Fishing and Niche Dimension for Food Consumption of *Caiçaras* from Ponta do Almada (Brazil)

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Abstract

In this research we analyze the diet of the caiçara population in Ponta do Almada (Brazil), regarding the items of animal origin such as fish, and its connection to local fishing activities. Observations of fishing activities and diet were made every two months during 1995-6. Diet data were collected from a total of 436 meals of 12 randomly selected families and 89 fishing trips. Fish was the main animal protein consumed, but there was no direct relationship between fish catches and fish consumed per month, even though some of the most frequently caught species were observed in the diet. Niche breadth for animal protein consumed was larger for families of full time fishermen. The reduction of traditional occupations (such as fisheries and small-scale agriculture) and the increasing dependence on urban centers and on activities related to tourism may result in changes in the dietary patterns of caiçaras.

Keywords: *diet, fishing, caiçaras, Atlantic Rain Forest, Brazil*

Introduction

Studies on the diet of human populations are helpful to understand their relations with natural resources (Messer 1984), and also reflect adjustments to changing environments (Kunhlein 1992; Pelto and Vargas 1992). Human diet can also be viewed as one of the many features included in a 'livelihood approach.' As proposed by Soussan et al. (1999), the 'livelihood approach' is useful to analyze the social security of a given population. It is related to the concept of sustainability, since the modes of production, consumption, and distribution of goods are among the basic societal processes related to local sustainability (Becker et al. 1997). In a human ecological point of view, an analysis of human diet, using ecological concepts such as diversity and niche, can reflect aspects of use of resources by a given population and its interactions with local sustainability.

In ecology, the abstract concept of niche brings together all of the environmental conditions and resources needed by an organism (Begon et al. 1996). Levins (1968) suggested the use of diversity indices (such as Shannon-Wiener and Simpson) (Magurran 1988, Krebs 1989) to estimate niche breadth. Even though a theoretical niche may have great number of environmental dimensions (Hutchinson 1981), the differences in a particular dimension (e.g. food) within various human groups can be used as a tool to understand their interaction with the environment (Hardesty 1975). The concept of ecological niche applied to human populations was also used to analyze the competition between groups of fishermen of Lake Erie (Berkes 1984) and at the Grande River (Castro and Begossi 1996).

The consumption of food items of animal origin in *caiçara* communities was studied by Begossi and Richerson (1992, 1993) and Begossi (1995a) on Búzios Island and at Puruba Beach. *Caiçaras* are native inhabitants of the Atlantic Forest region of Brazilian Southeast coast, whose subsistence is based on small-scale agriculture and artisanal fishing. They are descendants of native Indians and Portuguese colonists

with influences from African culture (Marcílio 1986; Mussolini 1980). Diegues (1983) defined artisanal fishing as being practiced by autonomous fishermen, alone or in partnerships, using relatively simple technology. Although production has proportionally decreased in relation to industrial fishing, artisanal fishing is still significant in Brazil, especially in fresh water environments (Petrere 1988, 1995).

In recent decades marine communities have been affected by external factors such as the replacement of local authorities, demographic and technological changes, urbanization, modernization and economic development (Ruddle 1993). For example, according to Ruddle (1993) in the Cook Islands the traditional authority was undermined by the imposition of a British legal and administrative code. On the southeastern Brazilian coast, changes in the lifestyle of *caiçaras* were affected by the adoption of motor boats, construction of new roads during the 1970's, intensified industrial fishing, land speculation, and tourism (Silva 1993). The establishment of protected areas in the Atlantic Rain Forest region also created conflicts because environmental legislation, in spite of local decisions, has imposed restrictions on the subsistence of populations that live inside or close to these areas (Begossi 1995b; Cunha 1989; Diegues 1996; Fletcher 1990).

The objective of this study is to analyze the diet of a *caiçara* population, concerning the items of animal origin, such as fish, and its relation to local fish catches. We examine if there is a correlation between fish production and consumption, and the trends toward changes in the food consumption of caiçaras from Ponta do Almada (Brazil).

Study Site

Ponta do Almada is located in the local district of Ubatuba on the northern coast of the State of São Paulo (Brazil) (see Figure 1). The settlement consists of 31 houses of native inhabitants including about 125 residents, most of which (87%) are native *caiçaras* or come from close neighborhoods. Tourism is important in the area, and some *caiçaras* have houses they rent in the summer and on holidays. The main local economic activities are related to artisanal fishing (76% of the interviewed men) and tourism (64% of the interviewed inhabitants) (Hanazaki et al. 1996).

