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Brief Communication

Ethnobotany of Atlantic Forest Coastal Communities: Diversity of Plant Uses in Gamboa (Itacuruçá Island, Brazil)

Gisela M. Figueiredo,[1] Hermógenes F. Leitão-Filho,[2] and Alpina Begossi[1]

Local plants are a very important resource for the community of Gamboa, located at Itacuruçá Island, Sepetiba Bay, State of Rio de Janeiro, Brazil. Ninety species of plants, belonging to 40 families, are used for a variety of purposes, such as food, construction, handicraft, and medicine. In a survey medicinal uses for plants were the most quoted by the community. Uses of medicinal plants within Gamboa and with other coastal communities are analyzed using diversity indices. Use by different categories of people based on sex, age, and economic activity was compared and significant differences were found among the groups compared, except for economic categories (fishermen and non-fishermen). The theory of island biogeography is shown to be useful for analyzing different levels of resource uses on different islands.

KEY WORDS: ethnobotany; diversity; island biogeography theory; fishing community; Atlantic Forest.

INTRODUCTION

According to Amorozo and Gely (1988), studies on ethnobotany are urgent, especially in tropical areas, where native populations are subject to cultural and economic acculturation pressures from the dominant society. Because of their dependence on oral transmission, such pressures may endanger the knowledge that native populations have of plants and their uses. The loss of traditional habits has been reported in many eth-

[1]Núcleo de Estudos e Pesquisas Ambientais (NEPAM), Universidade Estadual de Campinas (UNICAMP), CP 6166, Campinas, 13081-970, SP, Brazil.
[2]Departmento de Botânica e Parque Ecológico, UNICAMP, Campinas, 13081-970, SP, Brazil.

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nobotanical studies in different parts of the world, such as in the United States (Timbrook, 1990), Alaska (Holloway and Alexander, 1990), India (Navchoo and Buth, 1990), and Brazil (Furtado *et al.,* 1978; and Begossi, 1989).

Ethnobotany is an interdisciplinary field in which biological and cultural factors are important (Johns *et al.,* 1990). For example, ecological concepts and measures, such as *niche* and *diversity* have been shown to be very useful for understanding the use of resources by human populations. Hardesty (1977) and Begossi and Richerson (1993), among others, estimated the ecological niche of human populations through measures of abundance and variety of resources used by those populations. In other cases, such as when studying communities located on islands, the classical theory of island biogeography (MacArthur and Wilson, 1967) may be useful for comparing levels of resource use on different islands.

Islands are excellent sites for ecological studies because relative to continents they have a small, delimited area. Islands also may provide replications for natural experiments to test evolutionary hypotheses related to dispersal, invasion, competition, and adaptation (MacArthur and Wilson, 1967).

Island biogeography theory emphasizes that colonization and extinction rates of species are factors influencing the diversity of species in an area (MacArthur and Wilson, 1967). Colonization rates diminish the further islands are from the mainland and small colonization rates increase the probability of species' extinction on an island, a factor also influenced by the island area (MacArthur, 1972). Models based on the theory of island biogeography may also be used to investigate the interaction between island peoples and natural resources.

In this study it is suggested that native human populations from small islands or from islands further from the coast will use a lower diversity of natural resources than populations living on islands close to the mainland or larger islands. Nevertheless, in case of human populations, other factors, such as cultural habits and income, may be important in determining the intensity of plant use by a population (Furtado *et al.,* 1978).

This study includes a survey on plant utilization by the community of Gamboa. Plants are used for a variety of purposes and the community depends also on other resources, such as fish. Some plants are collected in the forest, others in disturbed areas, and some are cultivated plants. Traditional communities, even those close to urban centers such as Rio de Janeiro, also depend on forest resources. Naturally, this use has implications for the resource management of areas such as the top priority conservation area of the Atlantic Forest, (Conservation International, 1992). The last remnants of the Atlantic Forest are in the process of becoming

