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BACTERIOLOGICAL CHARACTERIZATION OF THE MIRIÑAY RIVER, CORRIENTES, ARGENTINA

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This paper presents a simple graphic tool that is used with physical-chemical and bacteriological data from the Miriñay River to visualize variability and trends in the environmental condition of the river. These tools can be used to monitor environmental conditions and to plan future management actions to regulate development activities.

INTRODUCTION

The developed countries of the world have demonstrated a great concern for environmental issues and problems, which are often associated with population growth and its consequences. Argentina has begun to move down the path to a recognition and possible solution of these problems, but is encountering numerous difficulties, above all economic, that impede the development of environmental stewardship in the context of sustainable development. This is especially true in the fields of science, technology, and the resource base necessary to successfully face the task of combatting pollution. To address these problems, in August 1995, the LABQUIAM (Laboratorio de Química Ambiental) project began in the Facultad de Ciencias Exactas Naturales y Agrimensura of the Universidad Nacional del Nordeste of Corrientes Province, Argentina. The project offers environmental support services to third parties in the areas of cleanup, investigation, development and consulting.

The lines of research and development at LABQUIAM are directed to environmental preservation. As part of this effort, the bacteriological characterization of the surface water bodies of Corrientes Province is one of the most important objectives.

Project P.I. N° 527 SGCyT has generated results that show environmental impacts as part of the global plan “Environmental Studies of Water Resources”. This paper partly reflects the efforts that the research group is carrying out.

Evaluating the bacteriological quality of the water of Miriñay River is the objective of this work. It was carried out through the use of graphic representation software that has been developed by the LABQUIAM group (Figure 1). The results show the data from monitoring events carried out during the years 2001 and 2002.

Earlier attempts to study the characteristics of water quality have been carried out by Ringuélet et al., 1967; Barreto et al., 1985; Agbo and Teme, 1985; Hem, 1985; and Stiff, 1951.