With pressures from growing tourism and land speculation, at the end of the 1970's and beginning of the 1980's many *caiçaras* were compelled to sell their land and houses. By this time, the majority of Ponta do Almada's fishermen were agriculturists too, who produced their own cassava flour, a typical staple among *caiçaras* (Diegues 1983; Smith 1958).

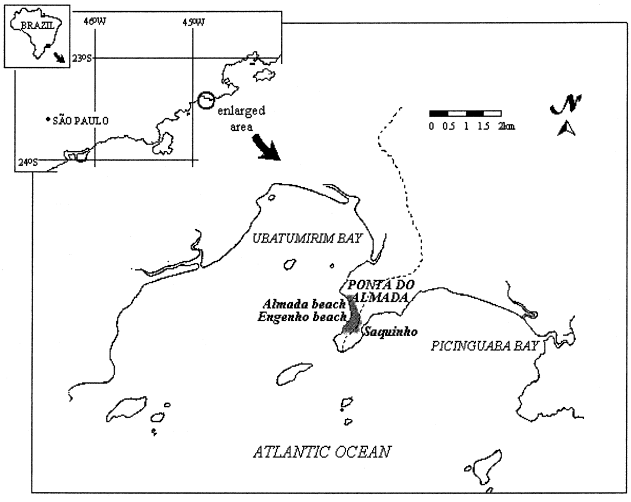


Figure 1. Study site. The local houses are located in the grey area. Fishing landings were observed at Almada Beach, Engenho Beach, and Saquinho. The dotted line shows the boundaries of the Serra do Mar State Park.

Ponta do Almada is located at the western boundary of the Núcleo Picinguaba of the Serra do Mar State Park, although most of the houses are outside the park limits. The region is also part of the Atlantic Rain Forest Biosphere Reserve (Lino 1992).

Methods

Data on fish landings and on the local diet were collected during a 3 to 4 day period every two months between August/1995 and July/1996. The data obtained from fishing trips included time spent fishing, species caught and gear used. Fish specimens were collected for identification. Identifications were based on keys by Collette and Nauer (1983), Figueiredo (1977), Figueiredo and Menezes (1978, 1980), Menezes and Figueiredo (1980, 1985), and Robins and Ray (1986). J. L. Figueiredo verified the identified species, which are placed at the Zoology Museum of the University of the São Paulo State (MZUSP).

In the diet study, 12 families were randomly picked among the 31 living in Ponta do Almada. During each visit they were interviewed about the two most recent meals (lunch and dinner).

Diversity measures including species' richness, rarefaction curves, and Simpson index (Hurlbert 1971; Krebs 1989; Magurran 1988) were used for the species caught on fishing trips. The indices were calculated based on the weight of each species caught. The same diversity measures were calculated for the animal protein consumption, using the frequency of

each species in the meals. The total number of animal food items consumed by each family gives the richness of the animal protein consumed. The niche breadth is given by the Simpson index, or $D = 1/\Sigma p_i^2$, where $p_i = q_i/N$, N = total number of quotations of each kind of animal food (richness), and q_i = number of quotations for the i^{th} animal food item. Rarefaction is given by the calculation of $E(S)$ for a sequence of n, or:

$$E(S) = \Sigma \left\{ 1- \left[\binom{N-Ni}{n} \Big/ \binom{N}{n} \right] \right\}$$

where $E(S)$ = expected richness in the rarefacted sample with a given n, n = standard size of the sample, N = total number of quotations of each kind of animal food, and N_i = number of meals with the i^{th} animal food item.

The relationships between species caught and consumed, as well as between *per capita* income and diversity indices were assessed using the calculation of a Spearman's correlation coefficient (Zar 1996).

A preliminary quantitative survey was carried out to estimate the caloric and protein contents of meals (n=22). On these occasions, the person who prepared the meals was interviewed about the amount of each kind of food. Most of the food was estimated by volume (in milliliters), with the help of measuring glasses; or weighed (in grams), with the help of scales of 1.5kg and 2.5kg. The nutritional content was estimated through literature data (FAO 1970; Franco 1992; IBGE 1985).

