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Panel

Management and livelihood: Interrelation between fishing and other activities in managed communities in the Amazon floodplain.

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Abstract

Previous research on the subsistence oriented fisher in the Amazon had suggested that fishing, agriculture, and ranching are closely related to each other. When communities in this region undergo under management the productivity of the fishing activity is increased and research has showed that extra time is saved to practice other activities. The objective of this work is to understand the relation between fishing and other activities in fishing communities in the Lower Amazon. By using a survey conducted in 18 paired communities with and without co-management agreements (i.e. 9 pairs of a co-managed and non-managed fishery each) this study had the objective to evaluate the changes in household practices once management is installed in a community and fish productivity increases. A total of 259 households were surveyed to estimate total income of economic activities, fishing effort, and catch. Results showed that the increase in productivity in managed lakes is actually the result of exclusion of external fishers and not the result of reduction in household time expended in fishing activity. This unchanged relation between fishing time in communities with and without management is also true for other activities as there is no significant difference between agriculture and cattle ranching practiced between managed and unmanaged communities (average crop area and heard size per family). A linear regression of fishing income and income of other activities and social variables showed a light significant positive relation

between fishing (using canoe) and agriculture and a negative relation with retirement income but did not show any relation with cattle, number of fishing boats, and income from salary. Using this analysis no relation was established between ranching and fishing activity giving evidence that fishing is not associated or subsidizing deforestation for cattle ranching.

INTRODUCTION

Although Amazon economy has grown economically due to several activities such as wood, mining or ranching (Mattos e Uhl, 1995, Sobral *et al.* 2002) fishing is an important traditional activity (Almeida *et al.* 2003). For the families living in the floodplain fishing is definitely the most important activity for the residents since the decline of agriculture in the floodplain (McGrath *et al.* 1993). Recently with the increased activity of commercial fishers, the families in the floodplain started to take control over their lakes and started to define rules on how to fish in their lakes (Almeida *et al*. 2001, Almeida & Cabral 2004, Almeida & Almeida 2003).

Due to the increasing importance of fishing for subsistence fishers, a large number of recent studies have focused on the socio-economic context and on institutional aspects of the fishing agreements (McGrath *et al.* 1993, De Castro 1999, Oliveira & Cunha 2000, Pereira 2000, Smith 2000, DeCastro & McGrath 2003) and recently, a study has shown that the regulations for individual lakes in the Amazon have resulted in increase in productivity for the fisher (Almeida *et al.* 2002).

Because of the changes in the fishing activity in those communities researchers have suggested that in some cases fisher tend to fish less and increase agriculture activities when fish productivity increases.

The present analysis aims to evaluate the relation between fishing and activities such as agriculture and ranching as productivity of lakes increases and fishers catch more per fishing hour in the Lower Amazon.

Methods

Data collection

The study was designed as a replicated, paired comparison of fishing effort and catch between communities with established and successful co-management agreements and communities without such agreements. At first, nine communities with established, successful co-management agreements were selected from a list of

registered agreements. Only communities where co-management was perceived to be successful by community leaders, the commercial fisher's union, the federal environmental agency (IBAMA), and NGOs alike were selected. For each community with a co-management agreement, a similar local community without a functioning management agreement was selected for the paired comparison. Pairing was based on similarity in terms of geographical proximity, dominant land type (upland or floodplain), and size of lakes in the vicinity of the community.

Detailed interviews were carried out with 259 families in 18 communities during the period of October to December 2000 (low water season), and again during July 2001 (high water season). Questions covered general household social and economic aspects, and detailed information on fishing activities carried out and catches obtained during the previous week. Additional interviews were carried out with community leaders in most of the communities with co-management agreements in order to establish their motivation for setting up agreements.

Interrelation between activities

Exploratory analyses were carried out to test for relation between variables (log transformed). A correlation matrix was used to explore relationships between variables. Only the variables that had significant correlation with fishing income (ln) were used as independent variables in a linear multiple regressions against fishing income.

Results

Characterization of the household activities

The surveyed communities ranged in size from 18 to 156 households, with a median of 67. The major sources of household income found were grouped into five categories: fishing, farming, cattle ranching, paid employment, and retirement benefit.

About 84% of households are engaged in fishing, however most of them fished only for subsistence purposes (7% of households owned a fishing boat and 11% of the families had a family member working as a fisher in someone else's boat).

Approximately 66% of households are engaged in agriculture, growing mostly beans, watermelon, manioc, and corn in areas as small as 0.5 ha or less. About 48% of households engage in cattle ranching, with a typical herd size of 22-32 heads. About 30% of the households receive retirement pensions from the government while 16% receive wages (Almeida 2004).

Income per activity

This survey was also used to estimate income of floodplain families. Families' practice a mix of activities among agriculture, ranching, fishing, and other less important activity such as animal husbandry or can have other source of income based on salary or retirement pensions. Families that practice only one activity add up to 27% of the families and have overall income lower then families that practice more than one activity. In this type of families (families with only one income) fish or salary brings an average income of R$1,200 and R$1,888, respectively while agriculture and retirement has an income about two times these values.

Families with more then one source of income have higher total income. About 30% of the families practice agriculture, cattle and fishing together. These families have an average income of R$3,796, a value much higher then the families that have only one source of income. The second biggest group are the families that practice fishing and agriculture, representing 27% of the families. Families that practice either agriculture and cattle or fishing and cattle have also similar income (varying from R$2,800-3,100) but represents only 12% of the families. Finally only 1% of the families practices the three activities and has also wage and retirement pensions, these families had the highest total income.

Interaction between activities

Correlation between activities shows that fishing is correlated to agriculture but not with cattle activity. Families that have income from retirement are older, with fewer years of education, and larger number of children. This group of people have positive relationship with number of head of cattle but negative relationship with size of area planted. Chi Square test of independence confirms that fishing and agriculture are dependent but cattle are not related to any of these activities.

Using only the variables that show significant correlation with fishing, a linear regression of log of fishing income and other income and some social variable showed significant relation between fishing and agriculture, retirement and number of kids and did not show any relation with cattle, number of boats, income from salary and age of husband. The explanatory variables, however, explained only 8.5% of total variance. Fishing activity was not significant also with families that lived in upper or flooded areas (all log transformed) (table 1).

Table 1. Regressions parameters estimated for the subsistence fisher activities.

	Coefficient (SE)	Sig.
(Constant)	2.905 (0.593)	
LN Value Production	0.157 (0.054)	0.187
LN Retirement	-9.35E-02 (0.045)	-0.135
Ln Number Kids	0.706 (0.305)	0.146
R2	0.085	

Discussion

Some studies have suggested that the higher productivity in the fishing activity of the communities result in an increase of activity of other nature such as agriculture or cattle. This might have occurred to some specific community but it was not true for the set of communities studied here. No relation except a small light relation between number of kids and income of agriculture and a negative relation with retirement income with fishing income was found. Also there was no relation between ranching and fishing showing that the drive to increase cattle heard in the floodplain is other then the fishing activity.

Based on previous studies with this data set (Almeida *et al.* 2002, Almeida 2004), the management of the communities seem to have the main purpose to reduce the effort of outside fisher. As Almeida *et al.* (2002) have shown the reduction of outside fisher causes an increase of productivity for the subsistence fisher from 60% in relation to unmanaged communities. But this does not represent that the community changed its fishing pattern. Based on this data it seems that all activities are practiced in the same way as in communities without management. As in other regions lake

management can be quite different (Oliveira & Cunha 2000) it is important to test this relation for regions such as Tefe or Peruvian floodplain.

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