>VU (Alt)</td>
</tr>
</tbody>
</table>

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**Latin name** | **Family** | **Common Name** | **Use** | **CITES Listing** | **IUCN Threat Category**
--- | --- | --- | --- | --- | ---
**Dasyprocta** | **Dasyproctidae** | red-rumped agouti (e); cutia (Bra); agouti (Guy); goudhaas, konkoni (Sur); picture; acquarella (Ven) | Bush meat | – | –
**Dasyprocta** | **Dasyproctidae** | great long-nosed armadillo (e); tatu de Kappeler (Fr); tatu, tati | Bush meat | – | –
**Dasyprocta** | **Dasyproctidae** | 9-banded long-nosed armadillo (e); negengordeigig; ganteldekker (Des) | Bush meat | – | –
**Hydrochaeris** | **Hydrochaeridae** | capybara (e); capibara (Sp); capoura; capudo (Bra); poncho; lancho (Col); chiquire, chiquiren (Gal, Ven); cabiai (FG); wotiae (Guy); kapooewa, waterhaas (Sur) | Bush meat | – | –
**Mazama** | **Cervidae** | common woolly monkey; Humboldt's woolly monkey (e); chom, barriagado (Sp); mayaco-barriagado (Bra); chooya, chausco, chulaos (Col) | Bush meat | 11 | L. cana & peyguyis VU (Alt)
**Mazama** | **Cervidae** | red brocket deer (e); groot boshert (Du); venado colorado, venado rojo (Sp); veado-pardo, veado-mateiro (Bra); ocho Cordero (Col); biche (FG); rededia, prasaradia, prasaradia (Sur); locho (Ven) | Bush meat | – | DD
**Mazama** | **Cervidae** | brown brocket deer; gray brocket deer (e); kleen boshert (Des); venado plomo, veando gris (Sp); veado bist, veado catingueiro (Bra); soche gris (Gal); maricain (Col, Ven); caraicou (FG); lariakoe (Guy); kasiakoe, bukakobata (Sur) | Bush meat | – | DD
**Myoprocta** | **Dasyproctidae** | red acouchi (e); cutiara (Bra); acouchi, mamboola (Sur) | Bush meat | – | DD
**Myrmecophaga** | **Myrmecophagidae** | giant ant eater (e); reuzenmiereneter (Des); banderin cabilla, hommigueno gigante (Sp); tamandua bandeira, tamandua-açu, papa-formigas (Bra); oso caballeno, oso palmero, oso pajina (Col); grand fourmiliere, tamannao (FG); barome (Guy); tamanao (Sur) | Bush meat | 11 | VU (Alt)
**Pristolophus** | **Myrmecophagidae** | giant ant eater (e); reuzenmiereneter (Des); banderin cabilla, hommigueno gigante (Sp); tamandua bandeira, tamandua-açu, papa-formigas (Bra); oso caballeno, oso palmero, oso pajina (Col); grand fourmiliere, tamannao (FG); barome (Guy); tamanao (Sur) | Bush meat | – | DD
**Priodontes** | **Dasypodidae** | giant armadillo (e); reuzenmiereneter (Des); armadillo-gigante, caracacha manan, cuanon, tatu carreta, tati-gigante, tati-guarí (Sp); tatu canastra, tatu açu di (Bra); oaxars, jusa trumo (Col); tatu gaint, cabusous (FG); gramangkapas (Sur) | Bush meat | – | DD
<table>
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<th>Family</th>
<th>Common Name</th>
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<th>IUCN Threat Category</th>
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<tbody>
<tr>
<td><em>Pteronura brasiliensis</em></td>
<td>Mustelidae</td>
<td>giant otter (e); aruana (Br); pinto de agua, lobo, colón, aruana (Col); water dog (Guy); gato de waterhoud, (bigi)waterhoudagoe (Sur)</td>
<td>Skins (historical), Pet (fiscal)</td>
<td>1</td>
<td>EN (A1acde)</td>
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<tr>
<td><em>Puma concolor</em></td>
<td>Felidae</td>
<td>cougar, deer tiger, red tiger, mountain lion (e); puma (e, fr, sp); leucon american, leon huy, mitili, ona bermeja (sp)</td>
<td>Skins</td>
<td>11</td>
<td>NT</td>
</tr>
<tr>
<td><em>Sapajus malabaricus</em></td>
<td>Callithricidae</td>
<td>golden handed tamarin, midas tamarin, red handed tamarin (e); simon, sagui (Br); sapajous noir (FG); saapwetje, saapowetje (Sur)</td>
<td>Pet Trade</td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td><em>Saimiri sciureus</em></td>
<td>Cebidae</td>
<td>common squirrel monkey (e); doudousoedhappe (du); friale, fauliux, barieu (sp); maaco-de-chresse, beto-petit (Br); titi (Col); singe écorceuil, sapajou blanc (FG); wulde-wuldedjoe (Guy); monklj monki (Sur); titi; mono calavera (Ven)</td>
<td>Lab Trade, Pet Trade, Bush meat</td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td><em>Tapirus terrestris</em></td>
<td>Tapiridae</td>
<td>lowland tapir, Brazilian tapir, South American tapir (e); Zuidamerikaanse tapir (du); tapir, anta, danta (sp); anta brasileña, anta, marubia (Br); tapir bradeo, danta, grau bestia, sacha vaca (Col); bush cow (Guy); tapir d’Americique, maipouru, tapir terreestre (FG); bokkoe, bofroe (Sur)</td>
<td>Bush meat</td>
<td>1</td>
<td>VU (A1d, B1b, d2d)</td>
</tr>
<tr>
<td><em>Tayassu pecari</em></td>
<td>Tayassuidae</td>
<td>white lipped peccary (e); wilhippeccarie (du); pecari à lèvre blanche (fr); questiadu, porco-do-mato (Br); huangana, pecari labiado (Col); wild hog (Guy); cochon-bois (FG); pingo (FG, Sur); bâquin (Ven)</td>
<td>Bush meat</td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td><em>Tayassu tajacu</em></td>
<td>Tayassuidae</td>
<td>collared peccary (e); halbgebändpecarier (du); pécari à collier (fr); Bush meat</td>
<td>11</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td><em>Trichechus inunguis</em></td>
<td>Trichechidae</td>
<td>Amazonian manatee (e); lamanit de l’Amazone (fr); lamanino amazónico, vaca marina amazónica, manati amazónico (sp); peixe-boi (Br); Medicinal</td>
<td>Bush meat</td>
<td>1</td>
<td>VU (A1d)</td>
</tr>
<tr>
<td><em>Trichechus manatus</em></td>
<td>Trichechidae</td>
<td>West Indian manatee, Caribbean manatee (e); vaca marina (sp); peixe-boi (Br)</td>
<td>Bush meat</td>
<td>1</td>
<td>VU (A2d)</td>
</tr>
</tbody>
</table>

