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EVALUATION AYDUGHMUSH RIVER QUALITY PARAMETERS CHANGES AND WILCOX INDEX CALCULATION

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ABSTRACT

As a cross sectional study the biological and chemical oxygen demand (BOD and COD), Dissolved Oxygen (DO), Nutrients(PO4, NO_2^{-2}-N, NO_3^{-}-N, , NH^{4+}-N), Electrical conductivity(EC), total Hardness(TH) and total Alkalinity(Talk), pH, total Coliforms(TC) and total Fecal Coliforms(FC), water temperature and heavy metals using standard methods in eight sampling stations along the river were measured within one year and three times. Results were analyzed using SPSS software and descriptive statistics. Results have been shown that pH has not been many changes and were at 8.1-8.5 range, maximum and minimum of total Hardness, there was at D and G stations, respectively and amount of SO_4 in all stations was in drinking standard level. Mean water temperature was at 8.5-13° C range and EC maximum and DO a minimum(3.1 mg/l) there were in B and C stations, respectively. Changing range of PO4 and NO3—-N were (0.22-0.94mg/l) and (0.04-1.2mg/l), respectively and concentration of Barium and Iron heavy metals were more to other surveyed heavy metals. The results of water quality Aydughmush review showed that certain pollution along the river, no water quality substantially be affected. However, in addition to artificial sources, river water quality through erosion and deposition can also be negatively affected. Livestock waste is one of the factors affecting the river pollution (as non-point sources).
Keywords: Water quality, Aydughmush, Phisico-chemical parameters, River.

INTRODUCTION

Freshwater ecosystems play an important role in preparing and providing food, agriculture, clean water supply and recreational and aesthetic aspects[1, 2]. According to the development of industry and agriculture resource development, resulting in artificial pollutants, engineering and construction processes within rivers and surface water pollution risk to ever become a serious threat[3]. In the past, to review the quality of surface water resources related to the tests' results of water chemistry were use to determine water chemistry conditions and evaluate the quality of surface water. The biological tests for data collection are much more accurate forecasting of water quality[4], and fecal coliform as one of the best indicators for the presence of microorganisms has been used. Fecal and total coliform tests simultaneously with other physico - chemical parameters, to detect changes in water zones by wastewater discharged from industrial or domestic sources, etc. have been used. For Optimum assess water quality, the parameters should be a combination of physical, chemical and biological[5]. Of the last ever, surface waters and rivers in particular for human uses have been considered. For the exploitation of human societies has been set up near rivers. Growth of human societies, industrial and agricultural development in the basin, cause abnormal manipulation and changing river conditions. So the water quality of rivers has been affected by human

societies[6]. Measure, analyze and interpret data to assess regularly the quality of rivers caused the correct administrative procedures are adopted[6]. The purpose of this study was the Aydughmush river water quality evaluation.Too many nouns the quality of rivers by non-point sources of pollutants is affected. Thereby, using indicators of microbial and physico - chemical and their impact on each other to review its quality has been discussed.

1-2. **Case Study: Aydughmush River**

Aydughmush River's catchment is located in the geographic area "47 º44'4"to 47º44' 5" east longitude, 36 º"43"14 to 37 º"23" 22 North latitude. It is limited to Qaranqu catchment from the north, south Aji Chay catchment, and East Ajjer Loo chaywatershed of the West and Quri Chay watershed. Aydughmush Basin area is 183661.21ha. Aydughmush is basic branches of the ghezel ozan river. This river is started from incorporation of two branches of the river above the Babune Bala village in the Hashtrood city, and at route, in addition to lateral flow from two main branches of Zolm Abad and Qūrt Yemaz gets swallowed[7].

EXPERIMENTAL

Possible to provide the final analysis regarding the condition Aydughmush River, within one year and three times the water on the river sampling stations (Figure 1) were selected. Position of sampling stations is given in Table 1.

Position, physical and public characteristics of sampling stations is given in Table 1. Quality parameters needed to evaluate the quality of river catchment Aydughmush was determined as follows: phosphate, nitrite, nitrate, ammonia, dissolved Oxygen levels, biochemical oxygen demand, chemical oxygen demand, chloride, sulfate, sodium, total dissolved solids, total alkalinity, total hardness, electrical conductivity, pH, temperature, fecal coliform, Total Coliforms and heavy metals.

