

An Assessment of Water Pollution of the Beshar River Aquatic Ecosystems

Amir Eghbal Khajeh Rahimi, Fardin Boustani, Omid Tabiee, Masoud Hashemi

Abstract—The Beshar River is one of the most important aquatic ecosystems in the upstream of the Karun watershed in south of Iran which is affected by point and non point pollutant sources. This study was done in order to evaluate the effects of pollutants activities on the water quality of the Beshar river and its aquatic ecosystems. This river is approximately 190 km in length and situated at the geographical positions of 51° 20' to 51° 48' E and 30° 18' to 30° 52' N it is one of the most important aquatic ecosystems of Kohkiluyeh and Boyer-Ahmad province in south-west Iran. In this research project, five study stations were selected to examine water pollution in the Beshar River systems. Human activity is now one of the most important factors affecting on hydrology and water quality of the Beshar river. Humans use large amounts of resources to sustain various standards of living, although measures of sustainability are highly variable depending on how sustainability is defined. The Beshar river ecosystems are particularly sensitive and vulnerable to human activities. Therefore, to determine the impact of human activities on the Beshar River, the most important water quality parameters such as pH, dissolve oxygen (DO), Biological Oxygen Demand (BOD5), Total Dissolve Solids (TDS), Nitrates (NO₃-N) and Phosphates (PO₄) were estimated at the five stations. As the results show, the most important pollution index parameters such as BOD5, NO₃ and PO₄ increase and DO and pH decrease according to human activities ($P < 0.05$). However, due to pollutant degradation and dilution, pollution index parameters improve downstream sampling stations.

Keywords—Human activities, Water pollution, Beshar River, Iran

I. INTRODUCTION

THE Beshar stream flow recharge to groundwater aquifers and supplies drinkable water for urban and rural populations. It is being used for a variety of agricultural, industrial and recreational activities thus largely contributing to the economy of the Yasuj counties [1]. Water is a vital natural resource that all living things depend on to survive, but water quality is being affected by human activity. An appropriate literature review in this study are done. The major water quality issues resulting in degradation include water-borne pathogens and noxious and toxic pollutants. Despite

efforts of United Nations organizations, international banks, and some national governments over the past several decades, human health is still at substantial risk due to water quality problems in many areas of the world [2]. In 1990, 1.2 billion people, or 20 percent of the world population, did not have access to a safe supply of water, and about 50 percent of the world population had inadequate sanitation services [3]. The continued rapid degradation of land and water resources due to water quality degradation may result in hydroxide for future populations [4].

The erosion and transport of soils from agricultural lands during intense rainstorms can rapidly mobilize bio available phosphorus [5, 6], which affects the freshwater tropic status [7,8,9]. Surface mining also alters the land, which affects hydrologic pathways. Water interactions with mine tailings and, in some cases, discarded chemicals used for ore processing can leach undesirable and toxic substances to receiving waters. Biological alterations include forest management, agriculture, and the import of exotic species.

The water quality from urban areas is complex due to the myriad of sources and pathways [10].

In urban areas, not only are there multiple sources of individual substances, but the natural hydrologic pathways are replaced with artificial drainage channels, wet and dry storage basins, sewers, and water distribution systems, all of which affect the spatial and temporal quantity and quality of urban runoff. The management of the delivery of untreated waste (point source) directly to surface water has received considerable attention in developed countries, and recently, more emphasis has been placed on controlling diffuse sources [11].

The dominant mechanism for mobilizing the adsorbed P is soil erosion during rainstorms or snowmelt. Because the P adsorption varies depending on the characteristics of the materials, dissolution of the P fertilizer will depend on the type of fertilizer, and the P mobilization will depend on the soil characteristics and water flux [12].

Even if fertilizer applications were stopped today, the nutrient content of the receiving surface water may increase for several decades as the nutrient-enriched soil is eroded and ground-water slowly moves to the receiving surface water [13,12].

The increased river flux of nutrients has resulted in an increase in estuarine eutrophication [14,15]. The frequency and spatial extent of hypoxia and related degradation, particularly the loss of marine life, has been increasing and may be

Amir Eghbal Khajehrahimi is academic member of Islamic Azad University, North Tehran Branch (khajehrahimi@yahoo.com).

Fardin Boustani is corresponding author, assistant professor of Islamic Azad University, Science and Research Branch, Fars, Iran (fardinboustani@gmail.com).

Omid Tabiee is academic member of Islamic Azad University, Arsanjan Branch (Tabiee @ iaua.ac.ir) and Masoud Hashemi is academic member of Islamic Azad University, Marvdasht Branch

attributed to increased biological oxygen demand accompanying increased inputs of agricultural nutrients [15].

