Caiçara Communities of the Southeastern Coast of São Paulo State (Brazil): Traditional Activities and Conservation Policy for the Atlantic Rain Forest

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Abstract

This paper addresses the traditional resource use by Caiçara communities, their means of subsistence and the critical aspects related to their survival within a restrictive protected area — the Estação Ecológica de Juréia-Itatins (EEJI). This study is based on historical and social data and its approach is ethnographic and ethnoecological. Caiçara communities descend from the intermarriage of Portuguese colonists, Indian populations and African slaves. Traditional activities linked to the ecological calendars are analyzed within economic and environmental policy contexts. The response of Caiçara subsistence economy to external changes is also appraised. The EEJI is located on the southeastern coast of São Paulo State and is covered by the Atlantic Rain Forest. This forest is a severely endangered tropical and subtropical ecosystem, due to 500 years of demographic and urban growth. Knowledge of the historical background and the comprehension of the Caiçara resource and land use practices should be integrated to policies of preservation of the Atlantic Rain Forest and, particularly to EEJI management plans.

Keywords: *Caiçara, Atlantic Rain Forest, ethnoecology, traditional communities, Juréia-Itatins*

Introduction

This study was carried out on *Caiçara* communities living in a protected area — the *Estação Ecológica de Juréia-Itatins* (*Juréia-Itatins* Ecological Reserve, *EEJI*) — situated on the southeastern coast of São Paulo State, Brazil. The term *Caiçara* is commonly used to describe artisanal fishermen or agriculturists of mixed African, European and Native South American descent (Diegues 1983; Mussolini 1980; Ribeiro and Neto 1992), living within the Atlantic Rain Forest ecosystem.

Estação Ecológica is a Brazilian official term defining a category of protected areas solely devoted to the preservation of natural ecosystems. The goals of the *Estação Ecológica* are to protect integrally 90% of the area, and to dispose 10% to scientific, basic investigation and to environmental education (Nogueira-Neto 1991; Por and Imperatriz-Fonseca 1984). Human settlement is not allowed inside this protected area (Brito 1998), however, 120 *Caiçara* families live within the *Estação Ecológica de Juréia-Itatins.* The government decree creating the reserve stipulates that the entire area should eventually be public (São Paulo 1995), and presently less than 20% of the area under protection has been expropriated by the São Paulo State government.

The Atlantic Rain Forest was the first Brazilian ecosystem to be settled by European colonists, just after the discovery of Brazil (Mussolini 1980). Before 1500, the Atlantic Rain Forest was continuously distributed along the Brazilian coast from Rio Grande do Norte to Rio Grande do Sul States, covering 1.1 millions km^2 (Capobianco and Lima 1997). Presently, Atlantic Rain Forest is still found in only 8.8% of its original area. Most remnant forested areas are under pressure and are still destroyed at elevated rates (Dean 1996).

The development of *Caiçara* culture is closely tied to the history of occupation of the Brazilian southeastern Atlantic Rain Forest. From the contact between Atlantic Rain Forest Indian and the European cultures (during expeditions to seize Tupinambá Indians for slave labor) a new culture has emerged. The first descendants from European, Indian, and later, African populations, were called "mestizo" by Portuguese colonists (Mussolini 1980; Ribeiro 1995; Willems and Mussolini 1966). The *Caiçara* culture has its origins in those "mestizo" populations (Cunha 1998; Queiroz 1969).

Today, the *Caiçara* concept is linked to a social group composed of people living close to the Rain Forest, with subsistence strategies tied not only to ecological factors (Begossi and Richerson 1992), but also to political-economic constraints (Marcílio 1986; Mussolini 1980). For instance, some

of their main activities, such as shifting cultivation or swidden agriculture, are an Indian heritage representing adaptations to household mobility and a subsistence economy (Candido 1964).

This broad characterization reflects a great social diversity on a regional level and, as is, it could include other traditional communities in Brazil. However, the term *Caiçara* has been strictly employed to describe coastal communities of São Paulo State and Lower Vale do Ribeira region (Brito and Vianna 1992; Diegues 1983), while inland inhabitants are referred to as Caipira (Cândido 1964; Queiroz 1983). Additionally, both *Caiçara* and *Caipira* peoples are also generally designated as "peasants" or "traditional populations" (Adams 1998; Martins 1981; Queiroz 1973; Wolf 1970).

Caiçara communities in *EEJI* are herein referred to as a defined social group whose related families live close together in household units, a central element of the social organization system (cf., Candido 1964; Mussolini 1980). Other attributes that characterize *Caiçara* are: 1) kinship or *compadrio* cooperation (cf. Moran 1974, 142) in economic activities; 2) slash and burn agriculture or shifting cultivation (*coivara*) as the main subsistence activity; 3) unlike Indian communities, the influence of regional political-economical context and the external trade in the *Caiçara* social dynamic and subsistence systems (Begossi 1997a, 1997b, 1997c).

The São Paulo State government has considered the *Caiçara* population within *EEJI* as "traditional" (São Paulo 1991). This term refers to those inhabitants with social and historical ties to the region, who depend mainly on the use of the ecosystem as means of subsistence (Orlove and Brush 1996; Vianna 1996). It is employed politically to mean that human presence is compatible with preservation goals (Vianna 1996).

In Brazil, there is the tendency to dichotomize discussions (Adams 1998, 299) on permanence and the compatibility of traditional inhabitants' activities with conservation goals of protected areas (cf., Diegues 1994; Hogan 1995; Oldfield and Alcorn 1987). In the case of *EEJI*, the controversial issue concerns *Caiçara* practices such as hunting, slash and burn agriculture and artisanal fishing. Hunting, for instance, has been considered incompatible with restricted protected areas (e.g., Peres 1994; Redford 1993; Redford and Robinson 1987), particularly in the Atlantic Forest (Martuscelli et al. 1994). On the other hand, the *Caiçara's* presumed knowledge of and balanced relationship with the Atlantic Rain Forest have both been used as an argument for legalizing settlements of these traditional populations within restrictive protected areas (Diegues 1994; Orlove and Brush 1996). However, empirical evidence of the way *Caiçara* subsistence strategies affect the Atlantic Rain Forest is still scarce (Adams 1998).