In each sampling station, sampling performed at 30 centimeters up of water level at three positions (center and edges) and harvested according to standard methods[8] were determined amount. Parameters such as temperature, pH and dissolved oxygen and electrical conductivity on sit and other parameters were measured 48-24 hours in the lab. After sampling the data and review and analyze were described by suitable table and graphs.

RESULTS AND DISCUSSION

pH

pH value related to watering ecosystems is an essential factor and an important aspect of toxicity to plants and animals. As observed in Figure 2 It related to the pH valuesat all sampling locations on the Aydughmush river is alkaline almost. PH valuesdid not show many changes. Amplitude changes that were in the range 8.1 to 8.5. Natural waters pH depends on the balance between carbonate - bicarbonate and carbon dioxide[6]. Because the process of heavy metals with carbonate / bicarbonate is removed from water environments, pH alkaline is preferred in surface water[9]. Overall average pH of water sampling points along the Aydughmush River was at the alkaline range. Alkaline pH of water may be due to its clean and low amounts of suspended solids and BOD. In contaminated water, decomposition of organic material can lead to acidification pH of environment, and thus it is reduced[10]. The results of this phase are consistent with study results done by Hong Jun Yang and colleagues[6].

Total Dissolved solids (TDS)

TDS representative of the entire non-volatile substances dissolved in water that contains different ions. Effect of soluble salts on plant growth depends on the osmotic process. Water with high mineral may be led to livestock death. High level of TDS causes water imbalance and is not less linked to a specific ion characteristic. TDS levels at sampling were 314 to 1264.7 mg/l. the lowest and highest value there were at stations D and B respectively were observed. This part of the results confirms by results obtained by Parham and colleagues[11]. Water with TDS less than 200 ppm is suitable for drinking and a good value for fishing is 2000 ppm.

Dissolved Oxygen

A dissolved oxygen amount is one of the important parameters in estimating the ecological health of water environments. Changes in different parts of the sampling location are shown in Figure 4. Lowest DO at Station B by the value 3.1 mg/ml was observed. One reason to reduce the DO, the high water

temperatures and increased activity of microorganisms in the water which is a lot of oxygen consumed due to metabolic processes and the decomposition of organic material. Dissolved oxygen levels in water samples depend on physical properties of the river body, water chemical properties and biological activity of microorganisms[6].

Table- 1: sampling stations description

name	Sample Location
A	Before connecting the river Qaranqu to Aydughmush
B	Upstream village Chāy Talvār
C	Bodāq Beyg gauging station
D	Branches Qūrt Yemaz
E	Branches Korjā
F	Branches Qareh Kandī
G	Babune Bala village
H	bridge of ghale Hussain Khan Village

Tab 2 : Mean results of analysis of heavy metals Aydughmush River (ppb)

Sampling locatin / Heavy metals	A	B	C	D	E	F	H
Fe	58	164	57	78	68	57	60
Mn	4	11	*	*	3	*	4
Ni	*	*	*	*	*	*	*
Zn	33	33	30	25	24	30	25
Ag	*	*	*	*	*	*	*
Cd	7	6	9	5	8	5	7
Cr	*	*	*	*	*	*	*
Pb	*	*	*	*	*	*	*
Cu	13	*	27	11	*	*	19
Hg	*	*	*	*	*	*	*
Ur	*	*	*	*	*	*	*
Va	*	*	*	*	*	*	*
Se	*	*	*	*	*	*	*
Ba	75	74	76	78	128	51	66

*:Very small amount

Tab 3 : Category -class river water based on Weil Cox index

Detailed Class Will Cox	Will Cox ranked based on electrical conductivity	Will Cox ranked based on sodium adsorption ratio	End Classification	Sampling stations
Passion - for agriculture by applying appropriate measures necessary	C3	S2	C3S2	A
Very salty - harmful for agriculture	C3	S4	C3S4	B
Passion - for agriculture by applying appropriate measures necessary	C3	S2	C3S2	C
A little salty - almost good for agriculture	C2	S1	C2S1	D

Passion - for agriculture by applying appropriate measures necessary	C3	S1	C3S1	E
A little salty - almost good for agriculture	C1	S2	C1S2	F
Passion - for agriculture by applying appropriate measures necessary	C3	S2	C3S2	G
Passion - for agriculture by applying appropriate measures necessary	C3	S2	C3S2	H