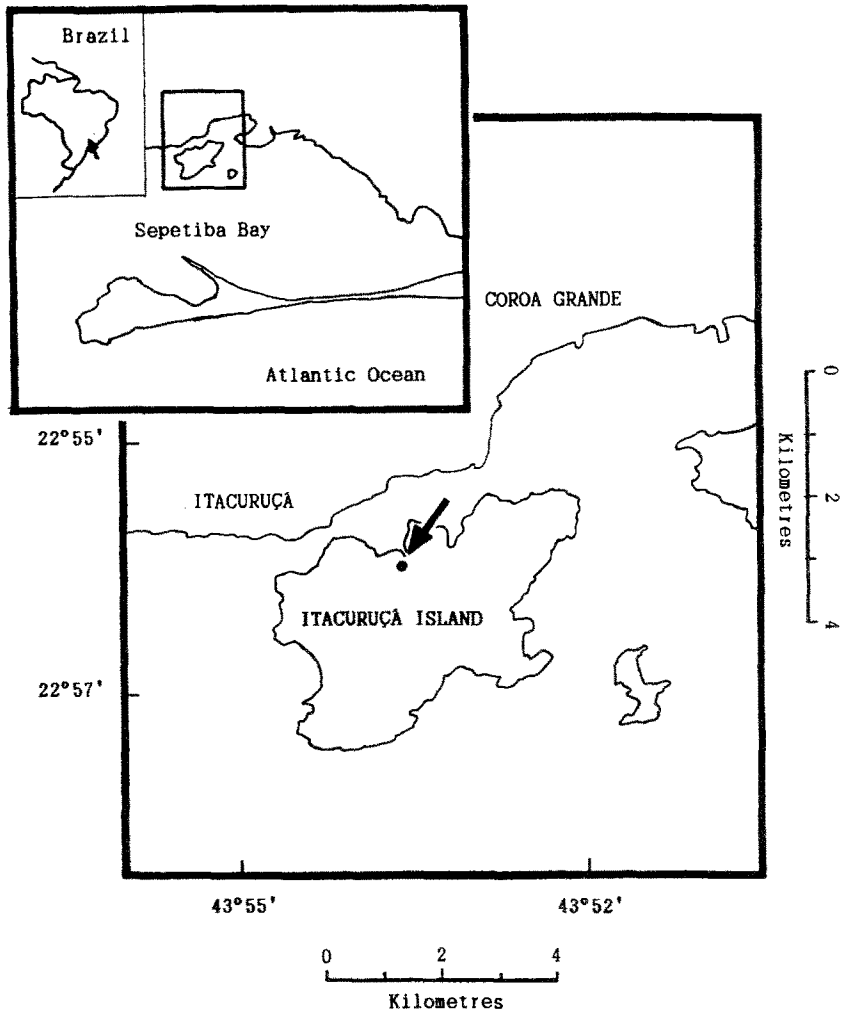

Fig. 1. Map of Sepetiba Bay, located in southeast Brazil, including Itacuruca Island and the community of Gamboa (arrow).

part of the Biosphere Reserves (MAB/UNESCO) (Lino, 1992), which will include an important part of the southern Brazilian coast.

Study Site

Itacuruçá Island is located in Sepetiba Bay, southeast Brazil (22° 57'S, and 43° 54') (Fig. 1), has an area of 8.3 km^2, and is 0.8 km distant from

the coast (Fernandez *et al.,* 1988). The community of Gamboa includes about 26 families, most of them artisanal fishers. The rest of the island includes tourist (non-residents') houses owned by families mostly from the city of Rio de Janeiro. The Sepetiba region is called the "Green Coast" and has many hotels and restaurants. Economic activities in Gamboa include artisanal fishing (Begossi, 1991; Begossi, 1992), and the cultivation of manioc, bananas, avocado, and coconut, besides tourism.

METHODS

This research is part of a major study, started in 1989, on the use of resources by small-scale communities of Sepetiba Bay, especially artisanal fishers (Begossi, 1991). Systematic fieldwork was carried out in visits to the community, a week each month, during six months; the ethnobotany study, beginning in March 1990, included a specific methodology of interviewing people and collecting plants.

The survey on plants used by the community of Gamboa was based on interviews with open-ended questionnaires. Fifty-eight residents over 18 years old were interviewed in their homes. Plants were collected in field trips in 1990 and 1991, and informants helped in the folk identification of the plants mentioned in interviews. The plants were identified by one of the authors (H.F.L.F.) and deposited at the Herbarium of the Universidade Estadual de Campinas, Brazil. Diversity indices were calculated based on the plants quoted (folk names) by islanders in interviews.

RESULTS AND DISCUSSION

Ninety species of plants, belonging to 40 families, were quoted in interviews and collected. Plant families most mentioned as used by islanders are Rutaceae (ten species), Compositae (nine species), Labiatae (eight species), and Solanaceae (seven species).

