Short Communication

The Caiçaras and the Atlantic Forest coast: Insights on their resilience

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Abstract:
In this study we approach temporal resilience, at an ecological scale, by comparing 22 years of activities of Caiçaras in Puruba Beach, SE coast of Brazil. Caiçaras are the local inhabitants of the Atlantic Forest coast, descending from Portuguese Colonizers, Native Indians, as well as with African influences. Resilience is a subject of great relevance when dealing with inhabitants of tropical forests, especially when considering livelihoods that depend upon the extraction of natural resources. Puruba beach was studied in 1991 (AB) and 2013 (GP) (who conducted semi-structured interviews), among other studies. The inhabitants of Puruba beach showed flexibility and capacity to manage the restrictions imposed by the governmental environmental agencies. They engaged in new jobs at the municipality of Ubatuba, and diversified their activities. In that regard, they were capable to adapt to new realities by diversifying and substituting their economic activities, showing socio-economical and ecological resilience.

Keywords: Atlantic Forest; resilience; small-scale fisheries

1. Introduction

Resilience is a subject of great relevance when dealing with inhabitants of tropical forests, especially when considering livelihoods that depend upon the extraction of natural resources. The Caiçaras are inhabitants of the coastal remnants of the Atlantic Forest of SE Brazil and their survival has been associated with their flexibility in adapting to new economic activities, and thus being able to continue their existence within the forest, rivers and the sea [1, 2, 3, 4]. In this study we focus on temporal resilience: in another words, we approach the temporal changes in a Caiçara community (1991-2013) and analyze the capacity of this local population of the Atlantic coast to overcome social-ecological perturbation. This Caiçara community built up new forms of living by coping with new social-ecological realities. Long term resilience has been approached in other studies, such as archaeological studies [5]. Here we approach temporal resilience at an ecological scale, considering developments of 22 years of Puruba Beach inhabitants.

1.1 *Resilience*

Resilience is the capacity to absorb changes [6]. One author [7], in particular, developed a model showing the dynamic process of resilience through the reorganization and conservation of the system. Since then, several authors [8, 9, 10, 11] have studied social and ecological resilience, applying models and tools (such as indicators of resilience) on human populations, including inhabitants of the Atlantic Forest and the Amazon [12]. Resilience can be a positive attribute, since a social-ecological system can absorb perturbation before shifting to an undesirable state; or, it can find out other desirable state [11]. This latter condition is what is of interest here in our study, by looking at the temporal changes at Puruba beach.

1.2 The Caiçaras

Caiçaras are the local inhabitants of the Atlantic Forest coast, descending from Portuguese Colonizers, Native Indians, as well as with African influences [1, 13]. The core of their livelihoods, as well as of their social and ecological relations, are based on kinship ties [4]. Caiçara culture includes set of values and typical features, such as their houses, boats, music, dance, religious rituals, among others [13]. The Caiçaras extract resources from the forest, rivers and the sea (plants, animals, fish). They have also participated in economic cycles of the regional and national economy: sugar cane (before 1870), small scale agriculture (declining after 1950) fish commerce (this latter by substituting the commerce of manioc flour and of other agricultural products [1, 2, 14]). In the last years, protected areas (through governmental environmental agencies) have prohibited manioc planting (their food staple) and fishing in certain areas of the coast [15]. Resilience of another Caiçara community (Aventureiro, Grande Island, Rio de Janeiro State) was associated with mechanisms of dealing with local complexities, such as geographical isolation, protected areas and tourism [16].

The community studied here is a Caiçara community (Puruba beach) , located at the Ubatuba district, São Paulo State, Brazil. What makes such a community special, in terms of a temporal social ecological resilience, is the focus of this study [17].