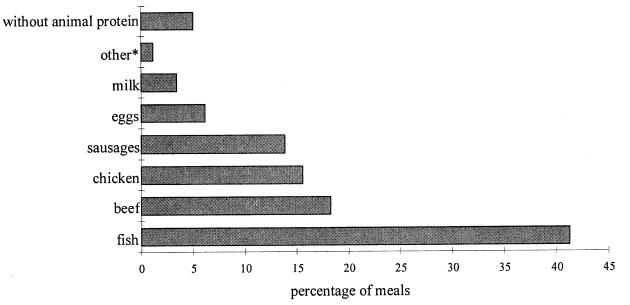
Results and Discussion

Animal Protein Consumption

Apart from the 44 occasions on which families did not take meals or were absent, 436 lunches and dinners were registered. The typical meal for the *caiçara* from Ponta do Almada consists of white rice, beans and *mistura*, frequently accompanied by pasta and salad. The majority of the families often consume cassava flour, but it has been replaced by rice as the main staple. *Mistura* refers to animal origin food such as fish, beef, chicken or eggs.

Animal protein was not consumed in only 5% of the meals (see Figure 2). Fish was present in 42% of the meals (44% of the animal protein consumed). Other sources of animal protein, such as beef and chicken were consumed in 59% of the meals. For July 1994 Hanazaki et al. (1996) observed that fish was present in 60% of the meals in Ponta do Almada which may indicate a trend toward changes in the consumption of animal food items, with beef and chicken gradually replacing fish.

At Puruba Beach, fish represents 52% of the animal protein consumed (Begossi 1995a). Among *caiçara* islanders



* "other" includes pork, turkey, jerk and tripe stew

Figure 2. Presence of animal protein on meals observed in Ponta do Almada, between August/1995 and June/1996.

this percentage was higher. At Búzios Island fish represented 68% of the meals from animal origin (Begossi and Richerson 1993), and at Gamboa (Itacuruçá Island) and Calhaus (Jaguanum Island), 65% (Begossi 1995b).

The niche breadth for animal protein consumed in Ponta do Almada is similar to the one obtained at Búzios Island by Begossi and Richerson (1993) but it is narrower than the one obtained by Hanazaki et al. (1996) in Ponta do Almada (Table 1). Both Ponta do Almada and Búzios Island, when compared to Puruba Beach, have wider niches. Begossi (1995a) considers that these differences may be related to the proximity of urban centers for people on Puruba beach when compared to the insular people at Búzios, and the same trend may have occurred in Ponta do Almada. The change in the food niche breadth from 1994 to 1995/96 may have arisen due to three interconnected factors: the increase of tourist related activities in the area as a source of income; the drop in dependency of fishing activities; and better transportation to urban centers to purchase food. Tourism leads to a higher and predictable income, when compared to fishing. As tourist related activities increases, fishing activities decrease, and less fish is available to local consumption. By the other hand, is easiest to go to the city to purchase other food items.

Table 1. Niche breadth for the frequency of animal protein consumption (given by the average of the Simpson index per month, all families included).

Community	Number of meals	Richness	Niche breadth	Period sampled
Ponta do Almada	436	41	7.48	1 year (1995-1996)
Ponta do Almada[1]	252	28	10.85	15 days (winter 1994)
Búzios Island[2]	1,241	65	8.47	1 year (1986-1997)
Puruba Beach[3]	1,311	43	5.76	6 months (1991-1993)

[1] from Hanazaki et al. 1996
[2] from Begossi and Richerson 1993
[3] from Begossi 1995a

Data from Fishing

Eighty-nine fishing trip landings were gathered, corresponding to 461kg of fish caught. The average catch per trip was 5kg. On 33% of the trips no fish were caught. Fishing trips were performed by one to three fishermen, depending on the type of fishing gear used, with paddled canoes. The most frequently used gear included set gillnets (used in 51% of the fishing trips), hook and line (31%), encircling nets (8%), beach draw nets (7%), ripper jigs (7%), small encircling nets (6%), harpoons (3%) and drift nets (3%).

When analyzing the weight of fish caught in each month, we observed that the coldest months (August, June, and October) showed smaller averages of kilograms of fish per fishing trip (Table 2). This may be related to the more adverse environmental conditions of fishing during the winter, such as winds and cold. The average production was higher in the hot months. Except for February, the standard deviation was higher than the average catch of each trip, thus showing the uncertainty of the fishing activity (see Table 2).

