

# Limnology Study of Yellow Lake(Al-Asfar ) in Al-Ahsa Governorate, Saudi Arabia - according to Globe's protocols

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## ABSTRACT

Al-Asfar Lake is one from the important shallow wetland lakes. It is located on Al-Hassa, eastern region of Saud Arabia. Al-Hassa Province is one of the largest oases in the world and located in the southern part of the eastern region of Saudi Arabia. It is situated between 25° 05' and 25° 40' northern latitude and 49° 55' eastern longitude Al-Asfar Lake is located east of the oasis of Al-Hassa, grow on the banks of many plant. The lake is the site of the confluence of migratory birds from outside the area visited by dozens of the virtues of birds. The lake formed a result of wastewater a farm in the oasis of Al-Hassa.

The aim of this study was to test some of the water characteristics of the Yellow Lake by determining the temperature of the water, the pH and the type of salts present in the water and its quantity, and testing the type of chemical elements in it.

## INTRODUCTION

Arid environments are the most diverse ecosystems of Saudi Arabia. However, much of their hydrobiology and its component biotic information are still unknown. Al-Asfar Lake is one from the important shallow wetland lakes. It is located on the eastern region of

Saudi Arabia, Al-Hassa Province. The area is characterized by widespread growth of halophyte shrubs associated with a very thin salt crust on the sabkha surface (The lake is the site of the confluence of migratory birds from outside the area visited by dozens of the virtues of birds (Fathi et al., 2009). However, much of their limnology and its biotic information are still unknown to the scientific community. Few studies were conducted on lake Al-Asfar, vegetation communities (Youssef et al., 2009) ; sedimentological, hydrogeological, chemical structure (Al-Dakheel et al., 2009); water quality and phytoplankton communities (Fathi et al., 2009); presence of pollutants in Al-Asfar Lake using sediment records as well as fungal spores to assess biological patterns (Al-Sheikh and Fathi, 2010). However, Abdel- Baki et al. (2011) studied the

bioaccumulation of some heavy metals in tilapia fish relevant to their concentration in water and sediment of Wadi Hanifah, Saudi Arabia .

### Research Question and Hypothesis

What are the main physical and chemical properties of the Alasfar lake, as measured according to the protocols Globe

### Importance of study and study objectives

The objective of this research is to identify some physico-chemical characteristics such as: location coordinates, water temperature, pH and salinity in Al- asfar Lake / Al-Ahsa Governorate / Saudi Arabia .

### Materials

Equipments , devices & Materials	
Data form to locate the study Site	GPS device( I phone )
string	Electronic balance
Integrated Day Data Form	Alcoholic temperature meter
Rubber hand strap.	Thermal thermometer
Pen	glass Stick for blending
digital watch to set the time.	eye protector
Samples of lake water	Several bottles with plugs
Cups and measuring cup	pH digital Measurement
	Labels
	Rubber gloves

### Method:

#### 1. Getting site coordinates:

1. Opening the Google Maps app on Our iPhone or iPad
2. Touching and holding an area on the map that has not been categorized.
3. We notice a red pin appears. At the bottom of the screen.
4. By clicking the dropped pin, we saw the coordinates of the area.

#### 2. Measure the average water temperature in the study site

1. Gloves are worn to avoid exposure to harmful substances such as bacteria and industrial waste.

2. . Attach the tip of the thread tightly to the thermometer and the other end with the rubber strap
3. Hand-held to ensure that the meter is not lost if it falls into the water.
4. Check the alcohol column connection and no air bubbles in it, then put The water meter is 10 cm deep.
5. Leave the meter in the water for 5 d then take the thermometer reading without lifting it out of water
6. The reading is repeated after a minute. If the temperature does not change, the next step is taken.
7. Otherwise the readings will be kept every minute until the temperature is stabilized and recorded temperature.
8. . Repeats the measurement twice more, and calculates the rate of the three measurements.
9. . Clean the balance with distilled water after lifting it from the water, and remove the gloves.

### 3. **pH Measurement**

1. Pour 30 ml of the lake water sample into a clean, dry cup that is sufficient to immerse the electrode scale.
2. Remove the meter cover and rinse the electrode and the surrounding area with distilled water
3. Then dry with a clean cleaning paper.
4. Press the power switch and immerse the electrode of the meter in the water of the lake in the cup.
5. The water of the lake moves in the cup once, then record the reading of the meter after it settles
6. This reading represents the amount of acidity of rain water.
7. Repeat steps 1-4 to obtain three readings and then record them in the data form.