Adams (1998) shows that from the 30s to the 60s most of the research about *Caiçara* were sociological and social anthropological. Human ecology research on *Caiçara* grew only after the 80s, motivated by political debates and conflicts. Some of these studies revealed the rational aspects of natural resource use by *Caiçara*, through incorporation of microeconomic models (Begossi 1992, 1993, 1997a, 1997b, 1997c).

The relationship between *Caiçara* and the Atlantic Rain Forest ecosystem will always be complex. First, since colonial times, increasing exploitation and human settlement have destroyed the Atlantic Rain Forest. Second, despite the maintenance of their traditions, *Caiçara* have always been part of a broader economic scenario (Vale do Ribeira). While the validity of the first argument is well established, the second one is supported by this study. Final considerations deal with cultural and environmental issues for the conservation of the Atlantic Rain Forest.

Methods

Study Area

The *Estação Ecológica de Juréia-Itatins (EEJI)* is located on the southern coast of São Paulo State (24˚30'S, 47˚15'W) on Vale do Ribeira region. It has an area of 798.30 km^2 comprising Iguape, Peruíbe, Itariri and Miracatu municipalities (Figure 1). The *Estação Ecológica da Juréia* was created in 1980 by the federal government to produce a buffer zone for a planned nuclear power plant (that has never been built), embracing 230.00 km^2 of flood plain areas (Nogueira-Neto 1991). In 1986, after strong lobbying by environmentalists, those areas and the Itatins Mountains were incorporated into the *Estação Ecológica de Juréia-Itatins.*

The *EEJI* encompasses a portion of the Atlantic Rain Forest ecosystem enclosed between two mountainous massifs (Catharino and Olaio 1990; Martuscelli et al. 1994): the Serra da Juréia on the southern coast, reaching altitudes of 800m, and the Serra dos Itatins, where the highest peak reaches 1,350 m. These massifs are separated by 40 km of lowland (Por 1986; Por and Imperatriz-Fonseca 1984). An association of sand dune, mangroves, swamp forest, slope forest, and mountain top vegetation formations characterizes the Atlantic Rain Forest. Together they form an ecological continuum of great importance to the maintenance of this ecosystem equilibrium (Rizzini 1979; Viana 1995).

Almost 50% (364.00 km^2) of *EEJI* area is covered by the flood plain of the Una do Prelado River. This river belongs to Ribeira de Iguape Basin, considered the last remaining area covered by swamp forest in São Paulo State (Por 1996). The coastal flood plain areas have been the most strongly affected habitat by human occupation, since the first settlements 8,000 years ago (Dean 1996).

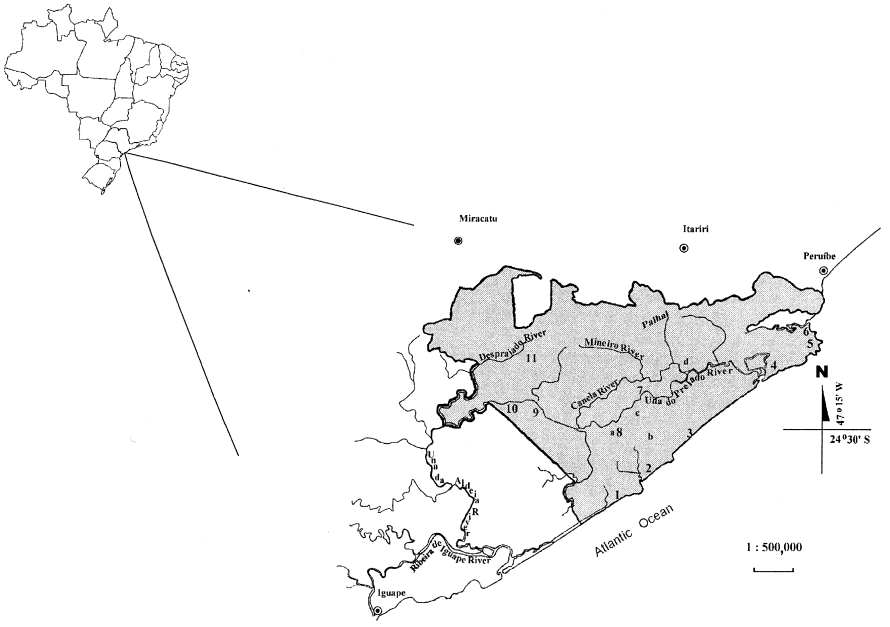

Figure 1. *EEJI localization and Caiçara communities*. Praia da Juréia (1), Rio Verde (2), Praia do Una (3), Vila Barra do Una (4), Parnapuã and Praia Brava (5), Guarauzinho (6), Rio Comprido (7), Cachoeira do Guilherme (8), Aguapeú (9), Rio das Pedras (10) and Despraiado (11). Some old settlements: Vila Cachoeira do Guilherme (a), Pogoçá (b), Descalvado (c), Palhal and Pimenteira (d).

Compared to the immediate past, when only native Indians inhabited the Atlantic Rain Forest, an intense destruction took place in a short period of time after European colonization. In São Paulo State, great deforestation took place in favor of cattle ranching, coffee plantations and immigrants' settlements (Capobianco and Lima 1997; Martins 1981).

The Atlantic Rain Forest ecosystem is considered a hot spot for biodiversity conservation (Primack 1995; Hanazaki et al.1996) and local extinction is documented (Brooks and Balmford 1996). In São Paulo State, the remnant natural areas (almost 17,000 km^2) represent only 5% of the original forest cover (Brasil 1996; Capobianco and Lima 1997; SOS Mata Atlântica and INPE 1993). Nowadays, the largest tracts of relatively undisturbed habitat are found along the Serra do Mar slopes on Vale do Ribeira region, where the *EEJI* is located.

Until 1992, there were approximately 1207 people (365 families) living inside the *EEJI*. Out of these, policy makers classified 120 *Caiçara* families as "traditional inhabitants" (São Paulo 1991). It is on the Una do Prelado flood plain areas that most of the *Caiçara* people are distributed in family units. Population densities in those areas reach 0.32 inhabitants per km^2, forming small aggregations known as "communities" or "*bairros*". Figure 1 shows localization of these communities, where Despraiado and Vila Barra do Una include other non-traditional families. These came from other areas of the country and were not included in this study.