Cultivated plants and plants collected for food and medicine are in Table I. Banana is the major food plant mentioned and orange, *boldo*, and balm (*erva cidreira*) are important medicinal plants. *Bacurubu, Schizolobium parahyba* (Vell) Black (Fig. 2) is the most important wood for building canoes.

Table II shows diversity indices on plant uses. The importance of medicinal plants for the community of Gamboa is strikingly apparent, with a richness of 72 folk species. While this community seems to depend heavily on traditional medicine, using a great variety of plants for that purpose,

Table I. Plants Collected and Quoted for Construction (C), Food (F), and Medicine (M) in 58 Interviews Carried out at the Community of Gamboa (Itacuruçá Island, Sepetiba Bay)

Names Local	English	Family	Species	Uses	(%)
Banana[a,c,d]	Banana	Musaceae	*Musa acuminata* Colla	C,F	81
Laranja[a–c]	Orange	Rutaceae	*Citrus sinensis* (L.) Osbeck.	C,F,M	60
Boldo[a]	Boldo	Labiatae	*Coleus barbatus* Benth	C,M	59
Erva cidreira[a]	Balm	Labiatae	*Melissa officinalis* L.	C,M	59
Abacate[a]	Avocado	Lauraceae	*Persea americana* Mill.	C,F,M	34
Mamão[a–c]	Papaya	Caricaceae	*Carica papaya* L.	C,F,M	34
Goiaba[a]	Guava	Myrtaceae	*Psidium guajava* L.	C,F,M	33
Laranja da terra[a,b]	Orange	Rutaceae	*Citrus Sinensis* (L.) Osbeck.	C,M	19
Maçã[c,d]	Apple	Rosaceae	*Malus pumila* Miller	F	19
Saião		?	?	M	19
Carqueja	Carque	Compositae	*Baccharis trimera* (Less.) DC.	M	17
Erva Doce[b]	Fennel	Umbelliferae	*Foeniculum vulgare* Gaertn.	M	17
Laranja da china[a,d]	Orange	Rutaceae	*Citrus* sp.	C,M	17
Coco[a,d]	Coconut	Palmae	*Cocos nucifera* L.	C,F	16
Mandioca[a,d]	Manioc	Euphorbiaceae	*Manihot esculenta* Crantz.	F,M	16
Pitanga	Brazilian cherry	Myrtaceae	*Eugenia uniflora* L.	F,M	16
Caju[a,b]	Cashew	Anacardiaceae	*Anacardium occidentale* L.	C,F,M	14
Santa Maria		Chenopodiaceae	*Chenopodium album* L.	M	14
Capim limão	Lemon grass	Gramineae	*Cymbopogon citratus* (DC.) Stapf.	M	12
Chapéu de couro		Alistamataceae	*Echinodorus grandiflorus* Mitch	M	12
Manga[a,d]	Mango	Anacardiaceae	*Mangifera indica* L.	C,F	12
Xuma rôxa		Malvaceae	*Sida* sp.	M	12
Erva grossa		Compositae	*Elephantopus mollis* H.B.K.	M	10
Quebra pedra	Flyroost leaf flower	Euphorbiaceae	*Phyllanthus niruri* L.	M	10
Tangerina[a,d]	Tangerin	Rutaceae	*Citrus aurantifolia* Swing.	C,F	10
Arnica	Arnica	Compositae	*Solidago microglossa* DC.	M	9
Jambo[a,d]	Star apple	Myrtaceae	*Eugenia jambos* L.	C,F	9
Maria da glória		?	?	M	9
Cana do brejo		Zingiberaceae	*Costus brasiliensis* Schum.	M	7
Erva de Macaé		Labiatae	*Leonurus sibiricus* L.	M	7
Maracujá[a,b]	Passion fruit	Passifloraceae	*Passiflora edulis Sims.*	C,F,M	7
Marireçô		Hypoxidaceae	*Hypoxis decumbens* L.	M	7
Melância[c,d]	Water Melon	Cucurbitaceae	*Citrullus vulgaris* Schrad.	F	7
Uva[c,d]	Grape	Vitaceae	*Vitis vinifera* L.	F	7
Arruda[a,b]	Rue	Rutaceae	*Ruta graveolens* L.	C,M	5
Caqui[c,d]	Kaki persimmon	Ebenaceae	*Diospyros kaki* L.	C,F	5