Table 2. Weight of fish caught in each month sampled (data from 89 fishing trips)

Month	Fish production per fishing trip (in kg)	
	average	standard deviation
August	4.80	5.25
October	4.94	7.41
December	7.15	12.11
February	6.97	5.46
April	8.96	12.39
June	2.81	3.94

Sixty-six different fish species were caught. Comparing the most frequently captured species with the most widely consumed ones, we can identify frequently captured fish species which are part of the diet, such as croaker (*Micropogonias furnieri*), Spanish mackerel (*Scomberomorus brasiliensis*), southern kingfish (*Menticirrhus americanus*) and mojarra (*Eucinostomus melanopterus*) (see Figure 3).

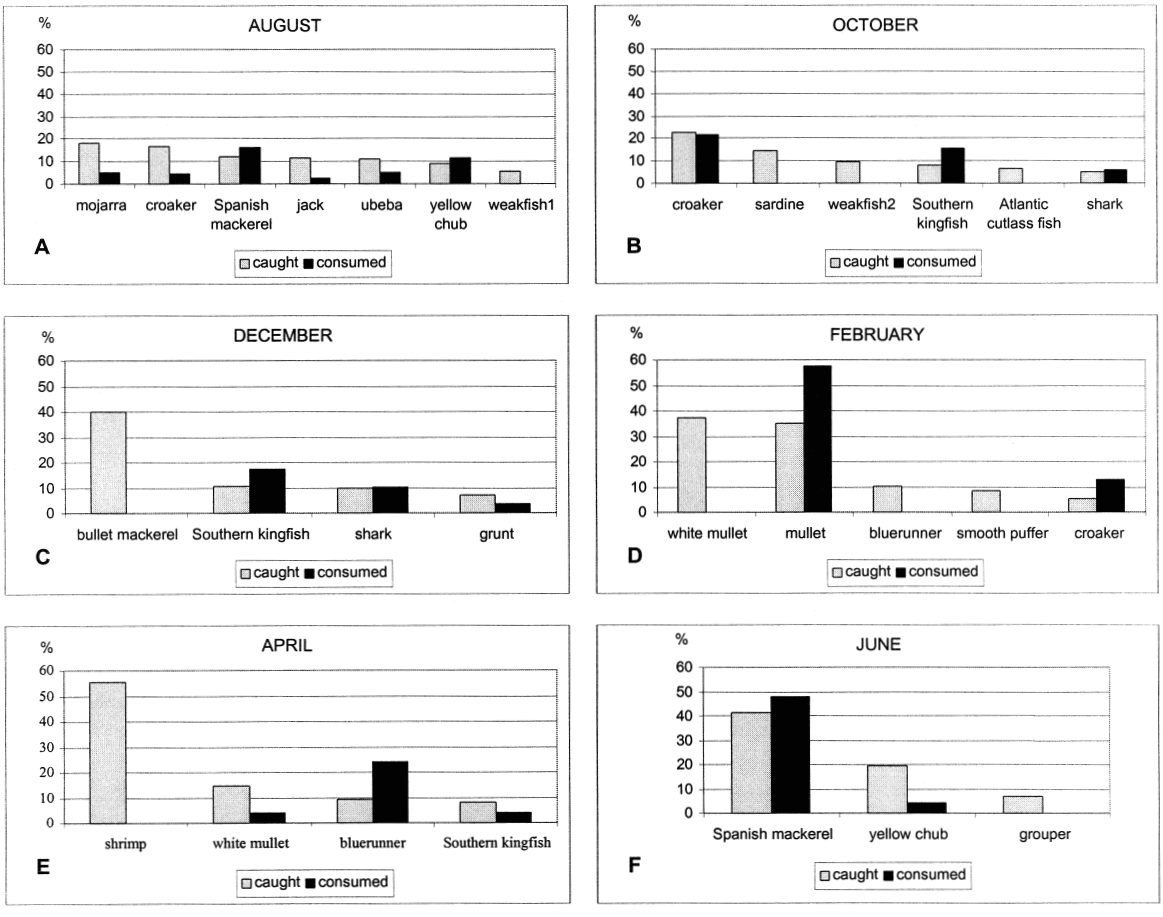


Figure 3. Caught and consumed species of fish in each month in Ponta do Almada, only for species present in 5% of the fishing trips at least. Values in percentage. a) August; b) October; c) December; d) February; e) April; f) June. See scientific names in Appendix 2.

