

## WATER QUALITY ASSESSMENT AND THE PREVALENCE OF ANTIBIOTIC-RESISTANT BACTERIA FROM A RECREATIONAL RIVER IN KUCHING, SARAWAK, MALAYSIA

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**Abstract:** Recreational activities may affect a river's water quality, which may pose health risks to those in direct contact with the water. This study aims to analyse the water quality of Jangoi River in Kuching, Sarawak, by measuring the conventional chemical and biological parameters and to characterise the bacteria isolated from the water based on their antibiotic susceptibility. The determination of the water quality is based on the Department of Environment's Malaysian Water Quality Index (WQI), which was carried out at three sampling stations (upstream, middle stream and downstream) in two different sampling trips. Six water quality parameters were measured: Dissolved oxygen, biological oxygen demand, pH, chemical oxygen demand (COD), ammoniacal nitrogen and total suspended solid. The WQI values of the river ranged from 88% to 92%, classifying the river under Class I. The one-way ANOVA analysis revealed that the parameter values for all the three stations are not significantly different, except for the COD. The higher COD value of the upstream water could be due to the release of wastewater from houses and agricultural activities near Jangoi River. The faecal coliform and total coliform counts ranged from 650 CFU/100 mL to 1,000 CFU/100 mL and 20,050 CFU/100 mL to 23,250 CFU/100 mL, respectively. Nine bacteria were isolated and 16S rRNA PCR and DNA sequencing. The DNA sequencing revealed the presence of *Escherichia coli*, *Chromobacterium violaceum*, *Lelliota amnigena*, *Pseudomonas aeruginosa*, *Achromobacter xylosoxidans*, *Stenotrophomonas maltophilia*, *Pseudomonas hibiscicola*, *Achromobacter mucicolens* and *Bacillus pacificus*. Antibiotic susceptibility tests demonstrated the highest percentage of susceptibility for ciprofloxacin (100%), followed by ampicillin (40%) and chloramphenicol (40%). However, the highest percentage of resistance (60%) was shown by erythromycin. The multiple antibiotic resistant (MAR) index in this study ranged from 0.0 to 0.6. The river's WQI categorisation and microbiological status are inconsistent, indicating the need to modify the WQI formula to include the microbial parameter. Additionally, this study recommends the establishment of water quality and antibiotic resistance pattern monitoring programmes to anticipate the emergence of MAR bacteria in the aquatic environment and to document the continuous water quality state of Sarawak's recreational rivers.

Keywords: River water quality, bacteria, Jangoi River and 16S rRNA sequencing.

### Introduction

Rivers are the most vital source of freshwater for all living things, including humans. Human social, economic and political developments during the last several decades have indeed been substantially determined by the availability and distribution of fresh water in riverine systems. Since water is used for a variety of well-being

functions, including municipal drinking water, agricultural land irrigation, industrial water, fishing, boating and body-contact enjoyment, there has been an increasing desire for water essentiality.

Today, Sarawak's recreational rivers have developed into one of the state's most prominent natural tourism attractions. The recreational