"Communities" or "*bairros*" are usually employed by policy makers as designations for artificial social aggregations, in order to identify those groupings. However, *Caiçara* recognize themselves as belonging to *apovoados* (small communities) when they refer to their past history of social and geographical organization. Thus, both communities and *apovoados* are terms herein considered synonyms.

Data Collection

This paper is based on historical and social data collected between 1989 and 1996, using an ethnographic and ethnoecological approach. I investigated changes in subsistence activities under different economic and historical contexts. The analysis is derived from information recorded from *Caiçara* informants, some of them still living in *EEJI*, and from direct observations.

Historical data were obtained from oral tradition and, when possible, compared to official documents and publications. This method allowed me to reconstruct the history of current inhabitants' predecessors and the historic and economic past of Vale do Ribeira. *Caiçara* recognize five major historical milestones (as presented in Table I). However, memory should always be considered selective, and the informant establishes his or her own shortcuts (Cunha and Rougeulle 1989; Peoples and Bailey 1988; Vansina 1985). The examination of official documents provided a chronological sequence for the facts reported by informants.

I assessed the *Caiçara* pattern of social organization through interviews and direct observation. The ethnoecological data consisted of descriptive records of animal and plant species names and of main labor tasks, such as farming, gathering, hunting and fishing, with respect to the ecological calendars.

After interviewing dozens of *Caiçara*, I selected twenty-one individuals as key informants. Then I conducted semi-structured, formal and informal interviews, through open-ended questions, followed by participant observation and sometimes by group interviews. I also accompanied informants on some of their forest incursions, whenever possible. The selection of key informants and the accuracy of ethnographic data based on oral traditions are based on the meth-

odologies of Bernard et al. (1984), Goward (1984), Holy (1984), and Vansina (1985).

The ethnoecological interviews and surveys were conducted under the assumption that a system of cognitive categories reflects a shared folk culture of utilitarian behavior (Madi and Begossi 1997; Netting et al. 1995, 56; Paz and Begossi 1996). This approach has been criticized as an oversimplification of the folk system (Hunn 1982; Toledo 1992). However, I decided to employ it in this research because it was never my intention to go beyond the understanding of ecological resource and land use by the *Caiçara*. Here I emphasize the analysis on *Caiçara* representation of nature in relation to their subsistence needs (c.f., Ellen 1989) and some conflictive points to conservation goals.

Results and Discussion

Caiçara Culture and Origins of the Juréia-Itatins Settlement

Some events — like historic, politic and social milestones — have great influence on the different strategies adopted by the *Caiçara*, as summarized in Table 1. This table provides a chronological framework to position practices, social organization and their changes. These events are related to the past of the Vale do Ribeira, where Juréia history is embedded.

The *Caiçara* origins in *EEJI* date back to the 16th century, when Ribeira de Iguape River became the main route for inland incursions aimed at the recruitment of Indian workmen, especially for gold mining activities. Iguape was one of the first villages founded along the Brazilian coast at this time, soon becoming a very rich village through gold mining activities and later through the advent of rice trade (Petrone 1966; Teleginski 1993).

The Iguape port was the central place through which products were bought in bulk and sent to Santos and Rio de Janeiro to be exported to Europe. Between the 17th and 18th centuries, colonists seeking gold and other precious metals are believed to have explored the coastal plain forest of *EEJI*. During the first half of the 19th century, it also became attractive to settlement because of the suitability of lands for rice culture and facility for goods transport through the Una do Prelado (or Comprido) River. Remnants of this period can be seen in the ruins of old rice mills, formerly operated through slave labor, which are numerous in *EEJI*.

Before the late 19th century, dispersed settlements are believed to have begun along the Serra dos Itatins valley, and chiefly on the Una do Prelado flood plain. During the "Time of the Ancients," those settlements were initiated by single nuclear families, through forest clearing areas known today as Palhal, Pimenteira, Descalvado and Pogoçá (Figure 1). The flood plain has allowed short-term subsistence crops such as manioc, beans, maize, and rice farming. With the intensification of rice farming to supply Iguape regional market, the flood plain areas attracted more families. Income resulting from agricultural surplus allowed exchange, mainly to obtain salt, sugar, coffee, kerosene, and clothes (Candido 1964; Marcilio 1986; Willems and Mussolini 1966).

Most Juréia inhabitants' predecessors were born in Juréia region or came from bordering localities; thus, all 120 *Caiçara* families are indigenous to Vale do Ribeira. The first *apovoados* in Juréia were initially based on one main family. They were composed of relatives, living in different areas, presently known as communities or *bairros* — Praia da Juréia, Praia do Rio Verde, Praia do Una, Vila Barra do Una, Praia do Parnapuã, Praia Brava, Guarauzinho, Rio Comprido (or Rio Una do Prelado), Cachoeira do Guilherme, Aguapeú, Rio das Pedras and Despraiado (Figure 1). As can be seen in Table 1, the changes in the politics and in the regional economy have greatly influenced the community dynamics (mobility of households, decrease in land access, individualization of activities and interests, etc.) and subsistence activities based on ecological calendars (prohibition and restriction on hunting, farming and fishing).

Social Organization and Land Tenure

The old *apovoados*, presently known as communities or *bairros*, consisted of several related households linked by kinship relations. The central core of the *apovoados'* organization was the household, which was characterized by the nuclear family (the parents and their children) or the extended family. Within these *apovoados*, social relationship took place at the neighborhood level, where households were clustered. Higher social organization levels occurred between *apovoados*, and between these and the external environment. These relationships took place through goods-sharing, agricultural *mutirões* and exchange among relatives, and also during religious and local festivals. In the past, the *apovoados* relationship with the external environment was based on the sale of agricultural surplus.