Mullet and southern kingfish were the most consumed fish found in the diet of the people from Ponta do Almada. The higher frequency of consumption of certain species must be related to its environmental availability, as well as to factors such as food preferences and avoidances (Begossi 1992, 1998).

Food Preferences

When analyzing the food preferences of the residents of Ponta do Almada, Hanazaki et al. (1996) found that mullet was the most frequently mentioned species, and also the most preferred. Croaker and southern kingfish were also quite frequently mentioned in the interviews. On the other hand, bullet mackerel is as a taboo fish or avoided species, which explains why it was not consumed, despite a large catch in December (see Figure 3c). Tabooed fish are those species that are not recommended for consumption, or "heavy" fish. From the emic point of view (Harris 1976) bullet mackarel is avoided by pregnant women and ill people (corresponding to Colding's (1995) segmentary taboos) because of it being fatty and bloody.

The shrimp (*Xiphopenaeus kroyerii*) caught in April was totally directed to sales (and not included in meals) because shrimp is highly valued merchandise (Figure 3e). For artisanal fishermen from Rio Grande, Castro (1992) also observed that the high valued fish were kept for sale and were not consumed.

We observed no remarkable differences in the richness of the consumption of animal protein per month. We found that even if there is a relationship between caught and consumed fish during the year (Spearman r_s=0.627, p<0.001), relationships within seasons are weak (r_{sAug}=0.243, r_{sOct}=0.330, r_{sDec}=0.282, r_{sFeb}=-0.190, r_{sApr}=-0.338, r_{sJun}=0.124, all p>0.05).

Many factors can contribute to the absence of a correlation between caught and consumed fish per month. Once fishermen sell part of the catch, this correlation is difficult to evaluate (Begossi and Richerson 1993). Before selling or giving the other inhabitants part of the catch, the fishermen keep their favorite species and the ones with lower commercial value for themselves. Moreover, the possibility of stocking fish in freezers may influence the diversity of animal protein items consumed.

Variation Among Families

Fish was the most frequently consumed animal protein source for 9 of the 12 families researched (Appendix 1). For families 1 and 6 the most frequent animal protein source was chicken, and for family 2 it was beef.

The optimal foraging theory predicts that a higher abundance of food should lead to higher specialization. When there is scarcity of resources, the niche should expand, to include items of lower ranking, or less preferred items. When resources are abundant, the niche should retract, because preferred items are easily found (MacArthur and Pianka 1966; Smith 1983; Stephen and Krebs 1986).

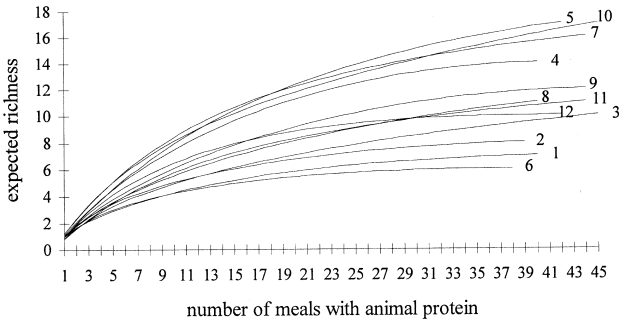


Figure 4. Rarefaction curves for animal protein items consumed by each family in Ponta do Almada. Numbers 1-12 point out the families.

The breadth of the feeding niche for animal protein measured by the Simpson index was larger for families 5, 7, 10 and 4. Analyzing the richness curves (Figure 4), it is possible to divide the families in two groups: the families 5, 7, 10 and 4, who consumed a greater diversity of animal protein items, and the families 9, 8, 11, 12, 3, 2, 1 and 6 with a lower diversity.

The large niche (high diversity) of families 4, 5 and 10 might be related to the fact that these families include full time fishermen. Fishermen usually have access to a high diversity of fish, when compared to the non-fisherman families (such as 8, 9, 11 and 12). In the case of family 7, the head of the family is a public worker, who has not given up his fishing activities, and two of his grown up sons are part-time fishermen. However, according to the optimal foraging theory, a high diversity of available fish could lead to a high specialization of items consumed and to the narrow niches: but the opposite was observed here.