2. Study area and research methods

2.1 The Puruba Beach, State of São Paulo coast, Brazil

Puruba beach was studied since 1991 at different steps. The first study conducted (one of the authors, AB) approached the use of natural resources by this community, where 14 families where living there [18]. This community was also studied and described it in 2002-2003 [19: 38](by this time a decrease in the fish diversity caught was observed):

"The community of Puruba Beach is located on the coast of the Atlantic Forest in Brazil's São Paulo State at these coordinates: 23º21'02''S and 44º55'09''W. The community is bordered by a state park, the Parque Estadual da Serra do Mar, which was created in 1977. The establishment of this park led to restrictions on the use of resources by the inhabitants, such as prohibitions against some of the traditional methods used in agriculture, e.g., slash and burn, and in fishing, e.g., the use of nets on the rivers, without providing alternative means of subsistence. In 1992–1993, 14 families made up this community, and by 2002–2003 the number had increased to 22, four of them families of tourists who had abandoned their former lives in large cities. One consequence of factors such as contact with outside people, the improvement in welfare services, and the environmental laws and restrictions imposed by the state park was that local inhabitants were forced to develop new habits or find substitutes for old ones. For instance, cassava cultivation is no longer practiced at this location, and cheap processed foods are becoming part of the daily diet."

2.2 Methods

One of the authors (GP) conducted semi-structured interviews at Puruba Beach during 2013. Questions were related to their current activities and to the new technologies they adopted, especially associated with communication (access to internet, for example). This study uses especially data from 1991, collected by AB, and compare them to the data collected in 2013 [17].

3. Results and Discussion

In 1991, 25 inhabitants of Puruba were interviewed (52% males, 48% females), with ages 18-80 years old. By this time, 40% were illiterates or functionally illiterates. In 2013, 15 inhabitants were interviewed (47% males, 53% female), with ages 14-80 years old. Illiteracy was in 2013 of 34% (Table 1) [17]. The community, currently, include 30 families, a school, and churches (Figure 1) [17,18]. Comparing the extractive and economic activities performed at Puruba Beach in 1991 with 2013 (Table 1) we observed that, in spite fishing being still part of an extractive activity for local consumption, fishing is not a commercial activity anymore. Hunting was already restricted (observed in 1991) by the governmental environmental agencies responsible for the State Park. Latter, small-scale agriculture and fishing were also restricted in that area [17, 18, 19]. Puruba beach had an increase in the number of Caiçaras that were living there: 14 in 1991, 22 in 2002 [17] and 30 in 2013 (we are not considering tourist houses). Internet communication has facilitated access to new skills, such as education, in which two residents (mother and daughter) perform undergraduate studies through internet. Facebook has facilitated interchanges among leaders of the communities.

The Puruba community has doubled in this 22 years. However, local inhabitants decreased the local extraction of natural resources due to limitations imposed by the State park for manioc flour production, hunting and fishing. Puruba inhabitants had to engage in other jobs in order to maintain their livelihoods. It is a community very different of the close Picinguaba, which include several local conflicts [20]. Puruba inhabitants diversified their activities and engaged in other jobs (Table 1). The average family income has relatively increased (US$ 86, 1991; US$ 282, 2013) [17].

Resilient livelihoods can cope with perturbations, being able to recover from it; existing capabilities that ensure the provision of sustainable livelihoods opportunities, also for future generations, can be maintained [21:63]. In that regard, Puruba's inhabitants, diversified their activities (Ubatuba's jobs). They choose (or were pushed to) to diversify instead of intensify the extractions of resources, such as fishing [22].

We used a framework on resilient categories [23: 237] in order to analyze in more detail the resilience of the inhabitants of Puruba (Table 2). We observed that for many categories, Puruba flexibility allowed the ecological and economical maintenance of livelihoods, with a continuous participation in the local or regional economy. Especially the categories of 'learning to live with change' and 'uncertainty, capacity of reorganization, envisioning new realities and combining different kinds of knowledge' (Table 2) (including new communication channels, such as through the internet, [17]) can be observed in the community.

However, the administration of the environmental agencies regarding restriction of fishing and manioc production have been already pointed out as a non-resilient management, since it decreases local diversity and affects food extractive processes [15, 24]. A resilient management would be to include cultural processes as well as the mechanism that include diversity, such as the manioc production culture the Caiçaras have of exchange cassava varieties and that enlarge agrobiodiversity [24].

4. Conclusions

In this study we compared the livelihood of the Caiçaras inhabitants of Puruba Beach, a community located within Atlantic Forest remnants, São Paulo coast, Brazil. The inhabitants showed flexibility and capacity to manage the restrictions imposed by the governmental environmental agencies. These restriction include prohibitions of local small-scale agriculture and of other extractive activities (hunting and fishing). They engaged in new jobs at the municipality of Ubatuba. In that regard, they were capable to adapt to new realities by diversifying and substituting their economic activities.

