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AN APPROACH TO STUDY SPATIAL DISTRIBUTION OF SMALL-SCALE FISHERY AT THE AMAZONIAN FLOODPLAIN LAKES USING THE GEOGRAPHIC INFORMATION SYSTEMS (GIS)[1]

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Resumo

Desenvolvemos uma eficiente abordagem para obter informações sobre a atuação da frota de pesca artesanal que pesca em lagos de várzea da Amazônia. A abordagem emprega técnicas de Sistemas de Informações Geográficas (SIG) e pode ser incorporada em sistemas tradicionais de estatística pesqueira. Os dados de entrada são captura e esforço de pesca e podem gerar informações acerca da distribuição espacial do esforço de pesca e dos habitats preferenciais das espécies explotadas, que são fundamentais em estratégias de manejo pesqueiro.

Palavras-chave: pesca artesanal, distribuição especial, várzea, SIG.

Abstract

We developed an efficient approach to obtain information on small-scale fishing fleet that act in Amazonian floodplain lakes. This approach employs techniques of Geographical Information Systems (GIS) and can be incorporated in traditional systems of fishing statistics. The basic data are catch and fishing effort. With this approach we are able to obtain fundamental information to fishery management like spatial distribution of fishing effort and most preferred habitats of exploited species.

Key-words: small-scale fishery, spatial-distribution, floodplain, GIS.

[1] A nota é parte do trabalho de doutoramento em Biologia de Água Doce e Pesca Interior do Instituto Nacional de Pesquisas da Amazônia, do primeiro autor.

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In general, management approaches in fisheries have been conducted on basis in ecology resource, habitat protection or both. However, temporal and spatial distribution of fishing effort within fishing grounds is an important baseline to assess the status of the fishery.

As was demonstrated by some authors (BEGOSSI 1998; PET-SOEDE et al. 2001), the fishermen behavior is not homogeneous and main differ substantially in their fishing strategies. Hilborn (1985) comments that the collapse of many fisheries can be best explained as the result of misunderstanding fisher behavior, rather than a lack of knowledge of fishery resources.

Although the relevance of understand the fishery dynamics, which include the behavior of fishing fleet, until now few studies were made (SALAS AND GAERTNER, 2004). Caddy and Carocci (1999) published a paper to report some practical Geographical Information Systems (GIS) applications for fishery management, including a model to simulate the fishing effort allocation by the fishing grounds. From a resource perspective, Nieto et al. (2001) employed GIS and identified probable fishing grounds to anchovy (Engraulis ringens) for the industrial purse seine fleets in the Northern Chile are related with sea surface temperatures and thermal gradients.

Some studies were accomplished at the Amazon basin, aiming to describe the fishing fleet dynamics, but only at a macro-regional scale and meaning this question from a one-dimensional perspective. Petrere (1978) identified fishing grounds explored by the fleet that landed in Manaus, main urban center in the Central Amazonian Region. Almost thirty years later, Batista and Petrere (2007) reported a similar essay on the small-scale fishing fleet of the Amazonas state, including a temporal component in their analysis. Both studies are quite important, because they show the reach expansion of the main commercial fishing fleet acting in the Amazon basin.

Recently, Nolan et al. (2009) developed an approach that use landscape variables aiming to explain the fishing yield of lakes. However, there are not developed methodologies to study the habitats preferences by Amazonian small-scale fishermen in a lake environment. The fishing strategy of these small-scale fishermen is determined mainly by the traditional knowledge and their habitats preferences will be probably the main driver force to explain the fishing fleet dynamics.

Nevertheless, the Amazonian small-scale fleet is composed by boats without technological engines that could store geographical information about fishing ground. At the same time, an important part of the fishermen is illiterate and trials to employ notebooks on board are longer to fit good results.

Thus, we developed a system to gather fishermen information by interviews made during fish landings. Thus, we incorporate strategies used to identify marine fishing grounds, specifically the employment of transect aiming to identify where was allocated the fishing effort and the origin of fish landed, and developed the following steps.