Because of the high land availability and the surplus of rice farming, the practice of agricultural *mutirões* was very common until the beginning of 20th century (Table 1). *Mutirão* is a large-scale mutual help organization, where all "neighbors" participate, and it is one of the most expressive social activities in *Caiçara* culture (Willems and Mussolini 1966, 59). It comprises group activities for cutting, cleaning and cropping, associated with local festivals like *fandango*. It allows intensive relationship within and between households and communities, through which information exchange and marriages occur (Marcílio 1986; Mendonca et al. 1993; Mourão 1971; Mussolini 1980).

Figure 2 summarizes social relationships, showing a general model for the *EEJI Caiçara* communities (Figure 2a). One illustrative example is that of Cachoeira do Guilherme community (Figure 2b), where most social and ritual events used to occur.[2] Until 1995, there were 11 families inhabiting it. Some of its members, represented in Figure 2b by different circle patterns, originated from other communities such as Aguapeú, Rio Comprido, and Praia do Una. These communities still maintain strong connections today. Despite living in different and distant areas, families move for participation on local festivities, religious commemorations, marriages or agricultural *mutirões*. Nevertheless, despite the fact that the entire regional *Caiçara* population is encompassed within *EEJI* limits, the boundary of social and economic relationships go beyond them and also comprehend broader networks than the ones that can be initially assessed.

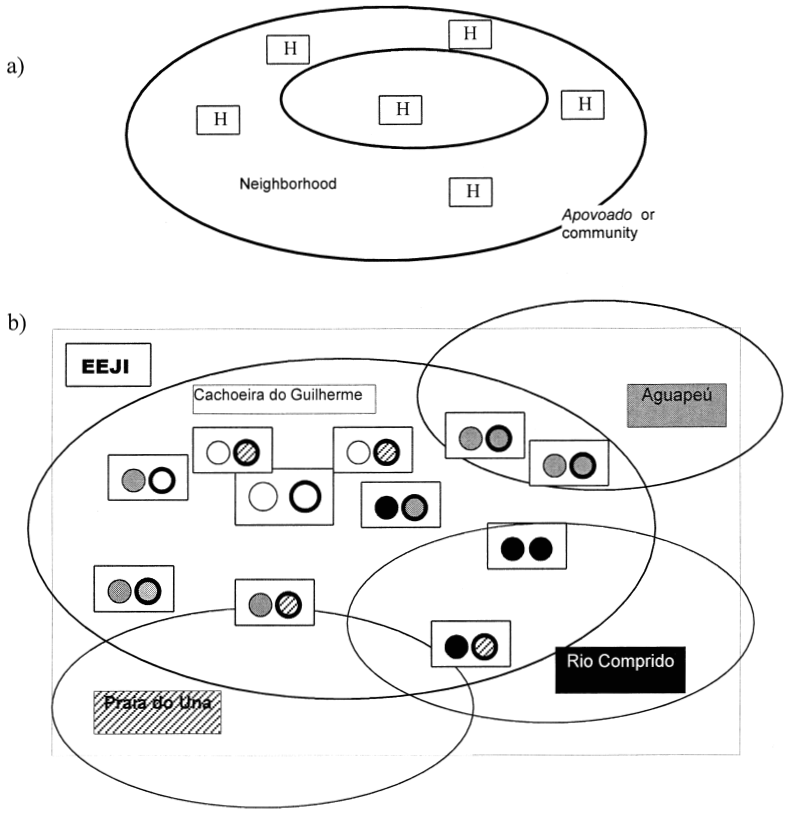

Figure 2. *Spatial model of the Caiçara social organization (a), focusing on the social network between Cachoeira do Guilherme and three other communities (b).* a) In the center of this system is the household (H) and the network is represented by the ring-shaped line. The household can be also related to others forming the "neighborhood". All of them form the *apovoado* or community. b) Each household is herein represented by the parents (e.g., O**O**). The larger household represents the head-leader. Each pattern of circle is associated with the origin of the members from Cachoeira do Guilherme community. They are Aguapéu, Rio Comprido, and Praia do Una, respectively represented by gray, black and striped circles. The relationships occur within (overlapping circles) and out EEJI limits (dotted line).

The main household characteristics are autonomy (Candido 1964) and production returned to the subsistence of the family (Wolf 1970). If the land is available and population density is low, autonomy allows familiar units mobility and under this condition shifting cultivation takes place (Netting 1993). This means that the household can migrate to any available area, as far from its original place as possible, without abandoning it completely or losing contact with neighboring households. Such mobility has also evolved historically as a response to market demands (Netting 1993) and conservation policies.

In *EEJI*, no traditional family owns the land, as has been reported for other *Caiçara* communities (Marcilio 1986; Willems and Mussolini 1966). About 70% of the traditional inhabitants are squatters, or *posseiros*, born in the area or having lived there for a long time, but not possessing legal ownership. The remaining 30% are caretakers, or *caseiros*, who live in the area but work for another *posseiro* or for a legal owner (São Paulo 1991; Sanches 1997).

This land tenure condition can be better understood considering *Caiçara* history. At a time defined as the "Time of the Ancients" (Table 1), the virgin forest belonged to no one, and all subsistence activities (farming, hunting, fishing) were practiced concomitantly. Because resources and land were easily available in the past, it was possible for them to explore the environment, as well as to move across different open areas. This is supported by Candido's (1964) and Netting's (1993) discussion about household mobility.

This way of life changed in response to five events: a) the end of rice trade in Iguape at the end of the 19th century, b) the emergence of palm heart (*palmito*, *Euterpe edulis*) and the timber called *caxeta* (*Tabebuia cassinoides*) exploitation since 1950 in the Vale do Ribeira region, c) increasing land speculation from the 1970's on, d) the threat of the construction of a nuclear power-plant, and e) the creation of *EEJI* in 1986.

One of the main consequences of these changes, summarized in Table 1, was on land use. From the end of the 19th century on, land purchase and appropriation by large landowners took place in Vale do Ribeira. There was a decrease of land availability for farming and crop rotation, and no more surplus seeds were produced for sale. In *EEJI*, there was an increase of *Caiçara* population, caused by the

Table 1. Changes in subsistence activities, and social and economical related issues through time in *Caiçara* communities of EEJI, Sao Paulo State, Brazil.