### 4. **Measurement of salinity by mass**

1. Collect samples (at least 100 ml) of seawater or any other source of water containing a significant amount of salt. (If appropriate, the same sample used in the pH experiment can be used for surface water).
2. Measure the weight of the container accurately and then record the result on the mD results sheet.
3. Measure the amount of water, about 100 ml as close as possible and then place it in the VW container.

4. Measure the weight of the container with water,  $m_D + W$ .
5. Solar-powered evaporation

Place the container completely under the sun and, if necessary, to avoid dust, cover the container with a transparent lid that allows air to circulate. Note: It may take a day or more to evaporate, so periodically monitor the container.

6. Measure the weight of the container filled with salt and record the result on the results sheet.
7. Place the container in the sun or heating plate and allow for 15-30 minutes.
8. Allow it to cool down, then measure it again and record the result.
9. If the weight is the second time less than the first time, repeat the experiment again and record the results.
10. Continue experiment until the weight becomes equal and non-variable.
11. The final weight is container mass weight and salt :  $m_D + S$  ..
12. Measurement of salinity
- 13.. In the beginning, measure the salt ratio by calculating the final mass of the vessel with salt and deleting the final mass of the container using the following equation:

$$m_S = m_{D+S} - m_D \quad (\text{g})$$

Salt mass:

$$m_{SW} = m_{D+SW} - m_D \quad (\text{g})$$

## 5. Flame Test Color

We conducted the flame test to detect the presence of an element in the sample by exposing it to the flame and through the apparent color can distinguish between different elements.

## Data Summary and Analysis

a. **Coordinates of Yellow Lake:**

25°33'00.9 south

49°47'32.9 East

b. **Temperature °C:**

23-24

c. **PH value:**

8.8

d. **Water Salinity :**

<i>Second trial</i>	<i>First trial</i>	
74.5	75.2	Container mass $m_D$ ( gm )
100	102	Volume of salt water $V_{SW}$ (ml)
178.3	178.5	Container mass and water sample $m_{D+SW}$ ( gm )
<b><i>Dry Weight Loss (Final)</i></b>		
75.5	78.5	Container and Salt mass - First Experiment (gm)
75.7	77	Container and salt mass - Second experiment (gm)
78.8	76.4	containers and salt mass - Third experiment (gm)
76.2	77.3	<i>The final mass of the pot + salts</i> $m_{D+S}$ (gm)
<b><i>Accounts</i></b>		
1.7	2.1	salt mass $m_S = m_{D+S} - m_D$ (gm)

e. **Flame Test Color results:**

A mixture of colors was obtained: yellow (indicating the presence of sodium) and violet (indicating the presence of potassium) and reddish orange (indicating the presence of calcium)

**Results, Conclusions, and Discussion:**

From the results obtained:

- we find that the temperature is almost between 22-23 ° C,( between winter and spring) which indicates the possibility of life of various organisms of plant and animal.
- pH value was always in the alkaline side. It fluctuated between. Generally, this general tendency to the alkaline side may be due to the increased photosynthetic activity of planktonic algae. The lowest pH and alkalinity values recorded in Al-Asfar lake may be due to greater amount of inflowing agriculture water and also to the decomposition of plankton and organic matter.
- The salinity ratio was high and varied from time to time and three components were observed at a reasonable rate as demonstrated by the flame test: sodium, potassium and calcium. fluctuations of lake from time to time, could be explained by the differences of the input amount of drainage water.

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THEGLOBEPROGRAM SCIENCE Data Entry Welcome Ahmed Ibrahim

Data Entry Home / Al-Anjal Intermediate School at Al-Ahsa / Al-Asfar Lake in Al-Ahsa Governorate, Saudi Arabia / Integrated Hydrology

### Integrated Hydrology Editing

Measured at date and time (24hr)  
 2020-02-27 08:58 UTC \* Local Get Current UTC Time  
 Your UTC time converted to Local (N/A) time is 2020-02-27 11:58

Water body state  
 Normal State

\* indicates required sections or fields  
 - Expand/Collapse | ✕ Remove

☾ Clouds

Do You Have Pictures Of The Sky?