**Sources:** Emmons, 1997; Duplaix, 2001; Orthopt., 2001; www.CITES.org; IUCN, 2002 (www.redlist.org or www.iucnredlist.org); NC-IUCN (pers. comm., 2003)
<table>
<thead>
<tr>
<th>Latin name</th>
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<th>Common Name</th>
<th>Use</th>
<th>CITES Listing</th>
<th>IUCN Threat Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ara macao</td>
<td>Psittacidae</td>
<td>scarlet macaw (e); geelvleugelara (du); ara rouge (fr); arara-piranga, ipitanga, arara-canga (po); guacamayo roja alamullita, guacamaya colobrada, guacamayo banden (Col); roodeaal, rodeaal, bolreaf, bolereaf</td>
<td>Pet Trade, Bush meat</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>Ara mandata</td>
<td>Psittacidae</td>
<td>red-bellied macaw (e); roodbuikaraat (du); ara macavouanne (fr); guacamayo, bartiga roja, guacamayo ventrerosa (sp); marais (fr); arara-piranga, petter, morisi (pa), paarden (Sar)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
</tr>
<tr>
<td>Ara nobilis</td>
<td>Psittacidae</td>
<td>red-shouldered macaw, Hahn's macaw, nobel macaw (e); roodschouder ara (du); ara nobel, petit perruche van Hahn (fr); guacamayo enano, guacamayo, nobele, sternarrendparkiet, sternarrendparkiet (Sar)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
</tr>
<tr>
<td>Ara severa</td>
<td>Psittacidae</td>
<td>chestnut-fronted macaw; dwerg ara (du); ara vent (fr); mancanaçu (sp); ararinhade-fronte-castanha (po); guacamaya cariecia (Col); raapparkiet, raapparkiet (Sar), mancanaçu (Ven)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Aratinga aurea</td>
<td>Psittacidae</td>
<td>peach fronted parakeet, golden-crowned parakeet (e); goudvoorhoofd-parkiet (du); pervogatouiter (fr); guacamayo coucou, guacamayo de color (sp); coucou de coucou, coucou doré (Col); raapparkiet, raapparkiet (Sar), mancanaçu (Ven)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
</tr>
<tr>
<td>Aratinga leucophthalma</td>
<td>Psittacidae</td>
<td>white-eyed parakeet/cockatoo, green crowned parakeet (e); chrysopterus catita alidorada, periquito ala dorada (sp); kankantriparkiet (Sur)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
</tr>
<tr>
<td>Brotogeris</td>
<td>Psittacidae</td>
<td>golden-winged parakeet (e); oranje-vleugelparkiet (du); toui para (fr); muscovy duck (e); muskuseend (du); canard de Barbarie, canard musqué (fr); leucophthalmus passerinus, passerinus (sp); perico, pico (Col); kankantriparkiet, kankantriparkiet (Sur); perico, pico (Col)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Caracara</td>
<td>Caracaridae</td>
<td>black caracara (e); zwartbeakcaracara, black caracara (du); black caracara (fr);.circular; guacamayo, caracara de ciruela (sp); coucou caracara, coucou de ciruela (Col); raapparkiet, raapparkiet (Sar), caracara (Ven)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<td>Deroptyus</td>
<td>Psittacidae</td>
<td>hawk-headed parrot/caique, red-fan parrot (e); Deroptyus accipitrinus</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Eudocimus</td>
<td>Threskiornithidae</td>
<td>scarlet ibis (e); rode ibis (du); corocoro colorado (fr); corocoro rojo, corocoro de color (sp); corocoro de color (Col); corocoro colorado (Col)</td>
<td>Pet Trade, Handicrafts</td>
<td>II</td>
<td>–</td>
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<td>Forpus</td>
<td>Psittacidae</td>
<td>green rumped parrotlet, green and blue rumped parrotlet, V enezuelan/Guiana parrotlet (e); Forpus passerinus, passerinus (sp); periquitos, parakeets, parrots (Col); perique, perico (Col)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Nobispiza</td>
<td>Psittacidae</td>
<td>dusky billed finch, dusky billed finch (e); Nobispiza passerinus</td>
<td>Pet Trade, Bush meat</td>
<td>II</td>
<td>–</td>
</tr>
<tr>
<td>Tahiria</td>
<td>Ciconiidae</td>
<td>jabiru nesting (e); jabiru (Du); jabiru (Ven)</td>
<td>Pet Trade, Bush meat</td>
<td>II</td>
<td>–</td>
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<td>Mystesia</td>
<td>Gruiformes</td>
<td>marsh sandpiper (e); Marsh Sandpiper (du); Marsh Sandpiper (Fr)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Nannopsittaca</td>
<td>Psittacidae</td>
<td>tepui parakeet, tepui parakeet (e); tepui parakeet (du); tepui parakeet (Fr)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Orga ruber</td>
<td>Embuedidae</td>
<td>lesser seed finch, lesser seed finch (e); Orga ruber</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Orthopanus</td>
<td>Embuedidae</td>
<td>large billed finch (e); Orthopanus cumanensis</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Penelope marail</td>
<td>Cracidae</td>
<td>marail guan (e); marail (fr); marai, marundi (Sur)</td>
<td>Bush meat</td>
<td>–</td>
<td>–</td>
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<td>Pionites melanocephala</td>
<td>Psittacidae</td>
<td>maï-pourri (fr); periquito de cabeça preta (po); patilico, loro cacique, loro guahíbo, curumai, loro mocho (Col), perico calzoncito (Col, V en); wetbereprakiki (Sur); perico siete colores, calzoncito (V en)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Pionopsitta caica</td>
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<td>caica parrot (e); caicapapegaai (du); caïque à tête noire (fr); lorito caica,</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<td>Pionus fuscus</td>
<td>Psittacidae</td>
<td>dusky parrot, little dusky parrot, violet parrot, dusky pionus (e);</td>
<td>Pet Trade</td>
