Abstract

The Zomar stream has been suffering for over 50 years from a variety of domestic, agricultural and industrial pollution sources together with development pressures in the open spaces that surround the stream. Increased water-dependent development and utilization have led to significantly environmental and hydrological degradation of the Zomar stream in Palestine and its dependent ecosystems.

The aim of this study is to assess the physiochemical and microbiological quality of the stream Zomar stream through one-year long monitoring, in order to estimate the key factors and variables that play a role in the environmental flow regime of the stream which in role can be functioned to save the stream restoration process.

Three sampling stations were selected depending on the human activities and pollution sources along the stream. The water samples were examined for the presence of *coliform* bacteria and pathogens. Four species were isolated (*Escherichia coli, Pseudomonas, Enterococcus, and Klebsiella*). The spatially and temporally behavior of these species in response to the variability in hydraulic parameter and nutrients load respectively. High total and *fecal coliform* were observed in most water samples under drought conditions.

The results from this study reflect that no one indicator or simple hydrological parameter is entirely suitable for all environmental systems and pathogens, even within a common geographic setting. Much point source pollution contributes to the water stream along its path. In the base flow conditions, the amount of pollutant load varied temporally according to the amount of load from point sources along the stream, and spatially with distance from the same sources. Significant variation was observed in response to the hydrological behavior of the catchment. The data show that commonly the bacterial community in the stream is affected by two factors; the first is the cumulative rain factor in winter season, where the bacterial potential to re-enhancing its growth is limited with successes rain events along the hydrological year. The second factor is single rain event dilution where the maximum bacterial removal was noticed at the maximum flood within one rain event. High flow and frequent washout of bacteria lead to lower bacterial concentrations. The *fecal Coliform* bacteria shows a good pattern in response to variation in one storm event, where the maximum *fecal Coliform* concentrations were measured after two week of drought and directly before the rainfall events. Anbta showing highest pathogen removal (self purification) while Deir Sharaf show lowest removal (close to source

point). Anbta show the lowest bacterial community. In general, relationships between indicator bacteria and pathogens were weak, site specific, but primarily positive. This happens because distribution of bacteria or pathogens perpendicularly across the edges and centre, when wash out occurs, it occurs in the middle leaving edges without washing. Average total Coliform levels in Zomar stream were $7x10^{16}$, $4x10^{16}$, $8x10^{16}$ cfu/100 ml all over the year. During discharge event this average reduced to $7x10^{14}$, $4x10^{7}$, $1x10^{14}$ cfu/100 ml showing log removal of 2, **9**, and 2.9 for all three sites, Deir Sharaf, Anbta and Tulkarem respectively. In case of FC, average concentration were $4x10^{13}$, $6x10^{12}$, $2x10^{11}$ cfu/100 ml and reduced to $5x10^{9}$, $4x10^{5}$, $2x10^{10}$ cfu/100 ml showing log removal of 3.9, **7.2**, 1.

The overall assessment for the water quality in the Zomar reflects a potentially serious threat to the environment. The results emphasize the need for:

1) Regulating the seepage effluent from industries and sewage system along the stream.

2) The stream should regularly provide with sufficient treated wastewater, in term of quality and quantity that ensure its sustainability all over the year even in summer time.

3) The addition of treated wastewater to the stream should not be restricted to the beginning of the stream, but distributed on at least 3-5 points along the stream to ensure good restoration process with spatial pattern.