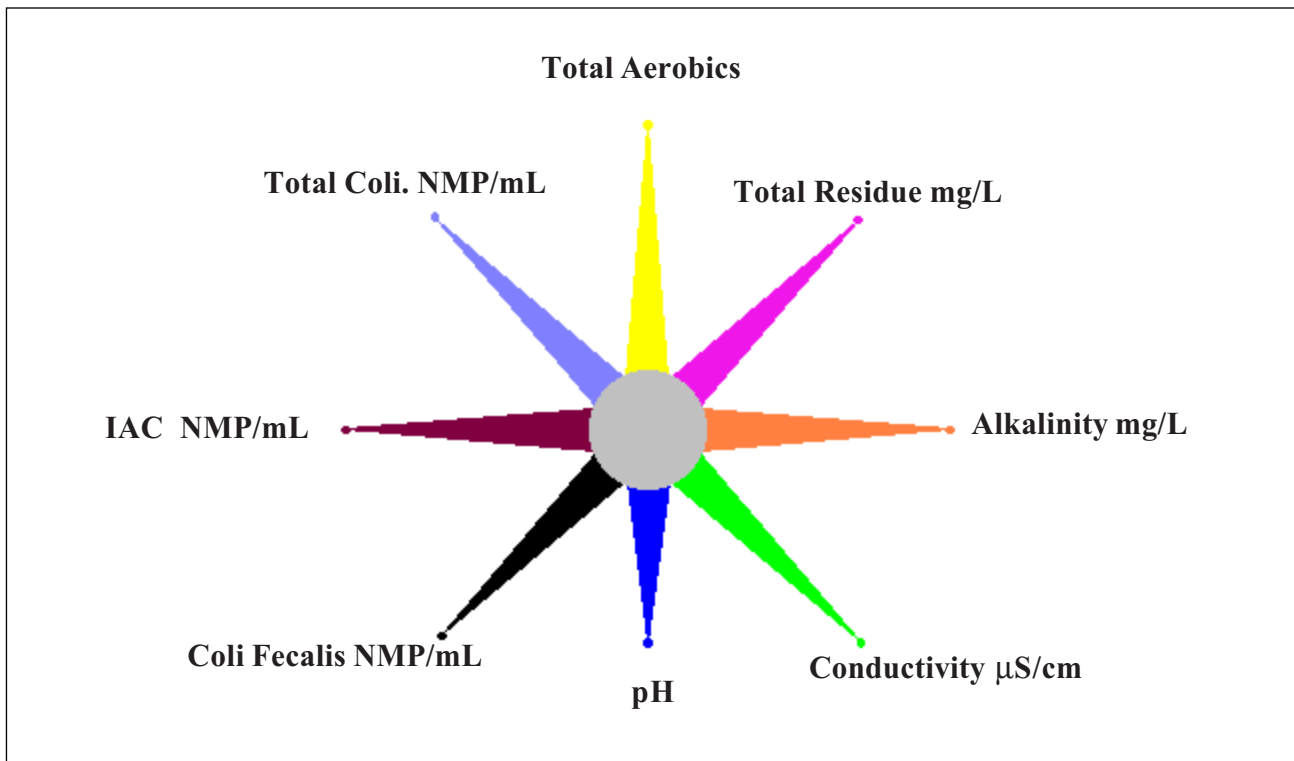


Figure 1. LABQUIAM water quality graphic.

The quality of a water body, taking into account the bacteriological characteristics, should be compared and correlated before taking any analytic decisions. We present here a simple visualization of the data that was developed in LABQUIAM. This tool will assist in the objective of this work, which is to obtain current and reliable information about the ability of Miriñay River to absorb different environmental disturbances. Using these tools, it is possible to establish a current baseline for the water bodies under study, and to determine their ability to absorb future human impacts. In this way decisions regarding the best management of the resources can be obtained.

The presence of coliform bacteria in river water is an indicator of both quality and suitability of the water for industrial, domestic and other uses. The cultivation reactions and the characteristics of this group of bacteria have been studied in detail. The results show that the density of coliforms bacteria is an indicator of the degree of pollution and, therefore, of the sanitary quality of the water.

PURPOSE

I - Partial visualization of the current bacteriological composition of the water bodies in Corrientes Province. On this occasion, only the bacteriological characterization was studied. In previous work, only physical-chemical characteristics were displayed and graphics were plotted by using Microsoft power-point software. However, in this case, graphics were plotted using the LABQUIAM software.

II- The immediate real time observation of the bacteriological quality of the water will permit early diagnoses of water quality in emergencies and early notification of potential environmental impacts.

This paper includes only a part of a comprehensive general project that covers the studies of the water resources of Corrientes, Argentina .

METHODOLOGY

Characterization

The bacteriological and physical-chemical determinations were carried out employing analytic, volumetric, colorimetric, and instrumental methods. The source for the analytical work is Standard Methods for Water and Wastewaters-AWWA-PNUMA (AOAC, 1984; APHA-AWWA-WPCF, 1989 and CEPIS, 1987).

Data processing uses the system developed at LABQUIAM, which has been specifically designed for these purposes. It facilitates the general management of the Laboratory databases and provides researchers with physical-chemical and bacteriological data and the opportunity to prepare statistical analysis of reports and graphics (Macé et al., 2004; Vázquez et al., 1999).

Information presented for the Miriñay River in Corrientes Province shows the nature of the surface water bodies studied and processed with the graphic tool developed at LABQUIAM.

Bacteriological parameters

The bacteriological parameters investigated in this study include aerobic bacteria, total coliforms, fecal coliforms, and coliforms (IAC).

Physical-chemical parameters

The physical-chemical parameters investigated in this study include conductivity, pH, alkalinity and total residues. The analyses were carried out in LABQUIAM. The results of plotting the monitoring data are shown in Figures 2 to 4 and accompanying Tables.