Biochemical Oxygen Demand

BOD is one of the major factors used in assessing water quality is related to the dissolved and suspended organic material. Most relevant to the BOD at Station G and there was lowest it at D station. Graph corresponding to changes in the BOD during the sampling stations are shown in Figure 5. Similar results in studying Hong Jun Yang is achieved[6].
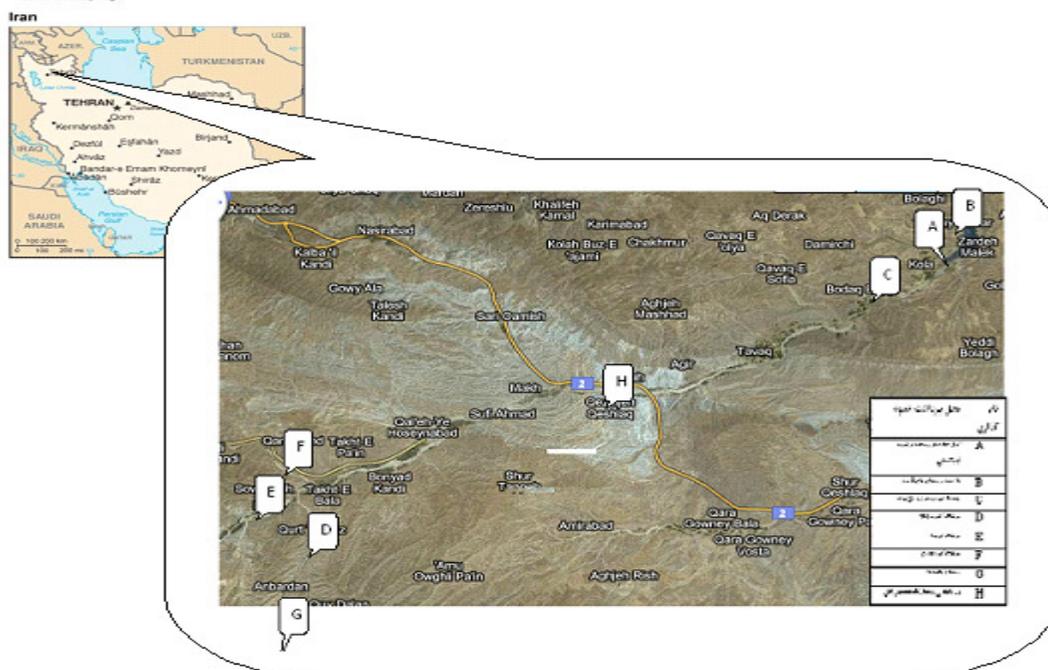
Fig.-1: Satellite map of Aydughmush River and sampling locations along designated rivers
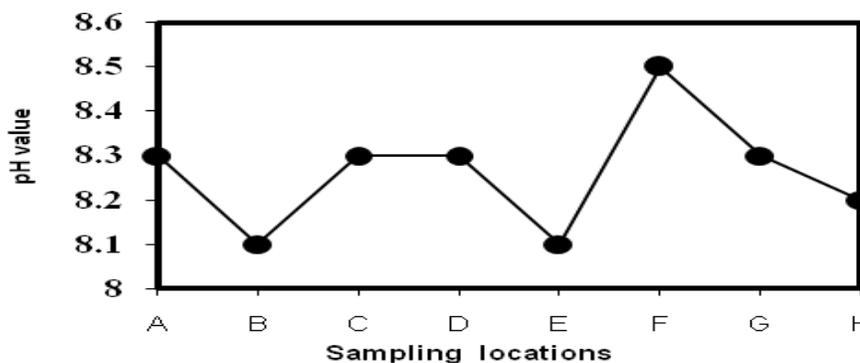
Fig.-2 : Changes in pH sampling stations
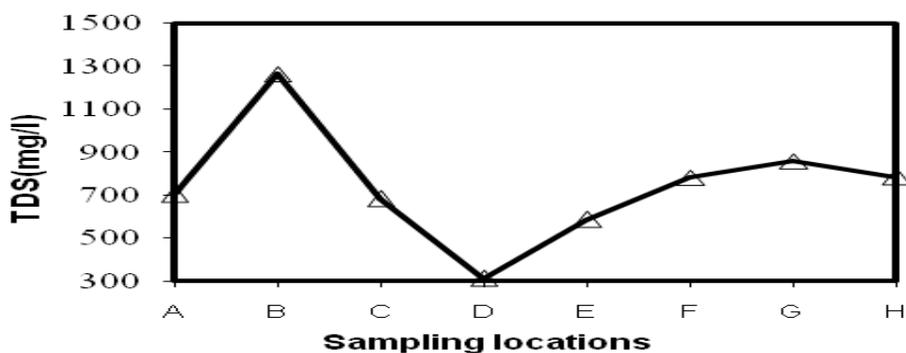
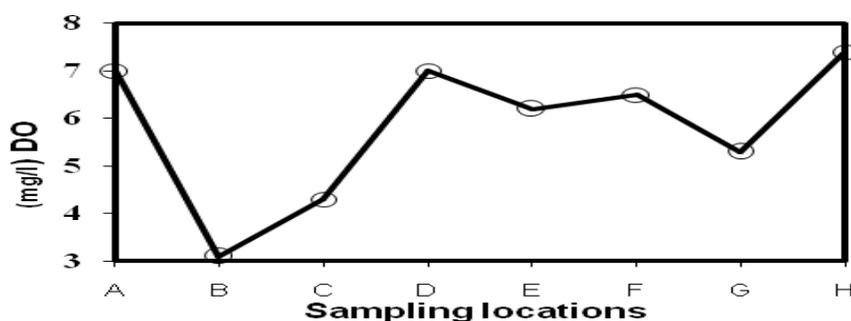Fig.-3 : Changes related to dissolved solids in the sampling stations