Events **Activities and general issues**	**Time of the Ancients ? - 1930/1940**	***Caxeta* and *Palmito* industry 1950-1970**	**Speculation on property development 1970-1980**	**NUCLEBRAS 1980-1986**	***EEJI* 1987**
land tenure	no	no	no	no	no
land availability	high	low and expropriation threat	low and expropriation threat	low and expropriation threat	low and expropriation threat
Resources availability	yes	less	less	less	less
land conflicts	start	high	high	high	related to legal permanence
settlement	first nuclear family units and dispersed; small communities or *apovoados*	more concentrated	dispersed	dispersed	dispersed or communities smaller than before; low densities
social organization	household + *apovoados*	isolated household	isolated household	isolated household	household; the *apovoados* are called "community" or "*bairro*"
household mobility	yes	less intense; sometimes only men leaving	yes	some leave the area; some return to it	some leave the area; some return to it
social relationships	intense interrelation; household, neighbors and apovoados	incipient relationships	household dependent on new land owner	tense relationships; hierarchies created due to the hiring acquisition of some persons as forest rangers	tense relationships; hierarchies created due to the hiring acquisition of some persons as forest rangers
hunting	yes	yes	yes	yes but prohibited	yes but prohibited
fishing	artisan; semi-industrial in other regions	artisan; semi-industrial and industrial in other regions	artisan; semi-industrial and industrial in other regions	artisan; semi-industries and industrial in other regions	artisan, but limited
slash and burn agriculture	yes	partially abandoned	partially abandoned	yes but limited by law	yes but limited by law
fallow periods	yes	decrease	decrease	decrease	decrease
mutirão	yes	temporary abandonment	resumed but limited	reduced or interrupted	reduced or interrupted
agricultural surplus	yes; sold and exchanged on regional market	less than before and exhanged within community level	less than before and exchanged within community level	reduced	none
ecological calendars	yes	yes	?	only for agriculture, exploitation and fishing	only for agriculture, exploitation and fishing

displacement of settlers from bordering localities. Families of relatives from old *apovoados*, which were living in these localities, migrated mainly to Una do Prelado flood plain.

Since the 1950's, in the "*Caxeta* and *Palmito* industry" period, private enterprises (such as the Johann Faber pencil industry) bought large areas on Una do Prelado River flood

plain to exploit those plant species. *Caiçara* families began to work for these companies, abandoning agriculture for about 20 years, due to the intensive activity related to cutting and transportation of *palmito* and *caxeta*. Since the 1970's, tourism was vigorously promoted besides the increasing land speculation in EEJI. Land conflicts became more intense (Mourão 1971; Paz and Begossi 1996) and also violent (Siqueira 1984), due to the displacement of Caiçara settlers. The palmito and caxeta exploitation and land conflicts were only interrupted with the plans for the construction of the nuclear power plant and the creation of the *Estação Ecológica da Juréia* in 1980, later called *Estação Ecológica de Juréia-Itatins (EEJI)*. There-after, some *Caiçara* people managed to stay in the *EEJI* as squatters or caretakers. But, their old traditional activities (hunting, shifting cultivation and artisanal fishing) became further limited by law, affecting their previous pattern as well as their social relationships. One of the greatest implications of this situation is associated with farming (see below).

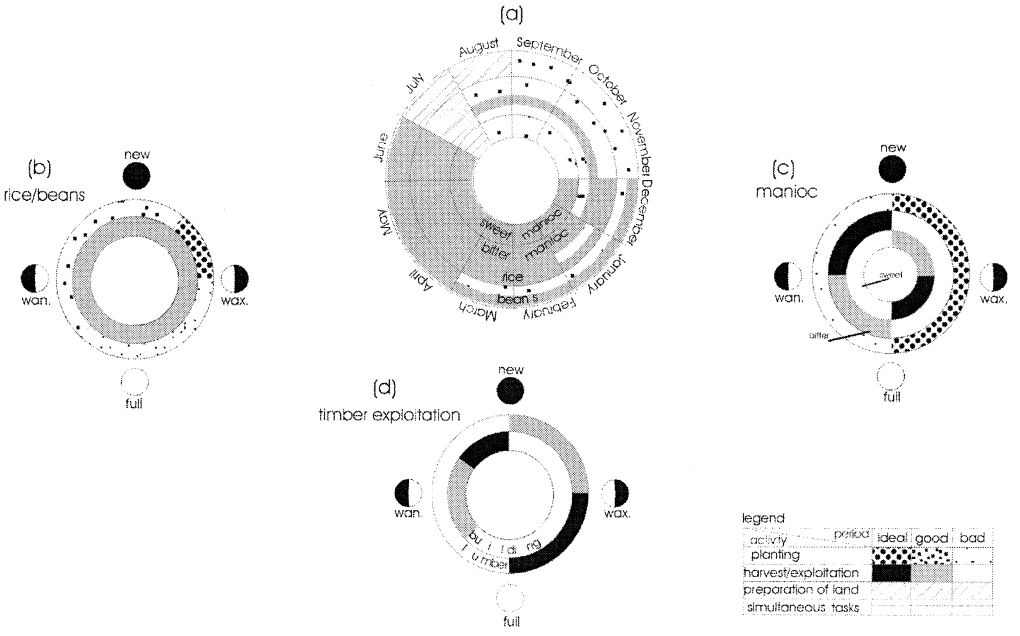

Figure 3. *Agricultural calendar*. a) Annual calendar; b) and c) moon calendar for planting and harvest; d) moon calendar for timber exploitation.

Subsistence Activities and Ecological Calendars

Through ethnobiological inquiries, I recorded almost 300 avian and 40 mammalian species (except small rodents and bats), 65 fishes and 130 tree species (Sanches 1997) associated with subsistence activities. The knowledge of reproductive behavior of many animals and the location of their habitats is important in order to optimize labor tasks. Fishing, timber extraction, gathering (mainly fiber, fruits, and medicinal plants) and farming activities are allowed and still occur in the *EEJI*, but the way these have been performed have changed considerably over time. Below I present a description of *Caiçara* subsistence activities against their respective ecological calendars, as performed in the "Time of the Ancients." I conclude this section with a description of changes in *Caiçara* practices related to historical events.