Other factors could be influencing the breadth of the animal protein niche among families in Ponta do Almada. The non-fisherman families usually acquire and stock frozen fish in great quantities. Stocking fish reduces the environmental uncertainties of food availability, and should result in the contraction of the niche breadth of animal protein.

Begossi and Richerson (1993) argued that since income can be a way of measuring resource availability, the ecological theory suggests that families with higher *per capita* incomes should have the narrowest niches, focusing their consumption on more preferred items. The same was observed in Ponta do Almada: richer families showed narrow niches. However, there was no correlation between the average income *per capita* of each family and the diversity of

consumed animal protein (Spearman r_s =0.256, p>0.05 for correlation with richness).

Among the families in Ponta do Almada, when the fishing activities are replaced by activities related to tourism there is a tendency for the food niche to contract. A reduction in the diversity of natural resources used (followed by a reduction of niche breadth) could be environmentally interesting, because the natural resources will be used less intensively. However, this trend toward changes in the dietary habits must be carefully analyzed, because it can influence the nutritional intake of this human population.

Nutritional Features

The calculation of the daily needs was based on the NRC/CDA (1980) recommendations for the consumption of calories and protein by adults (averages for men and women) and children, weighted by the number of adults and children in each family. It resulted in a recommended daily intake of 2261.2 calories and 49.4g of protein *per capita*. In our estimate of daily calories and protein consumption the average *per capita* consumption was estimated to be 1875.7 calories and 68.5 g of protein. Comparing the consumed values with the daily recommended needs, on one hand the diet of the *caiçara* population of Ponta do Almada does not reach the recommended intake for calories. However, on the other hand it is similar to the lowest values for average energy needs according to FAO (1996), which are between 1721 to 1960 daily calories *per capita*. Also, once we quantified the raw food, we could not take into account some items that could have contributed to the calorie intake, added during or after the cooking, such as the cassava flour.

Restrictions on subsistence agriculture can have reduced the amount of calories available. Traditionally, *caiçaras* depended on crops of cassava, sweet potato, and sometimes rice, as their main caloric sources. With the prohibitions on local agricultural activities, all these items now have to be purchased.

In a broad sense, the daily intake *per capita* of calories and proteins in Ponta do Almada is well within the recommended limits. Nevertheless, a variation occurs in the energetic and protein intake among families throughout the year and within each family.

Livelihood and Niche

The possible interactions among variables that could be influencing *caiçaras'* livelihood, and its relations with the food niche, are illustrated in Figure 5. Similarly with other Brazilian native groups, there are external influences that affect *caiçaras'* livelihood. For example, the decreasing of local activities (small-scale agriculture and artisanal fishing) is influenced by the environmental agencies which imposes restrictions towards these activities. In Brazil, protected areas

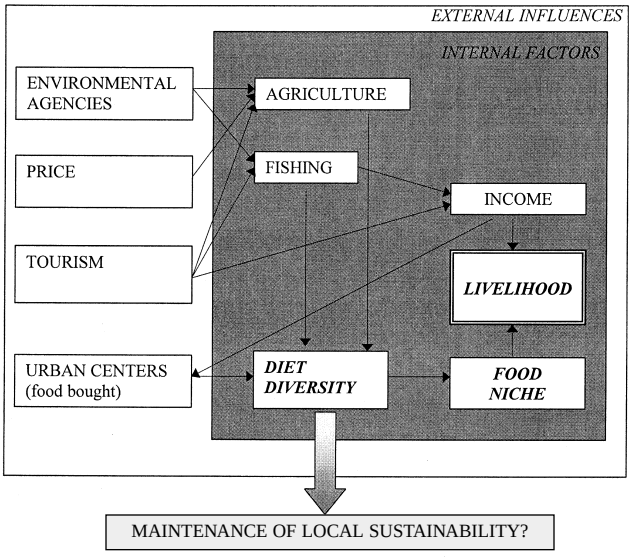


Figure 5. Possible interactions among variables influencing the livelihood at Ponta do Almada, related to food niche.