Nevertheless, in spite of observing the inhabitants of Puruba resilient, in terms of being capable to cope with changes, we are not sure if the decisions of the governmental managers are the correct: they are completely ignoring the local culture of manioc flour production, fishing and other activities.

1. The Puruba Inhabitants. Results from interviews (%) 1991 (n=25) and 2013 (n=15)

		1991 (n=25)	2013 (n=15)
Mean Age		47	50
Gender	Male	52	47
	Female	48	53
Years of	Illiterates	40	34
	Less than 8	48	40
	8 years	4	6,5
	Less than 10	4	6,5

	10-12 years	4	6,5
	Undergraduate incomplete	0	6,5
Born place	Puruba	60	80
	Same municipality (Ubatuba)	20	13
	Other municipalities in the State of São Paulo)	16	7
	Other	4	0
Activities	Fishing	24	0
	Hunting	0	0
	Bar/Commerce	12	0
	Agriculture	36	0
	House keeper	12	0
	Boat driver	4	0
	Services	8	0
	Public employee	8	20
	Knave	12	0
	Home care	28	7
	Teacher	4	-
	Retired	-	33
	Student	-	27
	Autonomous	-	13
Mean Family wage		US$ 86.00	US$ 282.5

Table 2. Resilience criteria and cultural expression, based on Doubleday (2007: 237) (Categories important for resilience)

Categories important for resilience	**Categories observed at Puruba**
Learning to leave with change and uncertainty	Puruba inhabitants responded to changes by adapting their economic activities in an integrated form within regional economic activities (sugar cane, manioc flour production , fishing). Uncertainty was minimized through jobs achieved at the municipality of Ubatuba. Infrastructure (bus, internet) helped to cope with uncertainty.
Nurturing diversity for reorganization and survival	Puruba inhabitants instead of intensifying activities through new technologies (such as increasing fishing effort) they diversified their activities through jobs at Ubatuba.
Combining different kinds of knowledge	The process of communication they have and participated (internet, facebook) helps in their organization and interaction. They were also very receptive to researchers in all steps of fieldwork, showing communicative behavior.

Creating opportunities for self-organization	They are organized within themselves. Participation at regional scale is limited. Facebook has helped to increases contacts with other institutions and communities.
Envisioning new realities	They have been opening to new realities by adopting new jobs and expanding their activities to Ubatuba, within the municipality. However, the fact that their location is at the frontier of the State Park of Serra do Mar, a protected area, limits their possibilities to new realities.
Practicing "thick co-management"*	There are local leaders, especially based on kinship ties. There are elders and young that interact in local leadership. Management, however, is far from being achieved, since regional interactions are still limited and especially based upon internet.

*thick co-management: asserting views and initiating events to bring about change] (Doubleday, 2007)

Figure 1. The local school of Puruba Beach and a view of the mains street (Picture by GP).

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Author Contributions

AB collected data in 1991, idealized the study and procedures, and wrote this manuscript; GP collected data in 2013, contributed with ideas, and performed her Master's based on this temporal comparison at Puruba Beach; MRS contributing with ideas and with the organization of the data.

Conflicts of Interest

"The authors declare no conflict of interest".

References and Notes

1. Begossi A: *Resilience and neotraditional populations*: the Caiçaras of the Atlantic Forest coast and caboclos of the Amazon (Brazil). In Linking ecological and social systems Edited by: Berkes F, Folke C. Cambridge: Cambridge University Press; **1998**:129-157.

2. Begossi A. Temporal stability in fishing spots: conservation and co-management in Brazilian artisanal coastal fisheries. *Ecology and Society***2006**; 11: 5.

3. Begossi, A. Small-scale fisheries in Latin America: Management models and challenges. *MAST* **2010**, 9: 7-31.

4. Begossi A. Ecological, cultural, and economic approaches to managing artisanal fisheries. *Environment Development and Sustainability***2014**; 16:5–34.

5. Colonese AC, et al. (2014) Long-Term Resilience of Late Holocene Coastal Subsistence System in Southeastern South America. *PLOS ONE* **2014** 9(4): e93854.

