ECOLOGY OF RESERVOIRS

Miguel PETRERE Junior

Rio Claro Biosciences Institute / São Paulo State University (UNESP)

Figure 1. Bariri reservoir (above) and Nova Avanhandava reservoir (below)

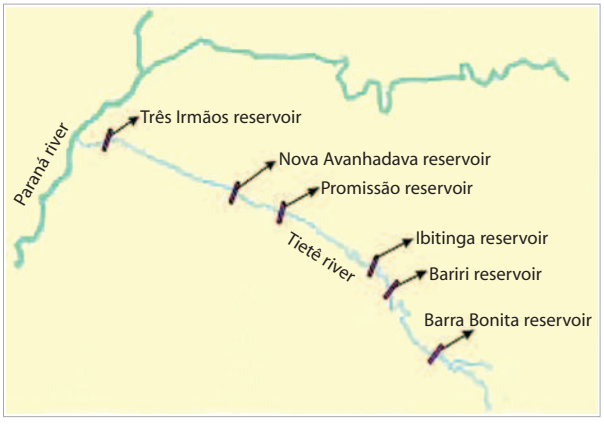

Figure 2. Reservoirs in the Tietê river (SP)

The present project is composed by five sub-projects: (1) *Historical evolution of the trophic and limnological relationships in the Itaipu reservoir: top-down and bottom-up effects in the fish production* through which we study the biotic and abiotic factors of the reservoir. This project aims to explain why the fish production of the Paraná basin reservoirs is comparatively low. (2) *Adaptation of the index of biotic integrity (IBI) to the reservoirs of Bariri, Ibitinga and Nova Avanhandava, in the Tietê river (SP)*, aiming to adapt the IBI in order to evaluate the trophic conditions of these three reservoirs by means of its fish fauna. This subject is important to delineate optimal strategies for the use of Tietê river basin soil, which minimizes its impact on the already impoverished fish fauna; (3) *Adaptation of the index of biotic integrity (IBI) to the reservoirs of PCH´s – Batista and Jorda Flor, Turvo river (SP)*. These two PCH´s were never studied and no scientific collection of its fish fauna was accomplished to now; (4) *Bio-economical evaluation of the small-scale fisheries of Barra Bonita reservoir (SP)*, whose main objective is to estimate the net profit of the fishers at Barra Bonita reservoir, in the Tietê river. This sub-project inserts in the social and economical problems of the unemployment in the rural area, where sugarcane monoculture prevails, and then fishing constitutes the last job opportunity for many; (5) *Food webs assembly and their resistance to the introduction and exclusion of fish species: resulting properties of an individual-based model*, through which we intend to develop a theoretical computational individual-based model, for the evaluation of new food webs assembled due to invasions and exclusions of fish species. This subproject is very opportune, pioneer in our country, since invasions and exclusions of fish species is a common phenomenon in reservoirs, which are no-deliberate human experiments when considering its fish fauna. Under this strategy, we intend to understand the intricate dynamics of the original fish communities when faced to invaders.

SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

The adaptation of the Biotic Integrity Index (IBI) for dams is a matter of particular interest, in order to evaluate the conditions of these ecosystems starting from some ecological attributes of its fish assemblies. The use of the fish is justified by the fact that they have an important position in the food chain and so they favor an integrated vision of the aquatic environment revealing its degradation.

The dams of Bariri, Ibitinga and New Avanhandava belong to the system of six dams of Tiete River (SP) reservoir cascade. The priority use of the water is electrical power generation followed by navigation and, secondarily, public and industrial provisioning, reception of domestic and industrial effluents, irrigation and fishing. A total of 24 points (six in Bariri, six in Ibitinga and 12 in New Avanhandava reservoirs) were selected for fish collection, located in three different types of habitat in each reservoir: lateral, mouth of tributaries and reservoir center. The fish fauna sampling methodology was standardized, using 10 gill nets with mesh sizes ranging from 3 to 12 cm between opposite knots and fish traps. In each point, we have collected fish and some physiochemical and environmental variables were annotated. The samples were collected in two seasons: dry (August 2007) and rainy periods (February 2008). In the data analyzes, it was also included previously collected data from Barra Bonita reservoir, the first of the cascade system. The following stages for the construction of the RFAI (Reservoir Fish Assemblage Index) a derivative of IBI were: (1) definition and selection of the metrics; (2) the reference conditions determination; (3) the punctuation attribution for each metric and RFAI calculations and (4) the results validation. The IAPR seasonal and space (dams and its habitats) variability of IAPR was evaluated by ANOVA, and the importance of the physiochemical and environmental variables were evaluated through an ANCOVA.

The results obtained in this study show a decreasing gradient of the values of IAPR along the reservoir cascade in Tiete River. In particular, the best values are calculated for Barra Bonita reservoir, the first and most polluted of the cascade, and the smallest values were calculated for Nova Avanhandava, the last of the studied sequence. So, an improvement of the water quality (increasing IAPR), due to biological processes of self-purification and sedimentation expected, as hypothesized, seems to be wrong. In this context, the result of the IAPR is not different from previous studies, but it allows improving the interpretation of this phenomenon. In particular, the poverty condition emphasized by IAPR of Nova Avanhandava may be a direct result of human impact upon the fluvial system. Three aspects stand out: (i) the alteration of the River Continuum Concept due to transformation of the Tiete river in a system reservoir cascade; (ii) the dominance of carnivore fishes increased due to the introduction of species as *Plagioscion squamosissimus* and *Cichla spp*; and (iii) the reservoir age.

MAIN PUBLICATIONS

Petesse ML, Petrere Jr. M, Spigolon RJ. 2007. Adaptation of the reservoir fish assemblage index (RFAI) for assessing the Barra Bonita reservoir (São Paulo, Brazil). *River research and Applications.* **23**: 595-612.

Petesse ML, Petrere Jr. M, Spigolon RJ. 2007. The hydraulic management of the Barra Bonita reservoir (SP, Brazil) as a factor influencing the temporal succession of its fish community. *Brazilian Journal of Biology.* **67(3)**: 433-445.

Miguel Petrere Junior

Instituto de Biociências de Rio Claro
Universidade Estadual Paulista
Av. 24 A, 1515 – Bela Vista
Caixa Postal 199
CEP 13506-900 – Rio Claro, SP – Brasil

+55-19-3526-4237
mpetrere@rc.unesp.br