<td>II</td>
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<td>Pionus menstruus</td>
<td>Psittacidae</td>
<td>blue-headed parrot (e); cotorra cabeciazul (sp); cheja cabeci azul, sirindero, tragaguamo, lorito guamero, cuara, curicunae (Col); margrietje (Sur); otorra cabeciazul (V en)</td>
<td>Pet Trade</td>
<td>II</td>
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<td>Platalea ajaja</td>
<td>Threskiornithidae</td>
<td>roseate spoonbill (e); roze lepelaar (du); lepelbek (Sur)</td>
<td>Bush Meat</td>
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<td>–</td>
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<td>Psophia crepitans</td>
<td>Psophiidae</td>
<td>grey winged trumpeter (e); agami trompette (fr); jacamim-de-costas-cinzas (po); grulla (sp); kamikami (Sur)</td>
<td>Bush meat</td>
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<td>Pteroglossus aracari</td>
<td>Ramphastosidae</td>
<td>black-necked aracari (e); arasari à cou noir, araçari grigri (fr); tilingo cuellinegro (sp); bosrokoman (toekanet), redibanti-kuyake (Sur)</td>
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<td>Pteroglossus viridis</td>
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<td>green aracari (e); groene arassari (du); araçari vert (fr); tilingo limón (sp); groennek toekanet, stonkuyake (Sur)</td>
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<tr>
<td>Pyrrhura egregia</td>
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<td>fiery-shouldered parakeet/conure (e); roodschouderparkiet (du); Pet Trade II</td>
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<td>Pyrrhura picta</td>
<td>Psittacidae</td>
<td>painted parakeet, blue-winged conure (e); bonte parkiet (du); perruche versicolore (fr); tiriba pintade, tiriba-de-testa azul (po); cotorrita barriguirroja, loro, perico (Col); kapuweriprakiki (Sur); perico cabecidorado (V en)</td>
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<td>Ramphastos toco</td>
<td>Ramphastosidae</td>
<td>toco toucan (e); reuzentoekan (du); toucan toco (fr); Pet Trade, II</td>
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<td>Ramphastos tucanus</td>
<td>Ramphastosidae</td>
<td>red-billed toucan, white-throated toucan (e); roodsnaveltoekan (du); Pet Trade, II</td>
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<td>Ramphastos vitellinus</td>
<td>Ramphastosidae</td>
<td>channel-billed toucan (e); groef-snaveltoekan (du); toucan à gorge jaune et blanche, toucan ariel (fr); diostedé pico acanelado, tucán Bush meat</td>
<td>Pet Trade</td>
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<td>Sporophila lineola</td>
<td>Emberizidae</td>
<td>lined seedeater (e); witsterdikbekje (du); ring neck (Guy)</td>
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<td>–</td>
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<tr>
<td>Sporophila minuta</td>
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<tr>
<td>Sporophila schistacea</td>
<td>Emberizidae</td>
<td>slate-coloured seedeater (e); leigrijs dikbekje (du); gelebek, busitwatwa (Sur)</td>
<td>Pet Trade</td>
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<td>–</td>
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<tr>
<td>Tinamus major</td>
<td>Tinamidae</td>
<td>greater tinamou (e); grote tinamoe (du); mamafowru-anamu (Sur)</td>
<td>Bush meat</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Touit batavica</td>
<td>Psittacidae</td>
<td>lilac-tailed parrotlet, seven-colored parrotlet, black-winged parrotlet, (e); Pet Trade II</td>
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<tr>
<td>Touit purpurata</td>
<td>Psittacidae</td>
<td>sapphire-rumped parrotlet, purple Guiana parrotlet, green-banded Pet Trade II</td>
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<table>
<thead>
<tr>
<th>Latin name</th>
<th>Family</th>
<th>Common Name</th>
<th>Use</th>
<th>CITES Listing</th>
<th>IUCN Threat Category</th>
</tr>
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<tbody>
<tr>
<td>Allabates femoralis</td>
<td>Dendrobatidae</td>
<td>brilliant-thighed poison frog</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
</tr>
<tr>
<td>Epipedobates femoralis</td>
<td>Dendrobatidae</td>
<td>epipedobate femoralis, epipedobate femoralis</td>
<td>Pet Trade</td>
<td>–</td>
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<tr>
<td>Aselus punctatus</td>
<td>Belythrolepidae</td>
<td>South American green anole</td>
<td>Pet Trade</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Bucephalarium constrictor</td>
<td>Boulidae</td>
<td>boa constrictr (e, du); dagte mols (Sur)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Bulba spp.</td>
<td>Boulidae</td>
<td>toads (e); padden (du, Sur)</td>
<td>Pet Trade</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Canis crocuta</td>
<td>Crocodylidae</td>
<td>spectacled caiman, common caiman (e); blikkaaiman (du); jactar tinga, jactare, lugartu blanco, crocodile, orocoche, cacarrudo, cachirre, tuvais (sp); babu, babulla (Col, Ven); weensoekaaiman (Sur)</td>
<td>Skins</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Caiman crocodilus</td>
<td>Crocodylidae</td>
<td>spectacled caiman, common caiman (e); blikkaaiman (du); jactar tinga, jactare, lugartu blanco, crocodile, orocoche, cacarrudo, cachirre, tuvais (sp); babu, babulla (Col, Ven); weensoekaaiman (Sur)</td>
<td>Skins</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Caracalus caracal</td>
<td>Boulidae</td>