1. We built a system to control the fish landings in Manacapuru, a small city of the Amazon basin located approximately 100km far from Manaus (capital of Amazonas state). This city concentrated the fish landings of catches accomplished at the Manacapuru Lake, a huge lake system, but not fluvial catches made by greatest fishing boats from other regions.

2. The lake area was divided in transects of 16,0 km^2. A map with numbered transects was built (Figure 1).

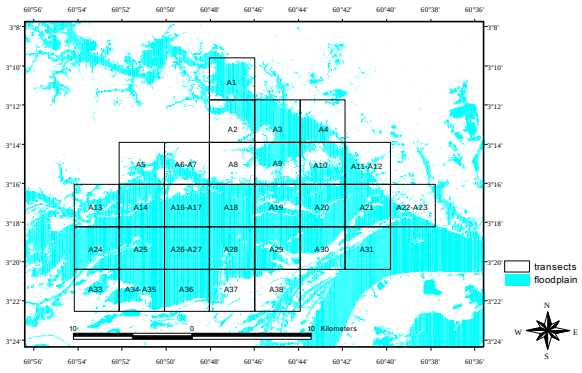

Figure 1. Lake area divided in transects of 16,0 km^2.

3. During the landings, we showed the map to the fishermen and asked them where they realized the fisheries.

4. We collected information related with the fisheries, mainly total catch and fishing effort.

5. Finally, we did to include this information in a map using GIS software. Basically, we built a relationship between fishing landing information database with a lake shapefile and its areas defined by transects.

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Thus, we were able to reach two purposes: (i) we identified the fishing grounds explored by the small-scale fishermen (Figure 2), and (ii) we obtain a first insight about fish species distribution in the lake system (Figure 3).

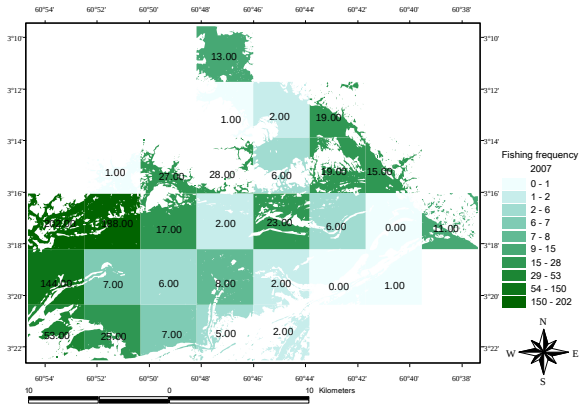

Figure 2. Fishing frequency by lake area during the year of 2007.

The number of possible combined information that could be made is great and could include temporal patterns, for example: fishing yield per area and season of hydrological cycle, fishing areas of threatened species, etc. This information type could be incorporated aiming a full knowledge of the complete fishery system, as described by Salas and Gaertner (2004) as a combination of subsystems (e.g. human, natural resources and management) that interact dynamically and are influenced by external and internal factors.

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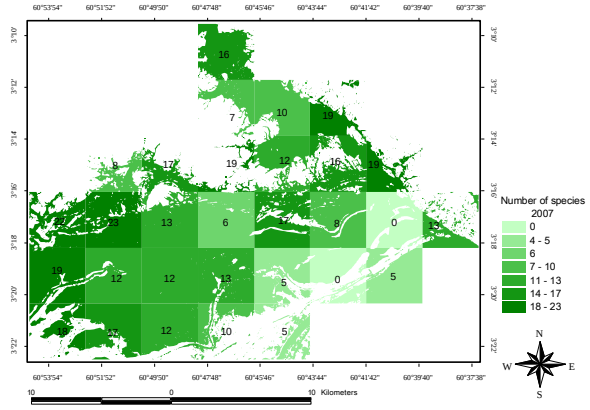

Figure 3. Number of species caught by lake area during the year of 2007.

Disclosure

This product is new and therefore is not considered for any other publication. The authors and reviewers did not report any conflict of interest during their evaluation. Therefore, *Scientia Amazonia* owns the copyright, has the approval and permission of the authors for publication of this article, electronically.

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