for nature conservancy were created following the original American model of "untouched nature" (Diegues 1996), ignoring the presence of local inhabitants. Restrictions on local activities were set in accordance with this model of protected areas. Also, as the price of agricultural goods decreases, local agricultural activities decrease (see Figure 5). The increasing tourism in the region pushes fishers to substitute fishing activities with more rentals to tourists. As tourism increases, fishing decreases and income increases. As fishing decreases, diet diversity decreases. We observed an increasing dependence on the urban centers in order to purchase food. Changes in local activities do influence livelihoods through the contraction of niche breadth: less diversity of food items such as fish caught, and concentration on purchased items such as chicken and beef. At Ponta do Almada, the effects of these changes can be positive: *caiçaras* may have a more predictable source of income from tourist activities than from fishing and/or agricultural activities. Nevertheless, local sustainability will be threatened if the new source of income from tourism do not benefit all families. Other negative consequence is the loss of accumulated knowledge about local activities such as fishing and agriculture.

Conclusions

Animal protein was consumed during most of the *caiçaras'* meals in Ponta do Almada. There appeared to be slightly less dependency on fish as a protein source, when compared to *caiçara* communities on islands where the access to purchased items is more difficult.

Some fish species were frequently caught and consumed, such as croaker, Spanish mackerel, southern kingfish, and mojarra. There is little correlation among fish caught and consumed in each month, because fishermen sell or store part of the catch. The consumption of some species may be related to food preferences and avoidances. Despite a high catch, bullet mackerel was considered a taboo fish, and it was not consumed.

Changes caused by the increase of tourist activities and by restrictions on traditional activities such as subsistence agriculture and artisanal fishing can result in changes in the connection with the natural resources used by native populations. The break down of local agriculture, in part due to restrictive laws, also has a role in the changes in the *caiçara*'s diet. Agricultural goods once grown locally now have to be purchased, and cash is needed for this. The increase in cash received from tourist activities instead of from fishing activities has contributed to the abandonment of artisanal fishing activities. A reduction in fishing activities can be environmentally interesting, however, it can lead to a contraction of niche breadth of animal protein consumed.

As the subsistence activities decrease, the dependence on urban centers will increase. These trends towards changes in the relations with natural resources should affect dietary patterns and local sustainability. Positively, *caiçaras* may have a more predictable source of income and a more predictable amount of animal protein. Negatively, the accumulated knowledge about local activities such as fishing and agriculture can be lost. Finally, these trends toward changes in the dietary habits must be carefully analyzed, because they can influence the nutritional intake of *caiçara*'s population.

Endnote

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Appendix 1. Frequency of Animal Protein Items Consumed per Family. (Numbers 1 to 12 show the sampled families.)

	1	2	3	4	5	6	7	8	9	10	11	12	total
Non-Fish Items													
beef		13	10	2	2	8	5	4	12	6	5	12	79
chicken	19	8	9	3		11	4	3	2	2	6	2	69
sausages	3	5		11	1	3	14	5	6	3	6	4	61
eggs	5	2	3	1	2		3			6	3	2	27
milk								15			1		16
tripe stew								2				2	4
pork						2							2
jerk											2		2
turkey										1			1
Fish Items													
mullet		4	4	2	2	4	2	1	4	5			28
southern kingfish	4			3	1		1		2	8		2	21
Spanish mackerel	1			2	3		6	1	3	2	1		19
croaker sp. 1		2	1						2	2	2	6	15
mojarra sp. 1	1		2	2	5							2	12
sardine			3	2			2		1		1		9
catfish		2						2				4	8
bluerunner					3		4			1			8
Atlantic cutlass fish				4		2						2	8
shark							1	1		5			7
white mullet	1		1		5								7
“ubeba”							2			5			7
guachanche					2				3	1			6
yellow chub				2	4								6
croaker sp. 2			1		3								4
squid					1			1	2				4
shrimp			1								2		3
redfin parrotfish							2						2
mojarra sp. 2				2									2
croaker sp. 3				2									2
Atlantic bonito					1								1
mojarra sp. 3					1								1
king mackerel										1			1
Jack										1			1
Florida pompano										1			1
weakfish sp. 1							1						1
leatherjacket					1								1
sardine (canned)					1								1
Grunt								1					1
lane snapper							1						1
Total	34	36	35	38	38	30	48	36	37	50	29	38	449
Richness	7	8	10	14	17	6	16	11	12	17	11	10	41
Simpson	2.89	3.99	4.85	8.64	12.41	3.62	11.37	4.68	5.59	9.8	7.56	7.12	12.01
average *per capita* income (in US$)	82.50	50.00	-[1]	94.10	60.00	25.00	91.60	175.00	112.50	41.67	126.00	37.50	81.44

[1] unavailable data

Appendix 2 Local Names, English Names[1] and Scientific Identification of Fish Caught and Consumed in Ponta do Almada.