<td>slender tree boa, Amazoon tree boa (e); boa arboiscelle d'Amazonie (fr); bosschildpad (Sur)</td>
<td>Pet Trade</td>
<td>II</td>
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<tr>
<td>Corythosaurus australis</td>
<td>Crocodylidae</td>
<td>American crocodile (e); spitssnuitkrokodil (du); crocodile d'Amérique (fr); crocodile americano (sp)</td>
<td>Skins (historical)</td>
<td>I</td>
<td>VU (A1c)</td>
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<tr>
<td>Crocodylus intermedia</td>
<td>Crocodylidae</td>
<td>Ormoco crocodile (e); canaim del Ormoco (sp)</td>
<td>Skins (historical)</td>
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<td>CR (A1c, C2d)</td>
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<tr>
<td>Dendrobothus asper</td>
<td>Dendrobatidae</td>
<td>blue poison frog (e); an uablaauw gefikker (du); dendrobate bleu (fr); oleppi (Sur)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Dendrobothus leucostictus</td>
<td>Dendrobatidae</td>
<td>yellow-banded poison frog (e); dendrobate jaune et noir (fr); rana de punta de flecha de bandas amarillas (sp)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Dendrobothus microlepidotus</td>
<td>Dendrobatidae</td>
<td>yellow-banded poison frog (e); dendrobate jaune et noir (fr); gefikker (Sur)</td>
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<td>II</td>
<td>–</td>
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<tr>
<td>Epicrates cenchria</td>
<td>Helidae</td>
<td>rainbow boa (e); egenbooga boa (Sur)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Epipedobates pictus</td>
<td>Dendrobatidae</td>
<td>spoted-legend poison frog (e); epipedobate paint (fr); rana de punta de flecha picta (sp)</td>
<td>Pet Trade</td>
<td>II</td>
<td>–</td>
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<tr>
<td>Eumeces marmoratus</td>
<td>Crocodylidae</td>
<td>black caiman (e); zwarte kaaiman (du); canaim noir (fr); canaim; caimán negro; lagarto negro (sp)</td>
<td>Skins</td>
<td>I</td>
<td>LRd</td>
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<tr>
<td>Epicrates cenchria pictus</td>
<td>Helidae</td>
<td>rainbow boa (e); egenbooga boa (Sur)</td>
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<td>II</td>
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<tr>
<td>Epicrates cenchria punctatus</td>
<td>Helidae</td>
<td>black caiman (e); zwarte kaaiman (du); canaim noir (fr); canaim; caimán negro; lagarto negro (sp)</td>
<td>Skins</td>
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<tr>
<td>Epicrates cenchria spiniceps</td>
<td>Helidae</td>
<td>black caiman (e); zwarte kaaiman (du); canaim noir (fr); canaim; caimán negro; lagarto negro (sp)</td>
<td>Skins</td>
<td>I</td>
<td>LRd</td>
</tr>
<tr>
<td>Epicrates cenchria subfloridanus</td>
<td>Helidae</td>
<td>black caiman (e); zwarte kaaiman (du); canaim noir (fr); canaim; caimán negro; lagarto negro (sp)</td>
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<td>I</td>
<td>LRd</td>
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<tr>
<td>Epipedobates asper</td>
<td>Dendrobatidae</td>
<td>blue poison frog (e); an uablaauw gefikker (du); dendrobate bleu (fr); oleppi (Sur)</td>
<td>Pet Trade</td>
<td>II</td>
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<tr>
<td>Eumeces marmoratus</td>
<td>Crocodylidae</td>
<td>black caiman (e); zwarte kaaiman (du); canaim noir (fr); canaim; caimán negro; lagarto negro (sp)</td>
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<td>LRd</td>
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<tr>
<td>Epicrates cenchria pictus</td>
<td>Helidae</td>
<td>rainbow boa (e); egenbooga boa (Sur)</td>
<td>Pet Trade</td>
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<tr>
<td>Epicrates cenchria punctatus</td>
<td>Helidae</td>
<td>black caiman (e); zwarte kaaiman (du); canaim noir (fr); canaim; caimán negro; lagarto negro (sp)</td>
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<td>Helidae</td>
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<td>LRd</td>
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<td>Epicrates cenchria subfloridanus</td>
<td>Helidae</td>
<td>black caiman (e); zwarte kaaiman (du); canaim noir (fr); canaim; caimán negro; lagarto negro (sp)</td>
<td>Skins</td>
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<td>LRd</td>
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<tr>
<td><em>Podocnemis unifilis</em></td>
<td>Pelomedusidae</td>
<td>-rayed river turtle, yellow-headed sideneck turtle (e), piedocenémide de Guyane (Fr), tracajá, tracazá (Po), termeur, temceure (Sp)</td>
<td>Bush meat</td>
<td>II</td>
<td>VU (Alasell)</td>
</tr>
<tr>
<td><em>Polychrus mammatus</em></td>
<td>Belycichthyidae</td>
<td>American false chameleon (e); marmemeluguin (Ch); bagallas (Sur)</td>
<td>Pet Trade</td>
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<tr>
<td><em>Pygocentrus nigrojanus</em></td>
<td>Syn. <em>T. nigrojanus</em></td>
<td>tegu, northern tegu lizard, banded tegu, black tegu, common tegu (e); tegu (Ch), grand tegu, anogorlice, tuyo negro, tuyo a tachos noires (Fr); tegu, tuyo (Br); sagalunka, rezentego (Sur)</td>
<td>Pet Trade, Skins</td>
<td>II</td>
<td>–</td>
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<tr>
<td><em>Uracentron azureum</em></td>
<td>Tropiduridae</td>
<td>banded spine-tail lizard (e), stekttaart legaasaa (Sur)</td>
<td>Pet Trade</td>
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**FRESHWATER FISH**