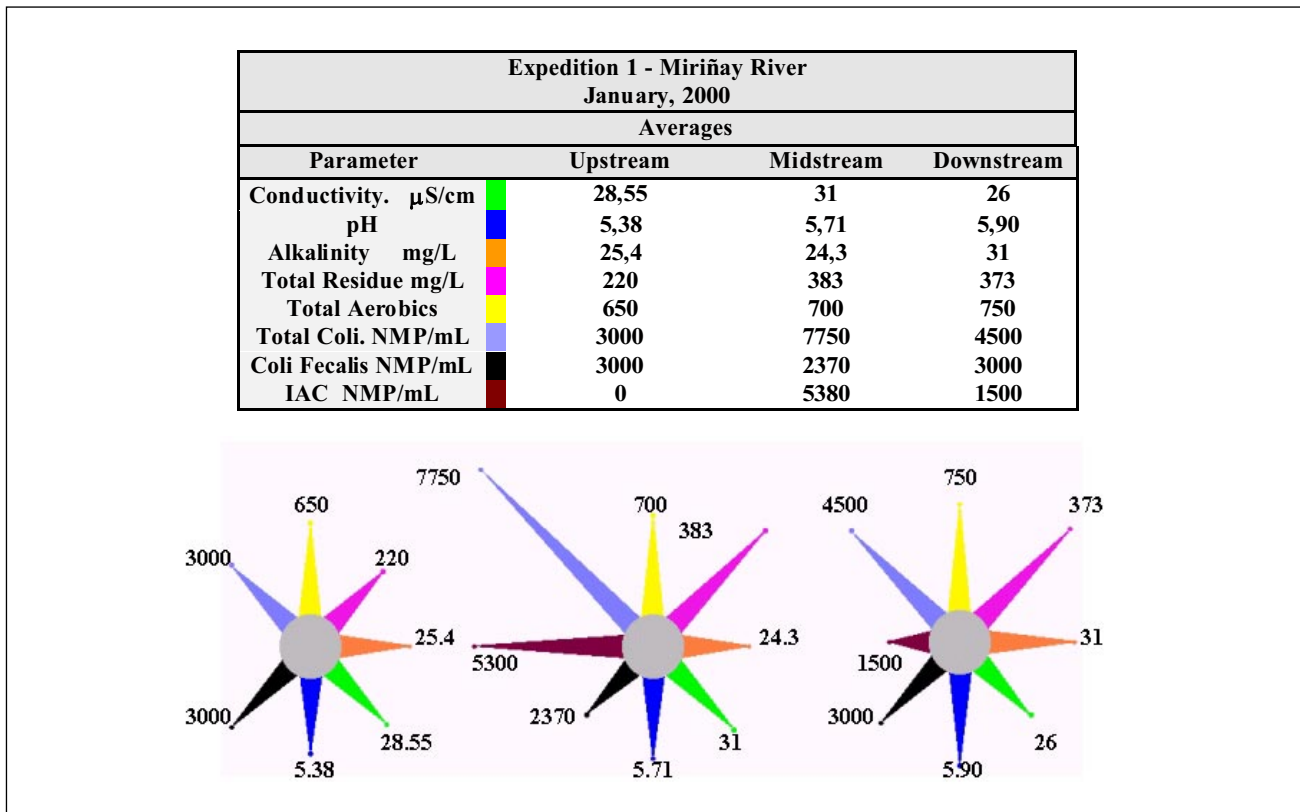


Figure 2. Miriñay River. January 2000 monitoring event graphic and data table.

