Evaluation of faecal indicator bacteria in a National Park river to assess human impact on the conservation of a protected area

Blanca Pérez-Uz, PhD, Universidad Complutense de Madrid (UCM), Spain

Elena Alonso Fernandes, MSc, CIB, Madrid, Spain

Mercedes Martín-Cereceda, PhD, UCM, Spain

Abstract (300 word limit)

Statement of the Problem: The main aim of National Parks is the conservation of outstanding natural resources which must be compatible with other social, cultural and educational purposes. Recreational activities involve an increasing avenue of visitors which cause difficulties to balance tourism with preservation during certain times of the year. The Guadarrama Protected area was recently (2013) erected as a National Park (Madrid). The administration of the Park requires information to manage the environmental impact of visitor activities on the main conservation purpose. In this context, we studied faecal bacteria indicators (FIB) in three points of the main river crossing the park (river Manzanares). The objective was to assess the influence of visitors´ affluence to the Park on FIB counts in different seasons of a year as well as to evaluate the short-term effects on the river. Methodology & Theoretical Orientation: Three points were selected in the river based on differential accessibility to visitors during four sampling dates in a year. Samples were taken in two dates during the same week to count total bacteria, total coliforms, faecal coliforms, enterococci and sulphite-reducing *Clostridium*. Sampling procedures were repeated four times in a year during different seasons. The main hypothesis was that visitors would influence in the FIB populations. Findings: The bacteria highest abundances were found after a weekend in the summer season when visitors´ affluence was the highest. Total aerobic counts (22 °C and 37 °C) and total coliforms remained stable or increased from Monday to Thursday sampling dates of each campaign. However, faecal coliforms and enterococci always decreased their abundance from Monday through Thursday which showed that these were preferentially eliminated or had a low short-term survival in the river compared to other bacterial groups. No significant differences were found for enterococci when sampling points were compared. Conclusion & Significance: Recreational activities in the park have indeed an effect increasing bacterial populations in the river. These bacteria were even risen in the short-term period of study after a weekend; however, main FIBs were significantly reduced during this term.

Image

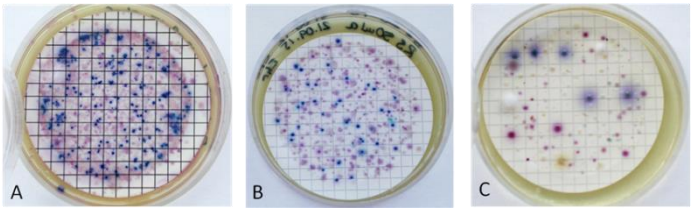


Figure 1. Filters on Chromocult® agar to assess total and faecal coliforms on the first day after a weekend in three of the sampling campaigns: July (A), September (B) and February (C). 50 ml volumes were filtered from the last sampling point (R3) where the highest bacterial concentrations were found. Pink colonies are total coliforms and blue are *E. coli* (faecal coliforms).

Recent Publications (minimum 5)

1. Ghimire, N.P., Caravello, G.U., Jha, P.K. (2013) Bacterial contamination in the surface waterbodies in Sagarmatha National Park and buffer zone, Nepal. Scientific World, 11 (11): 94-96.
2. Hammitt, W.E., Cole, D.N., Monz, C.A. (2015) Wildland Recreation: Ecology and Management. Wiley & Sons Ltd.
3. Strauch, A.M. (2011) Seasonal variability in faecal bacteria of semiarid rivers in the Serengeti National Park, Tanzania. Marine and Freshwater Research 62:1191–1200.
4. Rochelle-Newall, E., Huong Nguyen, T.M., Quynh Le, T.P., Sengtaheuanghoung, O., Ribolzi, O. (2015) A short review of fecal indicator bacteria in tropical aquatic ecosystems: knowledge gaps and future directions. Frontiers in Microbiology, 6 (Article 308):1-15.
5. Verhougstraete, M.P., Martin, S.L., Kendall, A.D., Hyndman, D.W., Rose, J.B. (2015) Linking faecal bacteria in rivers to landscape, geochemical, and hydrologic factors and sources at the basin scale. PNAS, 112 (33): 10419–10424



Biography (150 word limit)

Blanca Pérez-Uz has her expertise in microbial ecology and the use of microbial bioindicators both procariotic and eukaryotic in different natural and artificial environments. Her main interest has been the adaptations and effects of predatory activities of protist on bacterial populations and the possibility to use these activities to test the effects on wastewater treatment plants and natural environmental setups.

Email: perezuz@bio.ucm.com

Notes/Comments:

Funded by Project Microepics - MINECO-CGL 2013-4085