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<tr>
<th>Latin name</th>
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<th>Use</th>
<th>CITES Listing</th>
<th>IUCN Threat Category</th>
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<tr>
<td><em>Anapomus gigas</em></td>
<td>Osteoglossidae</td>
<td>arapaima (e); piranha (Po); poche (Sp)</td>
<td>Bush meat</td>
<td>II</td>
<td>DD</td>
</tr>
<tr>
<td><em>Bradypthalmus flavescens</em></td>
<td>Pimephalesidae</td>
<td>dourado (Ch); lico-laco (Ven)</td>
<td>Bush meat</td>
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<tr>
<td><em>Brachyplatystoma flavicans</em></td>
<td>Pimelodidae</td>
<td>dorado (Ch); lico-laco (Ven)</td>
<td>Bush meat</td>
<td>–</td>
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</tr>
<tr>
<td><em>Carnegiella sternicla</em></td>
<td>Gasteropelecidae</td>
<td>silver hatchetfish (e, Guy)</td>
<td>Pet Trade</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><em>Carnegiella strigata</em></td>
<td>Gasteropelecidae</td>
<td>silver hatchetfish, spotted hatchetfish (e, Guy)</td>
<td>Pet Trade</td>
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**HATCHETFISH**

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<th>CITES Listing</th>
<th>IUCN Threat Category</th>
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<tbody>
<tr>
<td><em>Coptodon elongatus</em></td>
<td>Cichlidae</td>
<td>pacu fish (e)</td>
<td>Bush meat</td>
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<td>–</td>
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<tr>
<td><em>Corydoras aeneus</em></td>
<td>Callichthyidae</td>
<td>corydoras (e); corredora (Ch); corredora (Ven)</td>
<td>Pet Trade</td>
<td>–</td>
<td>–</td>
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<tr>
<td><em>Electrophorus electricus</em></td>
<td>Electrophoridae</td>
<td>electric eel (e); telectric (Sp)</td>
<td>Pet Trade</td>
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<tr>
<td><em>Gasteropelecus maculatus</em></td>
<td>Gasteropelecidae</td>
<td>clouded hatchetfish, spotted hatchetfish (e, Guy)</td>
<td>Pet Trade</td>
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<tr>
<td><em>Gasteropelecus niger</em></td>
<td>Gasteropelecidae</td>
<td>silver hatchetfish, river hatchetfish (e)</td>
<td>Pet Trade</td>
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<tr>
<td><em>Geophagus platycephalus</em></td>
<td>Pimelodidae</td>
<td>skubering catfish (e); baboon (Ch);</td>
<td>Bush meat</td>
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<tr>
<td><em>Hemirhamphus sp.</em></td>
<td>Characidae</td>
<td>tetra brillante (Ch);</td>
<td>Pet Trade</td>
<td>–</td>
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<tr>
<td><em>Hoplosternum aeneum</em></td>
<td>Callichthyidae</td>
<td>arawoon or catfish (e);</td>
<td>Bush meat</td>
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<tr>
<td><em>Hoplosternum aeneum</em></td>
<td>Callichthyidae</td>
<td>tamaru (Ch);</td>
<td>Bush meat</td>
<td>–</td>
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<tr>
<td><em>Hoplosternum megalepis</em></td>
<td>Characidae</td>
<td>red phantom tetra (e); cipito fino (Ch);</td>
<td>Pet Trade</td>
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### INSECTS