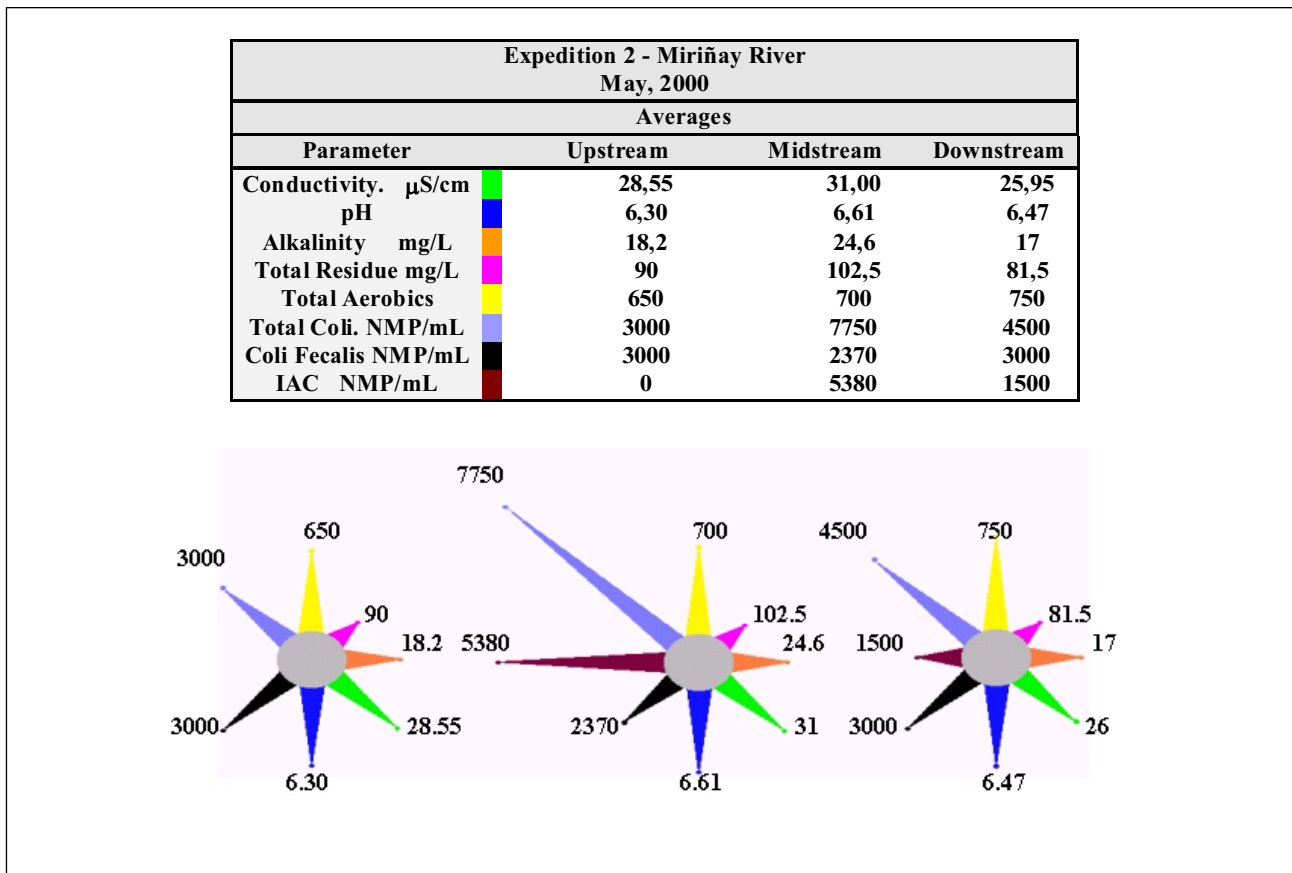


Figure 3. Miriñay River. May 2000 monitoring event graphic and data table.