6. Schläpfer, F; Schmid, B. Ecosystem effects on biodiversity: a classification of hypotheses and exploration of empirical results. *Ecological Applications***1999**, 9, 893-907.

7. Holling, C. S. 1992. Cross-scale morphology, geometry and dynamics of ecosystems. *Ecological Monographs***1992**, 62, 447-502.

8. Adger, W. Neil. Social Capital, Collective Action, and Adaptation to Climate Change. *Economic Geography*, Worcester, **2003**, v. 4, n. 79, p.387-404.

9. Berkes, F.; Colding, J.; Folke, C. 2003. *Navigating social-ecological systems*. Cambridge University Press: UK, **2003,** pp. 1-32.

10. Berkes, F.Shifting perspectives on resource management: resilience and the reconceptualization of 'natural resources'and 'management'. *MAST***2010**, 9, 13-40.

11. Cinner, Joshua; Fuentes, Mariana M. P. B.; Randriamahazo, Herilala. Exploring Social Resilience in Madagascar's Marine Protected Areas. *Ecology And Society***,** Canadá, v. 1, n. 14, p.41-41, jun. **2009**. Available online: <http://www.ecologyandsociety.org/vol14/iss1/art41/>.

12. Lopes, P.F.M.; Silvano, R.A.M.; Begossi, A. Extractive and Sustainable Development Reserves in Brazil: resilient alternatives? *Journal of Environmental Planning and*

Management **2011**, 54, 421-443.

13. Diegues, A. C. Mudança como Modelo Cultural: O caso da Cultura Caiçara e a Urbanização. In: DIEGUES, Antonio Carlos Sant'anna (Org.). *Enciclopédia Caiçara:* O Olhar do Pesquisador - Volume 1. São Paulo: HUCITEC: NUPAUB: CEC/USP, **2004**.

14. Begossi, A. The ethnoecology of Caiçara metapopulations (Atlantic Forest, Brazil): ecological concepts and questions. *Journal of Ethnobiology and Ethnomedicine* **2006.**

15. Begossi, A, MayP H, Lopes P F, Oliveira L E C, Vinha V, Silvano R A M. Compensation of environmental services from artisanal fisheries in SE Brazil. *Ecological Economics*. **2011**; 71: 25–32.

16. Prado, D. S; Seixas, C. S; Berkes, F. . Looking back and looking forward: Exploring livelihood change and resilience building in a Brazilian coastal community. *Ocean & Coastal Management***2015**, 113, 29-37.

17. Prado, G. E. *Cenários Temporais no Puruba (Ubatuba, SP): Tecnologias, Comunicação e Percepção Ecológica (1991 e 2013*). 2015. 49 f. Dissertação (Mestrado) – Curso de Ecologia, Sustentabilidade de Ecossistemas Costeiros e Marinhos, Universidade Santa Cecília – Unisanta, Santos, **2015**.

18. Begossi, A. Fishing spots and sea tenure: incipiente forms of management in fishing communities. *Human Ecology***1995**; 23: 387-406.

19. Maccord, P. L.; Begossi, A.. Dietary Changes over Time in a Caiçara Community from the Brazilian Atlantic Forest. *Ecology and Society*, **2006**, 02:, 11, 2006. Available online: http://www.ecologyandsociety.org/vol11/iss2/art38/

20. Begossi, A. Temporal stability in fishing spots: conservation and co-management in Brazilian fishing communities. *Ecology and Society* 2006; 11: 1,5. http://www.ecologyandsociety.org/vol11/iss1/art5/.

21. Armitage, D. In *Adaptive co-management,* UBC Press*:* Vancouver, Canada, **2007**, pp. 62-82.

22. Mccay, B. J. Optimal foragers or political actors? Ecological analyses on a New Jersey fishery. *American Ethnologist***1978,** 8, 356-381.

23. Doubleday, N. In *Adaptive co-management*, UBC Press*:* Vancouver, Canada, 2007, pp. 228-246.

24. Cavechia, L.A; Cantor, M; Begossi, A.; Peroni, N. 2014. Resource-patterns in swidden farming communities: implocations for the resilience of cassava diversity. *Human Ecology***2014**, DOI 10.1007/s10745-014-9672-6.