<table>
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<th>Use</th>
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<tbody>
<tr>
<td>Avicularia avicularia</td>
<td>Theraphosidae</td>
<td>French Guiana pink-toed tarantula (e)</td>
<td>Pet Trade</td>
<td>–</td>
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<tr>
<td>Megasoma action</td>
<td>Scarabaeidae</td>
<td>rhinocerous beetle, acteon beetle (e)</td>
<td>Pet Trade</td>
<td>–</td>
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<tr>
<td>Titanus giganteus</td>
<td>Cerambycidae</td>
<td>South American longhorn beetle (e)</td>
<td>Handicrafts</td>
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<tr>
<td>Theraphosa stirmi</td>
<td>Theraphosidae</td>
<td>goliath bird eater tarantula (e)</td>
<td>Pet Trade</td>
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Sources: Froese and Pauly, 2002; Royero, 1993; IUCN, 2002 (www.redlist.org or www.iucnredlist.org)
### Plant Species

This table lists all scientific and common names and main commercial use of plant species mentioned within the report.

Local country names: Brazil (Bra), Colombia (Col), French Guiana (FG), Guyana (Guy), Suriname (Sur), Venezuela (Ven).

**Language:** English (e), Spanish (sp).

<table>
<thead>
<tr>
<th>Species Family</th>
<th>Vernacular and Common names</th>
<th>Use category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrocomia aculeata (Jacq.) Arecaceae</td>
<td>macaw palm (e); macaúba, mucuja (Bra); tamaço (Col); coredo (Col, Ven)</td>
<td>Oil</td>
</tr>
<tr>
<td>Amba ranciendra Ducke, Ambur spp. Lauraceae</td>
<td>rosewood oil (e); pau rosa (Bra)</td>
<td>Medicinal oil</td>
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<tr>
<td>Artocarpus altilis</td>
<td>Moraceae</td>
<td>baobab</td>
</tr>
<tr>
<td>Astrocaryum chambira Burret Arecaceae</td>
<td>cumare (Col)</td>
<td>Crafts, fibers</td>
</tr>
<tr>
<td>Astrocaryum murumuru Mart. Arecaceae</td>
<td>murumuru (Bra)</td>
<td>Oils, wax</td>
</tr>
<tr>
<td>Bactris gasipaes Kunth Arecaceae</td>
<td>peach palm (e); pejibaye (sp); pupunha (Bra); cachipay (Col)</td>
<td>Food</td>
</tr>
<tr>
<td>Banisteriopsis caapi (Spruce ex Malpighiaceae</td>
<td>ayahuasca, yage (Col)</td>
<td>Medicinal, ritual</td>
</tr>
<tr>
<td>Bertholletia excelsa Bonpl. Lecythidaceae</td>
<td>Brazil nut, castañha (Bra); Paranoot (Sur)</td>
<td>Food</td>
</tr>
<tr>
<td>Brosimum rubescens Taub. Moraceae</td>
<td>palo de oro (sp); pau-rainha (Bra); satijnhout (Sur)</td>
<td>Crafts</td>
</tr>
<tr>
<td>Brosimum utile (Kunth) Pittier Moraceae</td>
<td>lechero, árbol vaca (Col)</td>
<td>Crafts</td>
</tr>
<tr>
<td>Calathea lutea (Aublet) G. Meyer Marantaceae</td>
<td>cauassu (Bra)</td>
<td>Wax</td>
</tr>
<tr>
<td>Caryocar nuciferum L. Caryocaraceae</td>
<td>sawari, butternut (Guy); sawarinoto (Sur)</td>
<td>Food</td>
</tr>
<tr>
<td>Castilla ulei Warb. Castilla spp. Moraceae</td>
<td>caucho (Col)</td>
<td>Latex</td>
</tr>
<tr>
<td>Croton lechleri Mull. Arg. Euphorbiaceae</td>
<td>sangre de drago (Col)</td>
<td>Medicinal</td>
</tr>
<tr>
<td>Duguetia lepidota (Miq.) Pulle Annonaceae</td>
<td>yara yara (Ven)</td>
<td>Food</td>
</tr>
<tr>
<td>Euterpe cuatrecasana Dugand Arecaceae</td>
<td>palm heart (e); naídí (Col)</td>
<td>Food</td>
</tr>
<tr>
<td>Euterpe edulis Mart. Arecaceae</td>
<td>palm heart (e); açai, assai (Bra)</td>
<td>Food</td>
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<tr>
<td>Euterpe oleracea Mart. Arecaceae</td>
<td>açai (Bra); manicole (Guy); pina (Sur); palmito (Bra, Ven); palm heart (e); nandi (Col); podoesc (Sur)</td>
<td>Food, roof thatch</td>
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<td>Family</td>
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<td><em>Euterpe precatoria</em> Mart.</td>
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<td>palm heart (e); asahí (Col); winamoro (Guy)</td>
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<td><em>Ficus insipida</em> Willd.</td>
<td>Moraceae</td>
<td>figuera (Br); chibechía (Col)</td>
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<tr>
<td><em>Ficus serratifolia</em> Post.; Kunst</td>
<td>Arecaceae</td>
<td>diablafurcia (Guy); las palmas (Sur); baru/bara, palma tepudora (V en)</td>
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<tr>
<td><em>Hakea spec.</em></td>
<td>Musaceae</td>
<td>wild banana (Guy)</td>
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<tr>
