

A network diagram with white nodes and lines on a pinkish-purple background.

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A background image of a rock surface covered in various handprints in shades of red, orange, and brown.

Collective thinking coordinated
by Olivier Dangles, Marie-Lise Sabrié and Claire Fréour

The logo for IRD Editions, featuring a stylized 'IRD' symbol above the word 'Editions' in a sans-serif font.

IRD
Editions

• Fishing in the Amazon: play first, negotiate later

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Background

From the international Conferences of the Parties (COP Climate and Biodiversity) to local agreements between users sharing resources, reaching consensus in multilateral negotiations is a challenge of primary importance to sustainability efforts. It has also become a dynamic field of research within the scientific community, as well as among political scientists and IT specialists. One example of this kind of research involves fishery resources in the Amazon basin, where local communities have a long history of collective organisation to ensure sustainable management. Highly diverse though they are, fish stocks are in sharp decline in certain parts of the Amazon as a result of climate change, environmental factors and industrial fishing. In some Brazilian states, such as Pará, community agreements are often violated. In such cases, fishing becomes a source of conflict.

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Further reading

CHAPUIS K. *et al.*, 2022 – Support local empowerment using various modeling approaches and model purposes: A practical and theoretical point of view. in Marcin C. (ed.), K. Bogumil (ed.): *Advances in Social Simulation*. Proceedings of the 16th Social Simulation Conference, 20-24 September 2021, Cham, Springer: 79-90. https://link.springer.com/chapter/10.1007/978-3-030-92843-8_7

Support modelling: facilitating system transformation

The purpose of support modelling is to encourage collective learning about the workings of socioecological systems, focusing on the use of natural and renewable resources; it may be explicitly focused on transforming practices in response to pre-identified problems. It involves stakeholders in the co-construction of models based on interactions between autonomous agents (e.g. fishermen within a community), and encompasses a vast array of formats ranging from role-playing games (or RPGs) requiring no computers to digital simulators (or multi-agent systems) used in participatory mode with all involved. The co-construction of models highlights the coexistence of different points of view concerning resources, and the potential for conflict between these views. The process aims to arrive at a shared vision conducive to informed collective decision-making, allowing for changes in the way resources are used within the existing system. The use of models makes it possible to operate at a certain remove from reality, making it easier to explore potential avenues for transformation identified by the group, and encouraging collective debate. Often simple in form, the model is a snapshot of the group's shared "vision"; it is not a predictive tool. Co-construction is an iterative, evolving process; it starts with a series of questions which evolve as the process continues, and may lead to the emergence of further questions.

Fishery resources in Amazonia: a source of competition and conflict

Managing fishery resources is a societal challenge well-suited to support models. In Amazon, subsistence fishing is the primary source of animal protein for populations residing on flood plains, and the main source of income for small scale fishing communities. The impact of industrial fishing on fish stocks has prompted the populations living in proximity to the great rivers to organise themselves with a view to limiting, or even prohibiting, access to flood-plain lakes. This has caused considerable conflict in the region. In the state of Pará, fishing is regulated by a 2004 law which fishing communities now regard as outdated, a recurring source of conflict. In 2021 the state government set about revising the community fishing agreements, henceforth the new legislative standard for fishing regulations. The government tasked representatives of small scale fishing communities (unions, fishery councils) municipal environmental secretaries and representatives of the State of Pará with supporting this process.

A serious game to encourage dialogue and negotiations

Within the framework of the Bonds (Biodiversa-Belmont Forum) and Saberes (BNP Paribas Foundation) projects, an interdisciplinary Franco-Brazilian team set out to create a support model for tackling the influence of climate

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change and the installation of dams to protect fisheries, seeking adaptation strategies to better preserve these milieus. However, during preliminary discussions ahead of the project launch, the local fishing union based in Santarém, in the West of Pará, proposed refocusing the modelling efforts on intra- and inter-community agreements, in order to better respond to the demand from local people. A focus group bringing together researchers, representatives of the NGO Sapopema (Society for fishing and environmental protection), local fishing unions, the Amazon Fishermen's Movement, rural workers' unions and representatives of the federation of community associations met monthly over the course of a year to co-construct a role-playing game called "Pesca Viva", which has since been tested and approved by several communities in the region.

From the Pesca Viva game to revised agreements on a regional scale

The co-construction of the game brought to light the problems faced by small scale fishing communities, such as the colonisation of fishing grounds by industrial fishing operations, the lack of fish stock monitoring and the inadequacy of the punitive measures applicable when agreements are violated. It also demonstrated the importance of strengthening the governance of local institutions and communities, and the need to communicate more effectively on the importance of preserving resources. A decisive step in the modelling process was the successful pivot to expand the focus group by involving municipal environmental representatives and the Pará state



The Pesca Viva game (August 2022).

government, in order to re-establish dialogue and trust between these governmental institutions and the representatives of fishing communities. By their own account, the dynamic established by this process paved the way for negotiation of a historic agreement for the region, spanning all three municipalities. One secretariat of Brazil's Ministry for the Environment has also made use of the game as part of their Pescando Cidadania programme, encouraging local people to respect the periods in which fishing is subject to restrictions in the region. The rules of the game are as follows:

two boards are laid out containing five fishing zones, reflecting the seasonal variations experienced by the flood plain. Four stocks of fish, two of which are protected, are dealt out. A year is played over three rounds - winter, summer and the “*defeso*” period in which protected species of fish cannot be sold. The game features four communities, each represented by a group of players who take on the roles of fishermen. They can move, fish and sell their catch, and use the money to buy food and goods. In each group, one player acts as

community leader. The four fish stocks reproduce and migrate. At the end of a year, the model (SMA) which accompanies the RPG is used to reproduce the behaviour of the players for four more years. Once the resulting effects on fish stocks are calculated by the model, the community leaders are invited to come to an agreement. The game facilitators do not give any particular instructions. The players then play for another year, and the multi-agent simulator once again calculates a projection for the ensuing four years.

KEY POINTS

In the Brazilian state of Pará, local fishing communities on the banks of the Amazon are more concerned about the damage wrought by industrial fishing than they are about climate change or the proliferation of dams. Participating in a co-construction exercise run by researchers - a support modelling project - has prompted them to rethink their initial objectives, although this does not mean that they cannot return to them later. The process has delivered tangible results, restoring interinstitutional dialogue and bringing users and political decision-makers closer together, contributing to the negotiation of a regional fishing agreement. The researchers adopted an intermediary position in this process, utilising a methodology which promotes the exchange of knowledge and fosters the formation of bonds of trust.