Fig.-4: Changes in the amount of dissolved oxygen sampling stations .
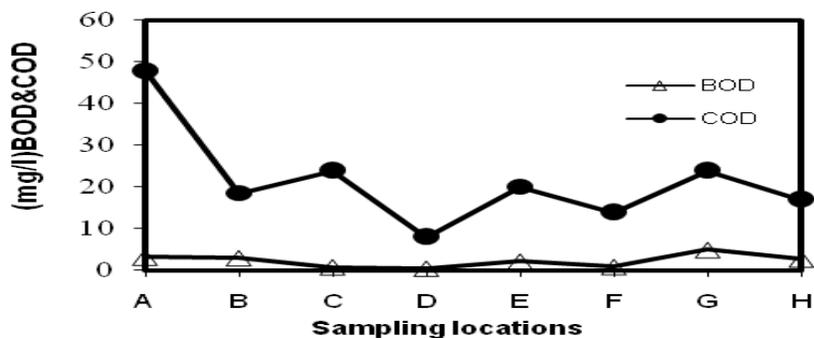

Fig.-5 : Changes related to BOD and COD during the sampling stations

Chemical Oxygen Demand

COD is the following total chemical oxygen demand which consumed in the oxidation reactions in the acidic environment close to a strong oxidizing substance. COD is usually an instance of the BOD value is higher. Minimum and maximum COD was seen at stations D and G, respectively. BOD and COD graphs fit together, and changes indicate that this source of organic matter in waste water Aydughmush water flowing from rural and agricultural land and did not add industrial organic materials to the water body. Sewage disposal in most villages in the catchment through the soaked way wells takes place, but in some villages, especially villages that fringe the river do not exist proper sewage disposal method, the possibility of sewage entering the river there. Nitrogen and phosphorus fertilizers and in some areas animal fertilizer has been used. Fertilizer residues from agricultural drainage waters enter the river.