<td><em>Heteropetalum bentingii</em> (Kunt.)</td>
<td>Arecaceae</td>
<td>cupo-típico, joroco (Br); kemona (Br, Sur); mbrs (Guy)</td>
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<td><em>Heteropsanyma oliveri</em></td>
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<td>mimbres (Col)</td>
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<td><em>Heteropsanyma schottii</em></td>
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<td>tica, joroco (Br); manuca (V en)</td>
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<td><em>Hovenia brasiliensis</em> Mill. Arg., <em>Hovenia spp.</em></td>
<td>Euphorbiaceae</td>
<td>rubber (e); seringueira (Br); caucho (Col)</td>
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<td><em>Hovenia pauciflora</em> Mill. Arg.</td>
<td>Euphorbiaceae</td>
<td>rubber (e); seringueira (Br); caucho (Col)</td>
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<td><em>Hyptis crenata</em> L.</td>
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<td>patauá (Br); mucopos (Col, seje (Col, V en); wapu (Sur, Guy)</td>
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<td><em>Leopoldinia piassaba</em> Trin.</td>
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<td>piassaba, Pará piaçava (Bra); cauchoqueh (V en); cba (Col, Guy)</td>
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<td><em>Leontochirpora</em></td>
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<td><em>Liriodendron tulipifera</em></td>
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<td>anacá (Gu); cauchoqueh (V en); cba (Col, Guy)</td>
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<td><em>Lophodermium flavescens</em></td>
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<td>manta (Br); mbrs (Col, V en); guacure (Sur)</td>
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<td>chihuhuaza (Col)</td>
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<td><em>Maquira coriacea</em> Karsten</td>
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<td>muiratinga (Bra)</td>
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<tr>
<td><em>Myrciaria dubia</em> Kunth</td>
<td>Myrtaceae</td>
<td>camu-camu (Col)</td>
</tr>
<tr>
<td><em>Myroxylon balsamum</em> Harms</td>
<td>Fabaceae</td>
<td>balsam (Col)</td>
</tr>
<tr>
<td><em>Ochroma pyramidale</em> Cav. ex Lam. Urb.</td>
<td>Bombacaceae</td>
<td>balsa (Col)</td>
</tr>
<tr>
<td><em>Oenocarpus bacaba</em> Mart.</td>
<td>Arecaceae</td>
<td>bacaba (Col); kumbu (Sur)</td>
</tr>
<tr>
<td><em>Oenocarpus flexuosus</em> (Kunth)</td>
<td>Arecaceae</td>
<td>cb (Col, V en); guacure (Sur)</td>
</tr>
<tr>
<td><em>Pilostyles petiti</em> Bartram</td>
<td>Fabaceae</td>
<td>angico (Col)</td>
</tr>
<tr>
<td><em>Psychotria ipecacuanha</em> Stokes</td>
<td>Rubiaceae</td>
<td>ipecacuanha (Bra)</td>
</tr>
<tr>
<td><em>Rhizophora mangle</em> L.</td>
<td>Acanthaceae</td>
<td>mangMary (Sur); plum (Guy)</td>
</tr>
<tr>
<td><em>Smilax officinalis</em> Kunt.</td>
<td>Smilacaceae</td>
<td>sanpinaria (Guy)</td>
</tr>
<tr>
<td><em>Smilax uniflora</em> Bentham.</td>
<td>Acanthaceae</td>
<td>sanpinaria (Col); sanp aprilla (Guy)</td>
</tr>
<tr>
<td><em>Spondias mombin</em> L.</td>
<td>Anacardiaceae</td>
<td>plum (Guy); sanpinaria (Col); sanpinaria (Guy)</td>
</tr>
<tr>
<td><em>Stryphnodendron americanum</em></td>
<td>Anacardiaceae</td>
<td>plum (Guy); sanpinaria (Col); sanpinaria (Guy)</td>
</tr>
</tbody>
</table>
Appendix 3

Threat Categories and Regulations

The IUCN Threat Categories used in this report are taken from the IUCN Red List last updated in 2002 (IUCN, 2002). For the commercial wildlife species in the Guiana Shield, A1d or A2d are the most significant factors contributing to the decline of the species. A1d and A2d are used in the IUCN Red List categories and criteria are used in the box below.

2001 Categories (version 3.1)

- **Extinct (EX)**: A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual, throughout its historic range), have failed to record an individual. Surveys should be over a time frame appropriate to the taxon’s life cycle and the habitat. Extinct in the Wild (EW): A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population outside the past geographical range.

- **Extinct in the Wild (EW)**: A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity, or as a naturalized population outside the past geographical range.