Table I. Continued

Names Local	English	Family	Species	Uses	(%)
Chuchu[b]	Chocho	Cucurbitaceae	*Sechium edule* Sw.	F,M	5
Fruta pão[a,d]	Bread fruit	Moraceae	*Artocarpus incisa* L.	C,F	5
Hortelã[a]	Spearmint	Labiatae	*Mentha spicata* L.	C,M	5
Jabuticab[d]	Brazilian grape tree	Myrtaceae	*Myrciaria cauliflora* Berg.	F	5
Jurubeba		Solanaceae	*Solanum paniculatum* L.	M	5
Romã	Pomegranate	Punicaceae	*Punica granatum* L.	M	5
Ameixa[d]	Prune	Rosaceae	*Prunus domestica* L.	F	3
Batata[a,d]	Potato	Solanaceae	*Solanum tuberosum* L.	C,F	3
Biribá[a,d]		Annonaceae	*Rollinia mucosa* (Jacq.) Baill.	C,F	3
Cacau[a,d]	Cocoa	Sterculiaceae	*Theobroma cacao* L.	C,F	3
Carapiá[b]		Moraceae	*Dorstenia* sp.	M	3
Erva de bicho		Polygonaceae	*Polygonum hidropiperoides* Mich.	M	3
Fruta do conde[a]	Sugar apple	Annonaceae	*Annona squamosa* L.	C,F	3
Gervão[b]	Verbena	Verbenaceae	*Stachytarpheta polyura Schauer*	M	3
Laranja da cida	Orange	Rutaceae	*Citrus reticulata Blanco*	F,M	3
Poejo	Penny royal	Labiatae	*Cunila spicata* L.	M	3
Salsâparrilha	Salsaparrilla	Liliaceae	*Herreria salsaparrilha* Mart.	M	3
Tomate[a,d]	Tomato	Solanaceae	*Lycopersicum esculentum Mill.*	C,M.F	3
Abiu[a]		Sapotaceae	*Chrysophillum cainito* L.	C,F	2
Abóbora[a,d]	Squash	Cucurbitaceae	*Cucurbita pepo* L.	C,F,M	2
Agrião[b]	Watercress	Cruciferae	*Nasturtium officinale* R. Br.	M	2
Alfavaca	Basil	Labiatae	*Ocimum gratissimum* L.	M	2
Alpiste	Canary grass	Gramineae	*Phalaris canariensis* L.	M	2
Assá peixe		Compositae	*Vernonia polyanthes* (Spreng.) Less.	M	2
Babosa	Aleo	Liliaceae	*Aloe vera* L.	M	2
Beladona	Belladonna	Solanaceae	*Atropa belladona* L.	M	2
Bem me quer		Compositae	*Aspilia* sp.	M	2
Boboia[d]		Solanaceae	*Solanum ciliatum* Lam.	M	2
Camomila[b]	Camomila	Compositae	*Matricaria chamomilla* L.	M	2
Carambola[a,d]	Carambola	Oxalidaceae	*Averrhoa carambola* L.	C,F	2
Carobinha		Bignoniaceae	*Jacaranda caroba* (Vell.) DC.	M	2
Carrapicho do amor		Fabaceae	*Desmodium barbatum* (L.) Benth.	M	2
Cebola[d]		Liliaceae		F,M	2
Condessa[a,d]		Annonaceae	*Anona* sp.	C,F	2
Dormideira		Legumisosae	*Mimosa pudica* L.	M	2
Eucalípto	Eucalyptus	Myrtaceae	*Eucalyptus citriodora* Hook.	M	2
Erva preá		Compositae	*Vernonia scorpioides* (Lam.) Pers.	M	2
Erva tostão[b]		Nyctaginaceae	*Boerhavia diffusa* L.	M	2