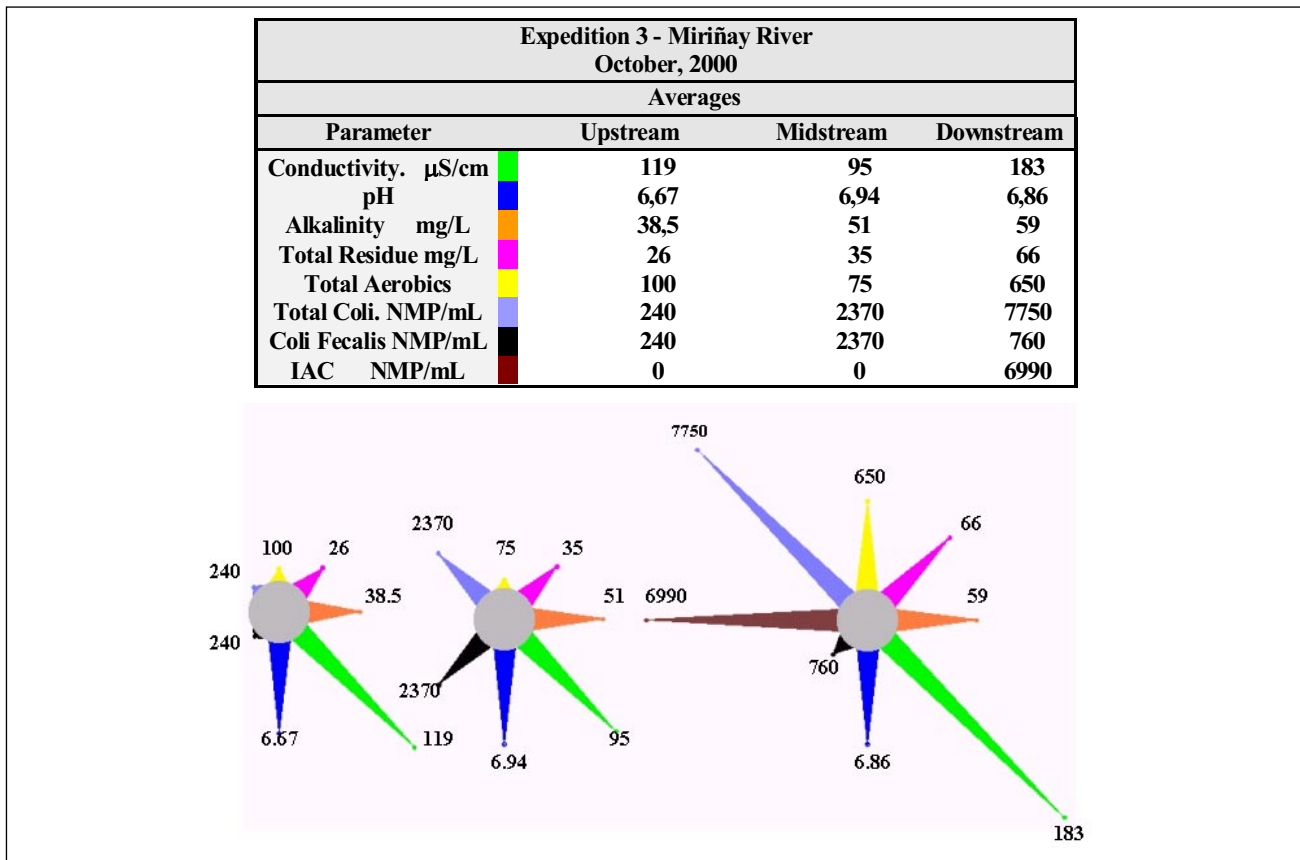


Figure 4. Miriñay River. October 2000 monitoring event graphic and data table.

CONCLUSIONS

It is necessary to regulate to conserve and protect. To create an adequate and sustainable regulation for each component of the whole ecosystem, it is indispensable to characterize each component correctly, and it is here where analytic chemistry participates in an essential way to obtain reliable information.

LABQUIAM objectives include the current need to generate reliable information about surface water bodies of Corrientes Province. The information will provide a baseline reference that will let us study future human impacts in a simple graphical way. It will also provide a useful tool for the establishment of correct policies regarding new developments and urban expansion. We show here how to use the methodology of characterization and representation of the quality from the bacteriological point of view, by reporting the quality of the water of the Miriñay River at the same monitoring location at different seasons of the year.

Water quality information was evaluated with a data processing program that relates eight variables. This program represents progress in the field of presenting environmental chemistry results. Finally, the real time observation of the bacteriological characteristics of surface water bodies is the most interesting conclusion of this study.

ACKNOWLEDGMENTS

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