- **Critically Endangered (CR)**: A taxon is Critically Endangered when it is in great danger of extinction in the wild in the immediate future. A taxon is Threatened (T) when it is not Critically Endangered but it is in some danger of extinction in the wild.

- **Endangered (EN)**: A taxon is Endangered when it is not Critically Endangered but it is in some danger of extinction in the wild.

- **Vulnerable (VU)**: A taxon is Vulnerable when it is not in imminent danger of extinction in the wild.

- **Near Threatened (NT)**: A taxon is Near Threatened when it has been assessed as not being Critically Endangered, Endangered, or Vulnerable.

- **Least Concern (LC)**: A taxon is Least Concern when it has been assessed as not being Critically Endangered, Endangered, Vulnerable, Near Threatened, or Data Deficient.

- **Data Deficient (DD)**: A taxon is Data Deficient when there is not enough information available to make a formal IUCN Red List assessment.

- **Not Evaluated (NE)**: A taxon is Not Evaluated when the taxon has been assessed as Data Deficient but the information is not sufficient to make an evaluation.

Species | Family | Vernacular and Common names | Use category
--- | --- | --- | ---
*Theobroma grandiflorum* | Sterculiaceae | cupuaçu (Br), copoazu, copuasú (Col) | Food (probably cultivated outside Brazil)
*Thoracocarpus bisectus* | Cyclanthaceae | scraping nibi (Guy) | Crafts
*Uncaria tomentosa* | Rubiaceae | curi (Goi), uña de gato (Col) | Medicinal
*Virola surinamensis* | Myristicaceae | ucuúba (Bra), dalli (Guy) | Oil
*Vriesia splendens* | Bromeliaceae | flaming sword (e) | Ornamental
*Zygosepalum labiosum* | Orchidaceae | Ornamental
1994 Categories (version 2.3)

Lower Risk (LR) A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

1. Conservation Dependent (cd). Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.

2. Near Threatened (nt). Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.

3. Least Concern (lc). Taxa which do not qualify for Conservation Dependent or Near Threatened.

More information can be found on the Red List Categories and Criteria on www.redlist.org/info/categories_criteria.html.

CITES

The Convention on International Trade in Endangered Species of Flora and Fauna (CITES) was established in 1975 to protect threatened species found in international trade. CITES is an international agreement that monitors the global trade in many species of wildlife and plants. A total of 151 countries, including all countries of the Guiana Shield region, co-operate through a system of permits and certificates to confirm that trade in listed animal and plant species (including parts and derived products) is legal, and would not threaten their survival in the wild.

The CITES convention is made up of three Appendices (see also www.cites.org):

Appendix I lists species for which trade in wild material is prohibited because of the threat of extinction.

Appendix II lists species which can be traded, but require special permits.

Appendix III lists species that any party country wants listed to help regulate the level of exploitation and for which it needs the co-operation of other parties to control the specimens in international trade.

To list species on Appendix III does not require a vote by all parties, as is the case for listing on Appendices I and II.

Some CITES resolutions are of interest when developing sustainable use or animal husbandry projects:

Resolution 8.3: Recognition of the benefits of trade in wildlife: acknowledges that commercial trade may be beneficial to the conservation of species and ecosystems and/or the development of local people when carried out at levels that are not detrimental to the survival of the species in question.
Resolution 8.9 (Rev.)/Decision 11.106 covers the Significant Trade Review Process, a process that is carried out if there is a significant trade in any species, defined as 100 units/year.

Resolution 8.15: Provides guidelines for a procedure to register and monitor operations breeding Appendix I animal species for commercial purposes.

Resolution 10.16: Deals with specimens of animal species bred in captivity.

**European Commission Decisions**

When exporting plants and animals to European countries, the European Commission can issue import restrictions under EEC Regulation (N. 338/97, 939/97 recently amended as 1579/01/EC, 1808/01/EC and 2087/01/EC). While CITES focuses on the country of export, the EC concentrates on import bans and permits. The EC assesses whether trade is detrimental for a species within each country of export. The outcome is a strict regulation above the national law within Europe. Following the CITES model, the EC Regulation is more stringent than CITES and covers more species (Cook et al., 2002).

The EC Regulation No 338/97 has four Annexes (A-D):

- **Annex A** covers all CITES Appendix I species, some CITES Appendix II and III species for which the EU has adopted stricter domestic measures, and some non-CITES species.
- **Annex B** covers all other Appendix II species, some Appendix III species, some non-CITES species.
- **Annex C** covers all other Appendix III species.
- **Annex D** covers some Appendix III species for which the EU holds a reservation and some non-CITES species.

For species in Annexes A and B, import conditions are also stricter than under CITES. The data on EC decisions are also stored in the CITES databases (www.cites.org).

Although the EC regulation is above national law, the penalties assigned by member states are not. As a result, European countries with weaker enforcement provisions are often targeted by those in the illegal wildlife trade racket (Cook et al., 2002). Border control in western Europe is sometimes lax, so once illegal wildlife products are in Europe (perhaps via one of the few countries that did not sign CITES), they can quite easily be distributed to the major markets in Europe (Cook et al., 2002).

**US Regulation**

The USFWS (United States Federal Wildlife Service) is one of the other agencies responsible for wildlife trade, along with the US Customs. USFWS has an inspector and investigator function (Cook et al., 2002). The US maintains a complete ban on the import of wild and captive birds under the 1992 Wild Bird Conservation Act, unless certain standards and criteria are met (Duplaix, 2001).