Photos

+ Add Edit Show Instructions

North No Image	South No Image	East No Image	West No Image	Upward No Image
Downward No Image				

What Does Your Sky Look Like? \*

Observability

No Observable Clouds/Contrails	Clouds/Contrails Observable	Clouds/Contrails >25% Obscured
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**What Does Your Sky Look Like? \***

Observability

☐ No Observable Clouds/Contrails ☐ Clouds/Contrails Observable ☐ Clouds/Contrails >25% Obscured

Sky Color

☐ Deep Blue ☐ Blue ☐ Light Blue ☐ Pale Blue ☐ Milky

Sky Visibility

☐ Unusually Clear ☐ Clear ☐ Somewhat Hazy

☐ Very Hazy ☐ Extremely Hazy

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**Snow/Ice** ☐ Yes ☒ No

**Standing Water** ☐ Yes ☒ No

**Muddy** ☐ Yes ☒ No

**Dry Ground** ☐ Yes ☒ No

**Leaves on Trees** ☐ Yes ☒ No

**Raining/Snowing** ☐ Yes ☒ No

Comments

**Air Temperature** Expand/Collapse | Remove

You cannot enter a maximum or minimum temperature because no current temperature was recorded within one hour of solar noon the day before this observation.

Current Temperature  °C

Comments

Max: 24.

**Barometric Pressure** Expand/Collapse | Remove

Select one of the following: \*

☒ Sea Level ☐ Station Pressure

mb

Comments

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**Relative Humidity** Expand/Collapse | Remove

Select one of the following: \*

☒ Sling Psychrometer ☐ Digital Hygrometer

Ambient Air Temperature  °C Relative Humidity  %

Comments

**Water Transparency** Expand/Collapse | Remove

**Secchi Disk Test 1**

Distance from observer to... Secchi Disk reaches the bottom and does not disappear.

to water surface  m

where disk disappears  m where disk reappears  m Add

**Transparency Tube Test 1**  cm Greater than depth of Transparency Tube? ☐ Add

Comments

**Water Temperature** Expand/Collapse | Remove

Measured with: ☒ Alcohol-filled Thermometer ☐ Probe

**1**  °C



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**Comments** Add

**Water Temperature** Expand/Collapse Remove

Measured with: Alcohol-filled Thermometer \*

Alcohol-filled Thermometer Probe

1 \* Temperature 23 °C

**Comments** Add

**Dissolved Oxygen** Expand/Collapse Remove

Method used: Kit

Kit Probe

Dissolved Oxygen kit manufacturer Hach model LaMotte

1 \* Dissolved Oxygen 7.01 mg/L

Salinity 8.14 ppt Add

**Comments**

**Electrical Conductivity** Expand/Collapse Remove

Temperature of water sample being tested 23 °C

Conductivity of standard 8.12 µS/cm

1 \*

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**Tide Information**

Time of High or Low Tide before Salinity Measurement (24hr)

06:00 High Tide Low Tide

Time of High or Low Tide after Salinity Measurement (24hr)

07:00 High Tide Low Tide

Location of tide

Site Latitude 25.33 Site Longitude 49.47 Site Elevation 110 M

Latitude of Measurement 25.33 North (of the equator) South (of the equator)

Longitude of Measurement 49.47 East (of the prime meridian) West (of the prime meridian)

Salinity kit manufacturer Hach model HI3835

**Salinity methods**

Hydrometer Samples Titration Samples

**Hydrometer Samples**

1 Temp. of water sample in 500mL tube °C Specific Gravity

Salinity ppt Remove Add

**Titration Samples**

1 Salinity of sample ppt Remove Add

**Comments**

**pH** Expand/Collapse Remove

Measured with: pH Paper \*

pH Paper pH Meter

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**Value of buffers used** Add

□ pH 4 □ pH 7 □ pH 10

**Comments**

**Alkalinity** Expand/Collapse Remove

Alkalinity kit Manufacturer Hach Model AL-AP

Kit used: reads alkalinity directly

reads alkalinity directly counts drops

1 \* Alkalinity 116.7 mg/L as CaCO<sub>3</sub> Add

**Comments**

**Nitrate** Expand/Collapse Remove

Nitrate kit manufacturer Hach model Ni-11

1 \* Nitrate + Nitrite 9.3 mg/L nitrate nitrogen + nitrite nitrogen

Nitrite (optional) 9.3 mg/L nitrite nitrogen Add

**Comments**

Send Data Cancel Reset

Link to the movie

<https://youtu.be/XqqK3v3E0UM>

<https://youtu.be/f2CCYSMKMkU>

Lake Yellow Map location

<https://www.google.com/maps/search/%D8%AE%D8%B1%D9%8A%D8%B7%D8%A9+%D9%85%D9%88%D9%82%D8%B9+%D8%A8%D8%AD%D9%8A%D8%B1%D8%A9+%D8%A7%D9%84%D8%A3%D8%B5%D9%81%D8%B1%E2%80%A0%D/@25.5487791,49.7756618,9920m/data=!3m2!1e3!4b1>





