

**RESUMO**  
[ ABSTRACT ]

**XXVII Congresso Brasileiro de Espeleologia**

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**O IMPACTO DA VISITAÇÃO INTENSIVA EM CAVERNAS**

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Este trabalho constou da análise de vários aspectos de cavernas em rocha calcária que são significativos para sua preservação quando exploradas por atividades turísticas. Seu objetivo principal é oferecer subsídios para determinar a capacidade de carga de uma gruta através de alterações nas medidas de temperatura e umidade relativa do ar, ocasionadas pela presença humana, de modo a determinar o número máximo de pessoas que pode transitar ou permanecer em um determinado espaço no interior de uma caverna sem provocar danos irreversíveis ao ambiente levando em consideração os parâmetros de temperatura e umidade registrados simultaneamente com a contagem dos visitantes.

A pesquisa foi realizada com uso de equipamentos desenvolvidos especificamente para o caso, com apoio de pesquisadores do Centro de Pesquisa Renato Acher (CenPRA), e com patrocínio da empresa SOLBET Microcontroladores e Robótica, ambos localizados em Campinas. Foi desenvolvido o equipamento sensor (ELCAS 7000) para registrar o número de pessoas em uma determinada área da caverna, programado para acompanhar a leitura simultânea de temperatura e umidade relativa do ar através de um termohigrógrafo (TESTOSTOR 175-2) da TESTO.

As medições foram registradas com intervalos de um em um minuto, vinte quatro horas por dia, em 3 pontos dentro da caverna de Santana (PETAR-SP, Parque Estadual Turístico do Alto Ribeira).

**Abstract:**

This thesis provides an analysis of various aspects of limestone caves which are important in their preservation during exploitation for tourism. The main objective was to offer support in the determination of the carrying capacity of a cave by consideration of modifications in temperature and relative humidity of the air when people are present to determine the maximum human presence which is possible without provoking permanent environmental damage.

The research was conducted using equipment especially developed by research workers of the Centro de Pesquisa Renato Acher (CenPRA) and supported by the company SOLBET Microcontroladores e Robótica, both located in Campinas. The first of the pieces of equipment developed consisted of a sensor (ELCAS 7000) designed to register the number of individuals present in an area of a cave which could be programmed to provide a reading at the same time that a thermohygrograph was recording data about the temperature and humidity in the air. The second (ELCAS 6001-III) was designed so that an individual could record the initiation of specific activities in the place where thermohygrograph readings were being taken.

The ELCAS 7000 was used to measure the intense visitation on two consecutive weekends (June 29-30 and July 7-9, 2002) in three areas of the show cave Caverna de Santana: Rio, Encontro, and Fafá. These measurements, taken every minute for twenty-four hours per day, were coordinated with the simultaneous measurements of three thermohygrographs (TESTOSTOR 175-2 loggers by TESTO)

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installed in the same areas. Moreover, 7 more thermohygrographs were installed at 7 points along the river for the period from June 29 to July 9, 2002, also providing measurements at one-minute intervals. The ELCAS 6001 was then used to record the initiation of each activity of this individual: waking up, preparing meals, and lying down to sleep, as well as urinating and evacuating.

Under the law for the protection of caves under consideration in the Brazilian National Congress, any cave to be exploited for tourism must present a Plan for Speleological Management to show how the environmental impact of tourism will be prevented or at least minimized, and the methodology tested here is recommended to help during the development of such plans. Not only can it help identify when levels of temperature and humidity have reached unacceptable levels, thus helping determine how many individuals can safely visit or remain in a given room in a cave at any one time or on any one day; moreover, used for constant monitoring, it can also provide information revealing the need for immediate restrictive actions.