Regular subsistence activities involved: a) the deep knowledge of the environment as well as ecological and biological aspects of each species and their management (this knowledge was orally transmitted), b) cost-benefit evaluation in decision making (which has varied through time and space as well as decisions on time allocation for these activities), c) the recognition of ecological calendars, with their appropriate months to perform those activities, allowing adequate caloric and protein intakes (Figure 3 and Figure 4), d) employment of available technology (traps and other labor equipment), and e) symbolic aspects such as food taboos, beliefs and myths.

Informants reported farming as the main subsistence activity. Through farming, the *Caiçara* could ensure calories in their diet; they grew annual and perennial food crops, using the slash and burn technique or swidden-fallow agroforestry (coivara) system. This system is still widespread throughout tropical forest habitats in the world (Boserup 1987), among different societies as Caboclos in Amazonia (McGrath 1987; Moran 1974; Murrieta et al. 1989). Farming was reported by the Caicara as the most labor demanding activity year-round. To maximize chances of good crops, the Caiçara followed the agricultural calendar (Figure 3). After choosing a suitable place, small forested areas were cleared (mainly from April to June) for swidden plots (less than 0.5 hectare per household). Then, the forest was burned in the dry season (July and August) and cropping took place with a consortium of different species.[3] As it can be seen in Figure 3, each crop had its best time to plant and harvest. After planting, the tasks were reduced to garden keeping (i.e., grass cutting and weeding) and, after harvest, manufacturing of cer-

tain goods like the manioc flour and rice threshing. With the end of the harvest, gardens were abandoned to fallow, and the cutting began in a new area or in old gardens.

The fallow period (*pousio*) refers to the time the area is left to rest (*descanso*) after the harvest. The length of the fallow is fundamental in the slash-and-burn system, because it allows the forest and soil nutrients to recover,[4] through vegetation succession in tropical areas (Boserup 1987). The *Caiçara* realized the need for a fallow period when production decreased. The period of rest varied from 5 to 10 or more years, according to land characteristics and crop production (for *Caboclo* and Indian farming in the Amazon, see Balée 1989; Brondízio and Siqueira 1997; Brondízio et al. 1994; Meggers 1954; Moran 1974, 1990; for *Caiçara* agriculture, see Jovchelevich and Canelada 1992; Hanazaki et al. 1996; for different regions of the world, see Conklin 1969; Geertz 1969; Johnson and Earle 1987; Rappaport 1968).

Physical and historical conditions were considered when it was time to choose an area to crop. Physical conditions were based on indicators like forest age (stage of succession) and soil properties. In a general way, *Caiçara* recognized the best area for planting as the "virgin" forest. The man who performed felling in order to till the plot acquired the genuine right to the land (Willems and Mussolini 1966, 25). Thus, for the *Caiçara*, the area belonged to the one who first farmed it. According to the kinship level, this "owner" could assign planting rights to relatives from the same or other *apovoados*. [5]

The agricultural calendar was also based on the moon phases. They were crucial for farmers in order to guarantee the crop at the best time. Figures 3b and 3c show the moon calendar for crop and harvest of rice and bean (*Phaseolus* spp.) and sweet manioc and bitter manioc (*Manihot* spp.). Black and high-stippled patterns represent the moon phases considered by *Caiçara* as ideal to perform each task according to the crop. The moon calendar for timber exploitation (Figure 3d) can be associated with the agricultural calendar. Once the forest was cleared, the timber could be used elsewhere, and according to the moon phase, it would have a specific domestic use. For example, the waxing moon was considered ideal for cutting timber to build houses and paddled canoes. Thus, considering physical and historical land conditions, land availability to swidden, the length of the fallow and the agricultural calendar, labor allocation was optimized and provided for surplus production.

Other subsistence activities were hunting and fishing. They used to provide the most important protein source. Hunting was freely conducted until the 70s (Table 1), and was typically a male individual activity, besides being occasional and opportunistic. The technology employed was mainly firearms with the help of dogs, in addition to traps like *trepeiro, ceva, mundéu* and *laço*.[6] *Trepeiro* is a kind of ladder manufactured with large tree branches, where the hunter can sit and wait for the prey. *Ceva* is a place where food is left as bait to attract animals. *Mundéu* is a small cage trap for smaller species of mammals. *Laço* is a rope set as a loop, and employed to capture the collared peccary (*Pecari tajacu*) or other large game.

Hunting occurred in two situations, during forest incursions (hunting trips) and in the form of "peeking" (*espia*), that is, periodically visiting the bait stations (*cevas*) during labor intervals. Hunting trips were infrequent. However, in both modalities, hunting depended on the best time to plant (Figure 3a), since the main interest was in agricultural production. Another factor influencing this activity was the high responsibility laid upon men to bring meat back to the household every time they left agricultural labor to women's care.

The animal harvest was rigorously considered and limited relatively to spatial and temporal factors. The best places for hunting were considered to be either hilly terrain or seasonally inundated flood plain, both difficult to access. These considerations had implications for the number of possible prey (Table 2).

Hunting could also occur during any intervals between agricultural tasks. Men and women would head to the place where the *cevas* were left, normally near the household, or where the *trepeiros* were set. The *cevas* were usually prepared according to the animal's diet, which could indicate an attempt of pre-selection of prey, related to *Caiçara* taste preferences (Table 2). The most desirable preys were: agouti (*Agouti paca*), armadillos (*Dasypus* spp., *Cabassous tatouay*, *Euphractus sexcinctus*), coati (*Nasua nasua*), capybara (*Hydrochaeris hydrochaeris*), collared peccary (*Pecari tajacu*) and white-lipped peccary (*Tayassu pecari*). Preferred birds were tinamou (*Tinamus solitarius*), black-fronted piping-guan (*Pipile jacutinga*) and toucans (*Ramphastus* spp.).