FAMILY **Species name**	**local name**	**English name**
ARIIDAE		
Notarius grandicassis (Valenciennes)	bagre	catfish
Sciadeichthys luniscutis (Valenciennes)	bagre amarelo	catfish
Netuma barba (Lacépède)	bagre cumbaca	catfish
BALISTIDAE		
Balistes capriscus Gmelin	porco	leatherjacket
CARANGIDAE		
Caranx crysos (Mitchill)	carapau	bluerunner
Oligoplites saurus (Bloch & Schneider)	guarivira	jack
Trachinotus carolinus (Linnaeus)	pampo	Florida pompano
CARCHARHINIDAE		
Rhizoprionondon porosus (Poey)	cação	shark
CLUPEIDAE		
Harengula clupeola (Cuvier)	sardinha cascuda	sardine
Sardinella brasiliensis (Steindachner)	sardinha maromba	sardine
Pellona harroweri (Fowler)	sardinha mole	sardine
Opisthonema oglinum (Lesueur)	sardinha savelha, s. verde, s. chata	sardine
ENGRAULIDIDAE		
Lycengraulis grossidens (Agassiz)	sardinha arenga	sardine
Cetengraulis edentulus (Cuvier)	sardinha arenga	sardine
GERREIDAE		
Eucinostomus melanopterus (Bleeker)	carapicu	mojarra sp.1
Diapterus rhombeus (Cuvier)	carapeva	mojarra sp.2
Diapterus olisthostomus (Goode & Bean)	caratinga	mojarra sp.3
HAEMULIDAE		
Haemulon steindachneri (Jordan & Gilbert)	sargo	grunt
KYPHOSIDAE		
Kyphosus sectatrix (Linnaeus)	piragica	yellow chub
LUTJANIDAE		
Lutjanus synagris (Linnaeus)	vermelho	lane snapper
MUGILIDAE		
Mugil curema Valenciennes	parati	white mullet
Mugil platanus Günther	tainha	mullet
RHINOBATIDAE		
Rhinobatos spp	cação viola	guitar fish

Appendix 2 (continued)

FAMILY **Species name**	**local name**	**English name**
SCARIDAE		
Sparisoma rubripinne Valenciennes	budião	redfin parrotfish
SCIAENIDAE		
Micropogonias furnieri (Desmarest)	corvina	croaker sp.1
Steliffer brasiliensis (Schultz)	cabeçudo	croaker sp.2
Stellifer rastrifer (Jordan)	cabeçudo	croaker sp.2
Menticirrhus americanus (Linnaeus)	imbetara	southern kingfish
Umbrina coroides (Cuvier)	mancevada	croaker sp.3
Cynoscion virescens (Cuvier)	pescada	weakfish sp.1
Isopisthus parvipinnis (Cuvier)	maria mole	weakfish sp.2
Larimus breviceps (Cuvier)	ubeva	-
SCOMBRIDAE		
Sarda sarda (Bloch)	baquara	Atlantic bonito
Auxis rochei (Risso)	bonito	bullet mackerel
Scomberomorus cavalla Cuvier	cavala	king mackerel
Scomberomorus brasiliensis Collette, Russo & Zavala-Camin	sororoca	Spanish mackerel
SERRANIDAE		
Epinephelus marginatus (Linnaeus)	garoupa	grouper
SPHYRAENIDAE		
Sphyraena guachancho Cuvier	bicuda	guachanche
SQUATINIDAE		
Squatina sp.	cação anjo	angel shark
TETRAODONTIDAE		
Lagocephalus laevigatus (Linnaeus)	baiacú	smooth puffer
TRICHIURIDAE		
Trichiurus lepturus Linnaeus	espada	Atlantic cutlass fish
Mollusca - Cephalopoda		
Loligo sanpaulensis Brackoniecki	lula	squid
Crustacea - Decapoda		
Xiphopenaeus kroyeri Heller	camarão	shrimp

[1]English names were based upon Suzuki (1986) and Audubon Society (1983)