Table I. Continued

Names Local	English	Family	Species	Uses	(%)
Fumo de rolo		Solanaceae	*Solanum erianthum* D. Dom	M	2
Gembra		?	?	F	2
Gervão rôxo	Verbena	Verbenaceae	*Stachytarpheta polyura* Schauer	M	2
Graviola[b]	Soursop	Annonaceae	*Annona muricata* L.	M	2
Hortelã do preto		Labiatae	*Peltodon radicans* L.	M	2
Inhame[a,d]	Yam	Dioscoreaceae	*Dioscorea alata* L.	C, F	2
Jaborandi		Piperaceae	*Piper* sp.	M	2
Jaca[a,d]	Jack	Moraceae	*Artocarpus integrifolia* L.	C,F	2
Laranja lima[a,d]	Orange	Rutaceae	*Citrus sinensis* (L.) Osbeck.	C,F	2
Laranja seleta[a,d]	Orange	Rutaceae	*Citrus sinensis* (L.) Osbeck.	C,F	2
Lima da pérsia[a,d]	Lime	Rutaceae	*Citrus sinensis* (L.) Osbeck.	C,M	2
Limão[b]	Lemon	Rutaceae	*Citrus lemon* Burn.	F	2
Lorde[a]	Absinth	Compositae	*Artemisia absinthium* L.	C,M	2
Malva[b]	Mallow	Malvaceae	*Malva parviflora* L.	M	2
Mangericão[b]	Basil	Labiatae	*Ocimum micranthum* Willd.	M	2
Maravilha		Nyctaginaceae	*Mirabilis jalapa* L.	M	2
Melão de são Caetano	Balsam Apple	Cucurbitaceae	*Momordica charantia* L.	M	2
Milho[d]	Maize	Gramineae	*Zea mays* L.	M	2
Parietalia	?	?	?	M	2
Pepino[a,d]	Cucumber	Cucurbitaceae	*Cucumis sativus* L.	C,F	2
Picão[b]	Dandelion	Compositae	*Bidens pilosa* L.	M	2
Rosa branca	Rose	Rosaceae	*Rosa* sp.	M	2
Santa Bárbara		Solanaceae	*Solanum swartzianum* Roem. & Schult.	M	2
Tamarindo[d]	Tamarind	Leguminosae	*Tamarindus indica* L.	F	2
Treporeba		Commelinaceae	*Commelina* sp.	M	2
Urtiga	Nettle	Euphorbiaceae	*Tragia volubilis* Muell. Arg.	M	2

[a]Cultivated plants mentioned in interviews.
[b]Plants collected on Jaguanum Island (Sepetiba Bay).
[c]Fruits from the market.
[d]Plants not collected.

many of the fruits they consume are bought in the markets of the coast, at the city of Itacuruçá.

The comparison of the diversity indices (Table III) show that the diversity of medicinal plants used in Gamboa is significantly larger than on a relatively close island, such as Búzios Island ($p < 0.05$). Búzios Island

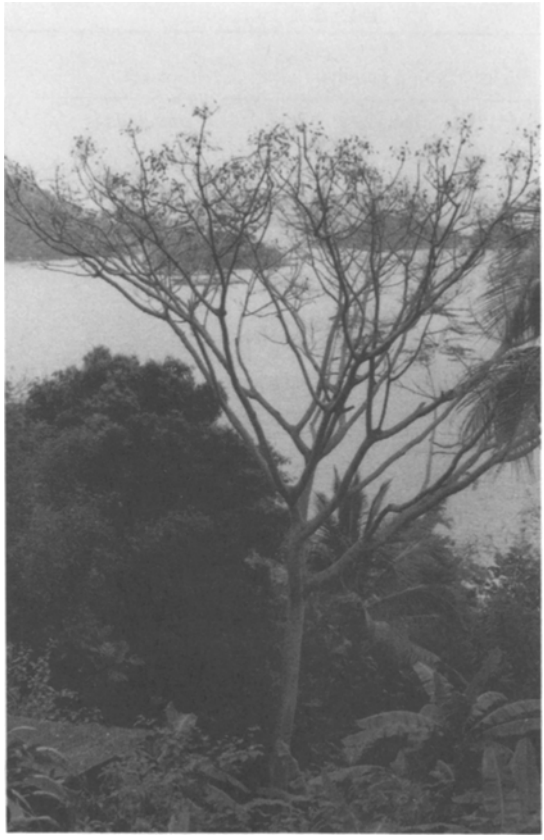

Fig. 2. *Bacurubú, Schizolobium parahyba* (Vell) Black, is a plant often used to make canoes at Gamboa and other communities close to the Atlantic forest, in southeast Brazil.

includes a fishing community of about 44 families; the island has an area of 7.5 km^2 and is about 24 km off the coast of São Paulo State. Búzios is also adjacent to the Atlantic Forest, and although more isolated than Gamboa, islanders from Búzios have market relations with buyers from the coast (Begossi, 1989).