The ecological calendars associated with hunting activities are represented in Figures 4a and 4b. Figure 4a shows the months when hunting occurred more frequently throughout the year, and Figure 4b considers the moon phases, classified as "ideal," "good" or "bad" for harvest and for trap manufacturing. These calendars incorporated factors such as the inherent seasonal nature of habits and breeding cycles of all involved species known to the *Caiçara*. According to Figure 4a, the period from July to September was not proper for hunting, especially for mammals, because of the birth season. The traps were disarmed and the hunting trips were reduced. This could also be due to the low probability of capturing any animal during wintertime. The reduction of the activity would significantly optimize hunting, or it could represent the need for increased attention to prepare the land for agriculture.

The gardens had a role as baits to attract wild animals for harvest. The manioc gardens were invaded by collared pecca-

Table 2. Main harvested animal species and technologies for hunting.

Common name	Species	Harvest time	n	m (kg)	M(kg)	Technology
agouti	*Agouti paca*	Mar-Jul	1 - 4	5 to 13	3 to 20	firearm/dog/*mundéu*
armadillos	*Dasypus* spp., *Cabassous tatouay*, and *Euphractus sexcinctus*	except Jul	1 - 3	2,7 to 6,3a 3,2 to 6,5b	5 to 15	firearm/dog/*mundéu*
coati	*Nasua nasua*	Mar-Jul	2 - 4	3 to 7,2	10 to 20	firearm/dog/*mundéu*
capybara	*Hydrochaeris hydrochaeris*	Sep-Feb	1	35 to 60	40 to 60	firearm/dog
red brocket deer	*Mazama americana*	Mar-Jul	1	24 to 50	30 to 40	firearm/dog
gray brocket deer	*Mazama gouazubira*	Mar-Jul	1-2	20 to 30	15 to 20	firearm/dog
white-lipped peccary	*Tayassu pecari*	any	1-3	25 to 40	40 to 50	firearm/dog/*mundéu*
collared peccary	*Pecari tajacu*	any	1 - 3	17 to 30	80	firearm/*laço*
tinamou	*Tinamus solitarius*	Mar-Jul	6 - 10	-	12	firearm

a Dasypus novemcinctus; b Euphractus sexcinctus

n = number of specimens taken per hunting trip
m = average weight of adults (Emmons, 1997)
M = amount of butchered meat
"n" and "M" are averages of the values estimated by the informants

ries (*Pecari tajacu*) and by tapirs (*Tapirus terrestris*) where they could be killed. This "hunting garden" allowed the acquisition of animal protein during the performance of agricultural tasks. The term "hunting garden" was proposed by Linares (1976) as a stock of protein and carbohydrate. According to her study, these gardens could have been used by the first horticulturist societies that inhabited coastal areas covered by tropical forests.

Almost all coastal *Caiçara* communities fish in the open sea. Fishing has been a very widespread activity along São Paulo coast since the farming market began to decline in the beginning of the 20th century (Diegues 1983; Mussolini 1980; Silva 1993), but this discussion is beyond the scope of the present study. However, in contrast to neighboring coastal regions, sea fishing does not occur in Juréia (Table 1). There is no manufacture of sea-going canoes, nor is there evidence of such activity in the past. Paddled canoes suited to riverine environments are prevalent. In Juréia there was not an active fishing market,[7] as observed in other places (Mourão 1971), and the use of technologies has been limited to subsistence needs (i.e., fishing rods and fishing traps (*covo*, *pari*) for fishing in rivers). The great majority of families inhabiting the coastal areas employed mainly gillnet (*rede de espera*), cast nets (*tarrafas*) and beach seines (*picarés*).

As was shown for hunting and farming, the annual calendars also indi-

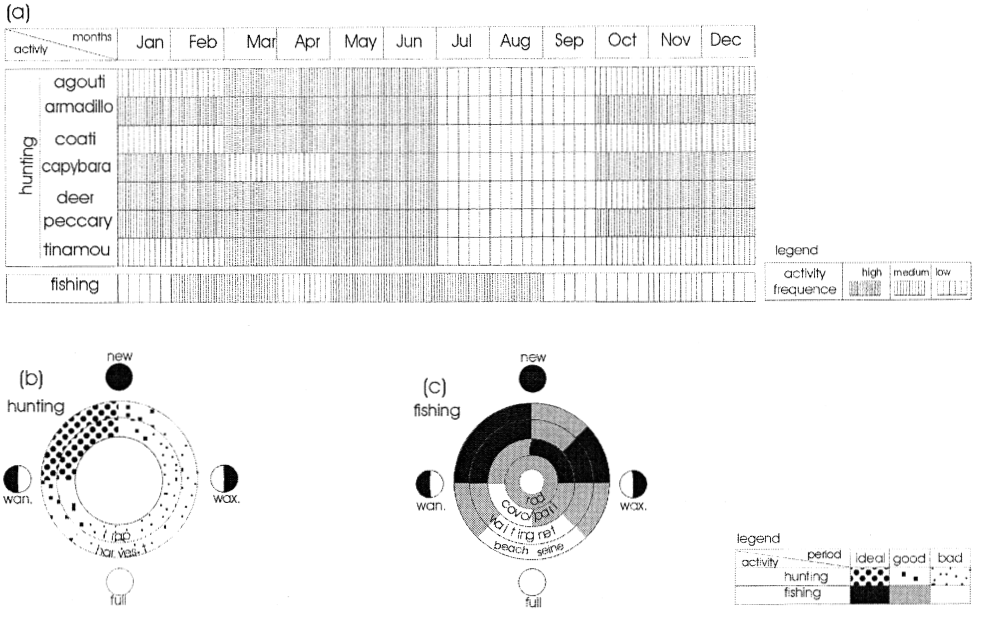

Figure 4. *Hunting and fishing calendar*. a) Annual calendar; b) and c) moon calendar.

cated the best periods for fishing and the kind of technology to be used (Figure 4a and 4c). Figure 4a shows the months when fishing happened more frequently. The *Caiçara* informants refer to the "cold months" (July to August) as the ones providing best quality fishes, despite the fact that the warmer months provide higher productivity to the industrial fishing sector. *Caiçara* fishing activity also increased in these months because of the mullet (*Mugil* spp.), which migrates to the region from May to August.