Nutrients

Currently, one of the most important problems related to surfacing water ecology is the eutrophication phenomenon. Nitrate nitrogen, ammonia and phosphate are important nutrients that cause the

eutrophication phenomenon in water zones. There are lot amounts of nutrients, causing algae growth in large quantities and presence of micro- cysteine in water[6]. As shown in Figure 6 there were the lowest valuesin rivers Aydughmush related to nitrate, nitrite, ammonium and phosphate respectively at stations A, D, D, G and G. Nutrient concentrations during low and high river has always been. Their entry can occur through the farmlands. With self-purification processes of rivers, their concentration decreases. Nitrification process not only needs a certain amount of nitrogen, but also requires a certain amount of dissolved oxygen, too. Dissolved oxygen is a key factor in relation to nitrogen removal capacity by nitrification- denitrification process - in surface water. In dry seasons, nitrate presence in fertilizer accumulates in the soil and is washed with rain. The amount of chemical fertilizers after entering the environment through the process of leaching the soil can be out of range of plants available and the lower layers of soil or lost through the drainage water to surface water flows[12, 17].
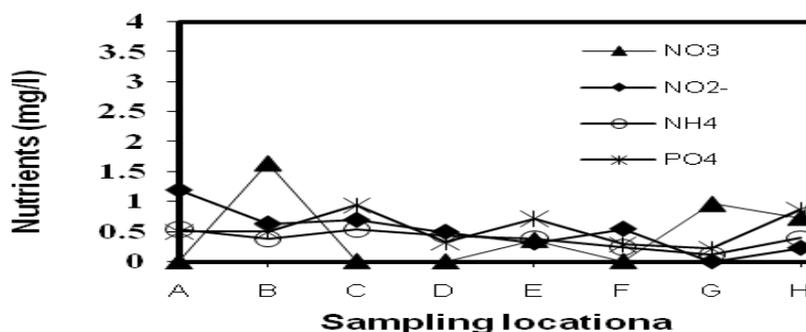

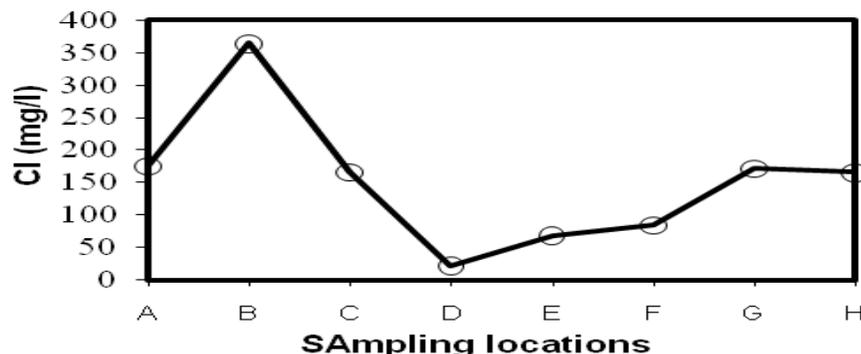Fig.- 6 : Changes in nutrient sampling stations along river

Fig.-7 : Change in chloride ion sampling stations

Heavy metals

Results to measure heavy metals is given in Table 2. Barium levels naturally in water of less than 0.1 milligrams per liter, but in some underground water sources, especially geothermal saline water exists to 10 mg/L. highest barium concentrations exist at Station E. Iron can be caused by the dissolution of rocks and minerals from acid mine drainage, seepage from landfills and sewage[12].

Salinity

Their chloride ions in water depend on the chemical composition of ground and can enter human pollution such as sewage. Changes in chloride ions in the sampling stations are shown in Figure 7. Be inferred from the river during the many changes in the values related to chloride ion. The oscillation can be related to the constructive river bed.

Total Coliforms and fecal coliform

The existence of microorganisms and their activities in the area of organic matter decomposition capacity of the water is clear. Highest number of total coliform and fecal coliform was existed in stations G and F.

Proportional increase in concentration of organic materials biodegradation and nitrate also increased the number of bacteria that can be concluded that organic matter removal rate is directly related with the number of bacteria[13, 17]. Three stations C, A and D coliform count was less t han 100 MPN in 100ml and in others, there was more. Presence of bacteria in the water may be due to point and non point contaminants (pastures and farmlands).
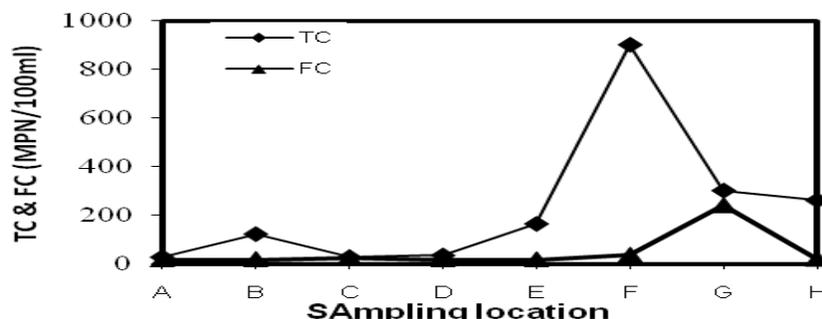