II. MATERIALS AND METHODS

The Beshar river is one of the most beautiful, diverse and complex ecosystems in the southern Iran. The Beshar river is one aquatic ecosystems affected by pollutants. This study was conducted to evaluate the effects of human activities on the water quality of the Beshar river. This river is approximately 190 km in length and situated at the geographical positions of $51^{\circ} 20'$ to $51^{\circ} 48'$ E and $30^{\circ} 18'$ to $30^{\circ} 52'$ N it is one of the most important aquatic ecosystems of Kohkiluyeh and Boyer-Ahmad province in south-west Iran. In order to evaluate the effects of these pollutants on the quality of the Beshar river, five monitoring stations were selected along its course. Some quality parameters in the stations are evaluated as follow as:



Fig. 1 The location of the Beshar stream stations

Temperature

Water temperature affects the ability of water to hold oxygen, the rate of photosynthesis by aquatic plants and the metabolic rates of aquatic organisms. Causes of temperature change include weather, removal of shading stream bank vegetation, impoundments, discharge of cooling water, urban storm water, and groundwater inflows to the stream.

pH

pH is a term used to indicate the alkalinity or acidity of a substance as ranked on a scale from 1.0 to 14.0. Acidity increases as the pH gets lower. A pH of 7.0 is neutral. Aquatic organisms differ as to the range of pH in which they flourish.

Electrical Conductivity

Electrical conductivity (EC) is a measure of the ability of water to pass an electrical current. Conductivity in water is

affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions or sodium, magnesium, calcium, iron, and aluminum cations. Organic compounds like oil, phenol, alcohol, and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity measurements are reported as conductivity at 25 degree Centigrade.

Turbidity

Turbidity is a measure of the amount of particulate matter that is suspended in water. Water that has high turbidity appears cloudy or opaque. High turbidity can cause increased water temperatures because suspended particles absorb more heat and can also reduce the amount of light penetrating the water.

Dissolved Oxygen

Although water molecules contain an oxygen atom, aquatic organisms rely upon a small amount of oxygen that is actually dissolved in the water. In general, rapidly moving water contains more dissolved oxygen than slow or stagnant water and colder water contains more dissolved oxygen than warmer water. Bacteria consume oxygen as organic matter decays. As a result, an oxygen-deficient environment can develop in lakes and rivers with excess organic material. These conditions can eventually lead to fish kills.

Biological Oxygen Demand (BOD)

The BOD is the amount of oxygen consumed by bacteria in the decomposition of organic material. It also includes the oxygen required for the oxidation of various chemical in the water, such as sulfides, ferrous iron and ammonia. While a dissolved oxygen test tells you how much oxygen is available, a BOD test tells you how much oxygen is being consumed. BOD is determined by measuring the dissolved oxygen level in a freshly collected sample and comparing it to the dissolved oxygen level in a sample that was collected at the same time but incubated under specific conditions for a certain number of days. The difference in the oxygen readings between the two samples in the BOD is recorded in units of mg/L.

III. RESULTS AND DISCUSSION

Some water quality parameter such as Temperature, dissolved oxygen, biochemical oxygen demand, PH, total dissolved solids, electrical conductivity, nitrate, phosphate and turbidity of five station on the Beshar river are sampled, then analyzed. The results of sample analysis show in table 1 as follow as.

TABLE I
THE MINIMUM AND MAXIMUM OF QUALITY PARAMETERS OF THE BESHAR RIVER

parameter	maximum		minimum	
	station	value	station	value
T (°C)	S ₄	22.3	S ₁	11
DO (mg/l)	S ₁	7.4	S ₄	3.1
BOD ₅ (mg/l)	S ₄	7.5	S ₁	1
PH	S ₁	7.8	S ₄	5.7
T.D.S (mg/l)	S ₄	478	S ₁	298
Nitrate (mg/l)	S ₄	3.6	S ₁	1.7
Phosphate (mg/l)	S ₄	5.34	S ₁	1.56
Turbidity (NTU)	S ₃	87	S ₁	20
EC (Mm/s)	S ₄	483	S ₁	312

The effects of some above water quality parameters are evaluated based on previous studies and other references.

Numerous scientific studies suggest that 4-5 parts per million (ppm) of DO is the minimum amount that will support a large, diverse fish population. The DO level in good fishing waters generally averages about 9.0 parts per million (ppm).

TABLE II
EFFECT OF DISSOLVED OXYGEN LEVEL ON FISH

Fish Species	Lowest DO level at which fish survive for:	
	24 hours (summer)	48 hours (winter)
Northern Pike	6.0 mg/L	3.1
Black Bass	5.5	4.7
Common Sunfish	4.2	1.4
Yellow Perch	4.2	4.7
Black Bullhead	3.3	1.1
(California Water Quality Resources Board, 1963)		

When DO levels drop below about 3.0 parts per million, even the rough fish die. The table in this section shows some representative comparisons. Shallow waters in subtropical regions that hold considerable organic matter often vary from pH 9.5 in the daytime to pH 7.3 at night. Organisms living in these waters are able to tolerate these extremes or swim into more neutral waters when the range exceeds their tolerance.

IV. CONCLUSION

This study was conducted to evaluate the point and nonpoint pollutants activities on the water quality of the Beshar river and their effects on aquatic ecosystems in the Beshar river. In this survey, five study stations were selected to examine water pollution in the Beshar River systems. River ecosystems are particularly sensitive and vulnerable to pollutants sources. Therefore, to determine the impact of this pollutants on the Beshar River, the most important water pollution parameters such as pH, dissolve oxygen (DO), Biological Oxygen Demand (BOD₅), Total Dissolve Solids (TDS), Nitrates (NO₃-N) and Phosphates (PO₄) were estimated at the five stations. As the results show, the most important pollution index parameters such as BOD₅, NO₃ and PO₄ increase and DO and pH decrease according to human activities (P<0.05). However, due to pollutant degradation and dilution, pollution index parameters improve downstream sampling stations.

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