The employment of different fishing technologies (Figure 4c) followed the lunar calendar. For example, any fishing during full moon was jeopardized by moon brightness. The waxing and the waning moon phases were considered to be bad for fishing, especially with cast nets and beach seines, because both the ebb and full tides during these moon phases are not high enough to allow fish capture on the sea shore (as opposed to what happens during new and full moons). The informants call the former moon phases' tides "seven tides." The new moon was considered the most appropriate or "ideal" period for the use of all technologies in any environment. Like hunting, fishing could also be integrated to farming. For example, fishing traps left on riverbanks were usually visited before lunch and in the late afternoon, and the beach seine was used in the early morning, in late afternoon, or occasionally at night. These periods were not devoted to agricultural labor tasks.

The Historical Events and Changes in Subsistence Activities

As can be seen in Table 1, *Caiçara* subsistence activities have changed since the "Time of the Ancients," due to reduction of the land availability marked by the summarized events. But the most affected activity was farming. While in the past land use and tenure were not limiting factors, the itinerant character of slash-and-burn system was adequate to household mobility. This condition, allied to an intense mutual help organization and a broader network of social relationships inherent to *apovoados* or communities, allowed a surplus production.

After the 1950s, farming and collective activities were partially abandoned in favor of working for private enterprises, and the household economy became dependent on the legal landowners. This situation persisted until the creation of *EEJI*, when farming and some collective activities were recovered, even with legal restrictions imposed by environmental conservation policies and land tenure conditions. The main problem is the instability of legal permanence within the *EEJI*.

Despite this, both fishing and farming may be performed under special authorizations that are issued by technicians according to specific governmental decrees. *Caiçara* are allowed only to cut down the managed forest, usually early second growth (*capoeira*), and to fish in areas delimited by technicians. They still maintain their ecological calendars to perform the tasks and the agricultural *mutirão* still occurs, but less frequently than before. The last one I documented occurred in Juréia six years ago. The need for special authorization, particularly in the case of farming, has led to intensification of cropping over the same area, with the reduction of the fallow period and crop rotation.

On the other hand, hunting has been prohibited since 1967, according to the Brazilian Constitution, and has been reinforced after the creation of the *Estação Ecológica da Juréia* in 1980. In the past the ecological calendar provided control of subsistence hunting, but this probably does not occur now. Although there was an increase in game law enforcement, this does not imply that the local population has abandoned the practice. If hunting still happens — as it probably does — it is a discreet and opportunistic activity undertaken without consideration for any calendar.

Many of the *Caiçara* relatives living outside *EEJI* have looked for jobs in urban centers, hoping to improve the education of their children. Even so, they still maintain their gardens of rice, maize or manioc inside the *EEJI* and whenever possible participate in local festivities, as in the case of Cachoeira do Guilherme community. Technicians have sought to find technical arguments and cooperative solutions with the *EEJI* inhabitants, despite criticism from the scientific community and from the environmental policy makers, both emphasizing the conservation goals of the *EEJI*.

Final Considerations

The *Caiçara* culture continues an important Indian heritage, and its origins can be traced back to the time of the first European contacts. It has evolved over the past five centuries in response to environmental changes associated with the use of the Atlantic Rain Forest. The *EEJI* region, mainly the Una do Prelado flood plain, is a testimony of the numerous forms of management that have been carried out by different inhabitants since pre-colonial times.

The relationship among all subsistence activities — hunting, fishing, farming — has been modified by events such as land conflicts and legal prohibitions, and the creation of *EEJI*. These events also led to changes in traditional cooperative activities, within and between households. It seems that, on the basis of the long history of *Caiçara* use of the Juréia region and the apparent lack of noticeable biological extinction there, the employment of ecological calendars, as in the "Time of the Ancients," would actually lead to a sustainable condition.

Farming has always been a *Caiçara* core activity, struc-

turing household organization and its network of social relationships. Environmental policies have influenced *Caiçara* farming practices mostly by restricting fallow length and land availability. How are the new conditions affecting household adaptation and the land use by *Caiçara*? Only monitoring production levels and their effect on household form and social relationships will allow us to answer this question. In *EEJI* it would be necessary to collect quantitative data on human ecology, such as household form changes (composition and size) associated with subsistence activity changes, and considering time allocation techniques (Netting et al. 1995).

Regulation of agricultural activities should allow the continuity of traditional *Caiçara* practices, such as fallow and crop rotation. Emphasis on alternative economic activities with high valued indigenous species such as palm heart (*Euterpe edulis*) and *caxeta* trees (*Tabebuia cassinoides*) could be an interesting strategy. Legislation ruling their exploitation has already been enforced and scientific research on their management has been undertaken, adding to folk knowledge, which may lead to feasible production of goods from these species without compromising their preservation. It is important to establish ruling strategies pertaining to the use of *EEJI*, taking into consideration both scientific and folk knowledge. In the last two decades, policies creating protected areas without the participation of local populations have generated conflicts and further obstacles for the management of these areas, causing detrimental effects to conservation objectives.

The conservation of the Atlantic Rain Forest also involves an ethical question. Considering that the existence of *Caiçara* communities long predates the creation of *EEJI*, and that the only areas in São Paulo State where some *Caiçara* families are still found are exactly within the Atlantic Rain Forest remnants areas, conservation policies for this ecosystem should also allow the survival and reproduction of these communities. If, on the one hand, science benefits through new discoveries and challenges posed by the diverse organisms from the tropical forest, on the other hand there are people — the *Caiçara* — who still depend culturally and materially on it.

Endnotes

1. e-mail: rosanches@zipmail.com.br
2. It is supposed to have been founded in the 30's and its origin has also a religious purpose influenced by Sátiro da Silva Tavares's father. He and his son were leaders and shamans and have stimulated many families to migrate to Jureia region.
3. For example, raising together bean, maize and manioc, or varieties from one same species, all of them in the same garden.
4. But not necessarily to the original conditions.
5. The Caiçaras usually refer to them by the last name of the family that has first farmed at that place.
6. In many situations the Caiçaras preferred to set the traps in places used by animals as shelter or passages (carrero).
7. According to communities from Praia do Una, sometimes fresh or smoked fishes could be sold but this activity always suffered with the high competition from semi-industrial or industrial fishing.

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