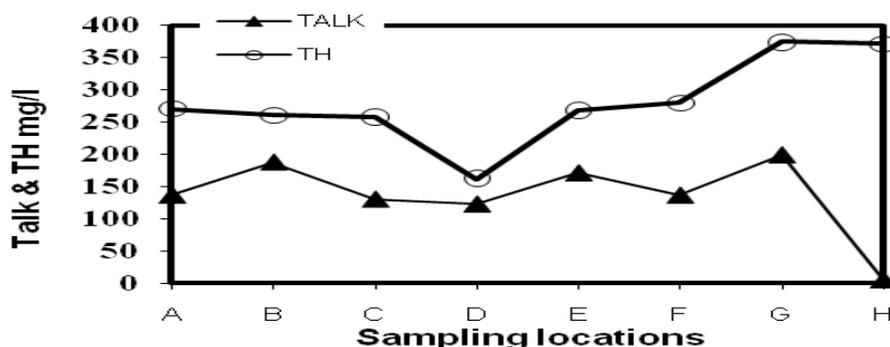Fig.-8 : Total Coliforms and changes in fecal coliform sampling

Fig.-9 : Change of total alkalinity and total hardness in the sampling stations

Alkalinity and total hardness

Alkalinity index of buffering the water hardness is closely related. Alkalinity and hardness of water samples to the sampling stations are shown in Figure 9. As it is inferred from the values they close together can be said that water from the alkali carbonates and there are no carbonates. Depending desirable for use in hard water is considered. Water hardness range changes in the stations were 162 to 375. The minimum and maximum order that the stations D and G were observed.

Electrical Conductivity

Electrical conductivity indicates a presence of mineral in the water. The highest and lowest value was observed in stations B and respectively F (micros180-1949). Related to high amounts of sodium, calcium and chloride levels in water the electrical conductivity of water was increased. Although the electrical conductivity of water represents the amount of minerals in the water, but with increasing mineral ions move and put a negative impact on each other electrically driven solution as dilute solutions is not proportional to the number of ions[12].

Wil cox Index

Two factors, electrical conductivity and sodium adsorption ratio are the important parameters in measuring water quality, stand point of agriculture. Based on this, Wil cox is formed[14, 15]. As seen in the water quality station B is unsuitable for agriculture (Table 3).

CONCLUSION

The results of water quality Aydughmush evaluation showed that certain pollution along the river, no water quality substantially be affected. However, in addition to artificial sources, river water quality through erosion and deposition can also be negatively affected. Considering that one of the most

extensive areas of economic activity inhabitants, livestock is one of the factors affecting the river pollution (as non-point sources) is livestock waste. Livestock waste on pasture land and meadows and play areas on rainfall and surface water can flow into the river and thus water quality will decline.
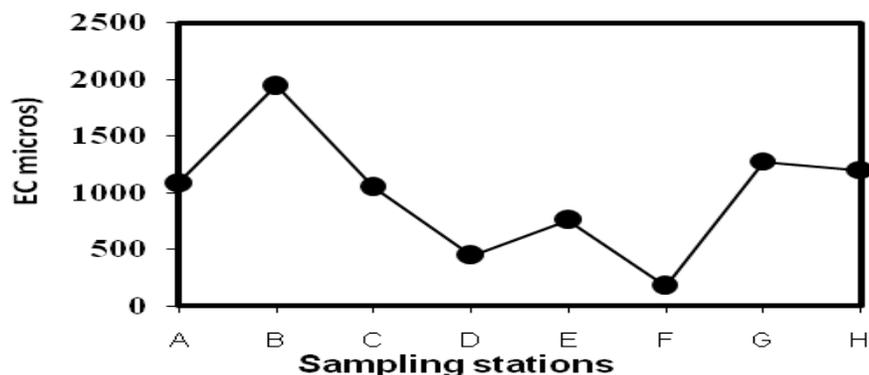
Fig.-10 : Changes in electrical conductance sampling stations

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