We observed that despite the closeness of Gamboa to Itacuruçá city, located on the mainland, and the availability of pharmacies and hospitals in this city, islanders seem to rely on medicinal plants. The low availability

Table II. Diversity Indices (Richness, Simpson, and Shannon-Wiener) Based on Plant Quotations (Folk Names) in 58 Interviews in Gamboa, Itacuruçá Island[a]

Uses	Richness	Simpson	Shannon-Wiener	Quotations
Food/cultivated	36	16.00	1.37	96
Food/collected[b]	28	8.07	1.10	193
Medicinal plants	72	20.82	1.57	269
Medicinal by category				
Fishermen	26	16.07	1.30	60
Non-fishermen	19	16.09	1.24	26
Women	57	17.72	1.49	180
Men	35	16.81	1.37	99
Age > 40	63	24.86	1.58	189
Age < 40	29	10.92	1.24	80
Total plants quoted at Gamboa	100	25.14	1.65	558
Medicinal plants quoted at Búzios Island[c]	46	20.94	1.47	148

[a]Diversity indices are shown by category, such as profession (fisher/non-fisher), sex, and age.
[b]May be bought at markets.
[c]Begossi (1989).

of cash may influence islanders' reliance on traditional medicine, as suggested by Furtado *et al.,* (1978), as well as cultural factors.

It is noteworthy to observe that the comparisons among diversity indices follow the predictions of the theory of island biogeography (adapted to the *use* of resources) because the diversity of plants is low for a smaller island further from the mainland, such as Búzios. The greater diversity of medicinal plants used in Gamboa compared to Búzios island may be explained by a greater diversity of plants available on Itacuruçá, an island closer to the mainland and larger than Búzios island.

Table III. Comparison of Shannon Indices, Based on Zar (1984), of the Communities of Búzios and Gamboa, and by Category in the Community of Gamboa, Itacuruçá Island

Categories	Significance (p)
Búzios/Gamboa	< 0.05
Fishermen/non-fishermen	> 0.05 n.s.
Man/women	< 0.02
Age (>40–<40)	< 0.002

The diversity of indices of fishermen and non-fishermen were not significantly different, showing that economic activity has no influence on the use of medicinal plants. Men and women showed significant differences in their references to medicinal plants ($p < 0.02$) (Tables II and III). Women usually take care of children and consequently prepare many medicines from collected plants. For example, tea made from *boldo* leaves is used for liver problems, and balm-leaf tea is useful for headaches, flu, menstrual cramps, high blood pressure, and as a sedative. Many plant leaves are used to treat common childhood illnesses such as flu (*assá-peixe*, *carapiá*, balm, *erva grossa, jaborandí*, orange and Brazilian cherry, among others), bronchitis (spearmint, pennyroyal, and flowers of papaya and rose), diarrhea (guava, *hortelã do preto,* and *marireçô*), and earaches (squash flower and basil) (Table I).

Differences in number of references to medicinal plants based on age (up to 40 and over 40 years old) were highly significant ($p < 0.002$) as the diversity indices show (Tables II and III). Individuals over 40 years old showed a greater knowledge of medicinal plants than younger islanders. Field observations also confirmed these results, because the best informants were usually older than 40 years. Differences among generations in the knowledge of medicinal plants were also observed by Begossi (1989) at Búzios Island. Native individuals living at Gamboa, as well as Búzios Island, have hospitals and pharmacies on the mainland more available to them now than one generation ago. The younger generation especially tends to be more open to health centers or doctors than their parents. For example, at Búzios just a very few old people practiced traditional medicinal rituals. In interviews at Gamboa and Búzios, young people referred to plants used in folk medicine that they did not know how to prepare, or referred to their use as past behavior or practice. This evidence suggests a loss of knowledge on the use of plant resources.

CONCLUSIONS

We have shown here that small-scale fishing communities adjacent to the Atlantic Forest, in spite of their proximity to urban centers, depend on plants collected for food and medicine. Medicinal plants, in particular, are very important to those communities, such as Gamboa, located on Itacuruçá Island. Islanders from Gamboa referred significantly more medicinal plants than islanders from Búzios, a smaller and island further off the southern coast of Brazil, showing that the theory of island biogeography may be an useful tool to analyze the diversity of resources used by islanders.

Women and islanders over 40 years old have a larger knowledge of medicinal plants than men or younger islanders. This information is extremely useful in order to help in management and conservation projects. The importance of ethnobotanical studies for purposes of management is well established (Posey *et al.,* Cohen *et al.,* 1991) but how to approach the communities and how to get useful information from them is a more complicated subject. Studies that go beyond the community level may contribute to a better knowledge of the community and allow realistic propositions for management. Finally, ecological concepts and theories, such as *niche, diversity,* and *island biogeography,* are useful for analyzing in more detail the exploitation of resources by human populations.

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