INTRODUCTION

1.1 Background study

According to Buetow & Dennis E (Apr 2011), there are more than 250 species of *Euglena sp.* have been identified, however the real numbers is not known. The habitat of these species is mainly in stagnant pool and ditches which have contaminated with fecal matter (Flinn, 2016). It also gives green color and soup-like appearance water because of its chloroplast (Euglena, n.d). It can survive in both freshwater and salt water (Princeton, n.d). It also stated that it can form protective wall around itself and become dormant in low moisture condition. Besides, it can survive in dark by storing paramylon granules in pyerenoid bodies within the chloroplast. It is claimed that *Euglena sp.* are mixotrophs which they are both autotrophs and heterotrophs (Euglena, n.d). In addition, they have characteristics that are animal- and plant-like. It able to produce food as it have chloroplast and it can also find food in unfavorable condition. *Euglena sp.* is effective on photosynthesis processes as it have eyespot that excellent in finding light sources. However, the sun is limited to day only. Hence, it need to search for food, in this case it have to obtain it from green algae (Euglena, n.d). NC State University (2004) stated that the locomotion for this species is it propel by flagella. For the reproduction, it undergo longitudinal binary fission (Euglena, n.d).

In a research (Kim Jun Tae & Sung Min Boo, 2001), it take measure of temperature and concentration of nutrient in pond to know the abundance of *Euglena sp.* in Jeonjucheon, Korean. It state that the environment factor can be a measurement to have abundancy of microorganisms. Giometto A. et al. (2014), state that light can be a factor in fundamental processes of *Euglena sp.*. In addition, environment pH also effecting the internal pH of *Euglena sp.* which it a reaction to the stimuli (Lane A. E. 7 & Burris J. E, 1981). In other research by Wolken J. J. et al. (1955), state that temperature will change the kinetic in terms of activation-energy for growth and chlorophyll synthesis.

We found that there are several pools beside the library of the University Malaysia Terengganu do not have proper draining system which make it to be like stagnant pools. Some of it covered with green algae. So, we assume that particular sites are suitable habitat for *Euglena sp.*. Our studies is we want to know is there any presence of *Euglena sp.* in that area. We also obtain the environment factors that have probability to contribute on the presence of *Euglena sp.*. In short, we are focus on ecological relationships between *Euglena sp.* and environment variables. The environment variables that we are considered are pH, turbidity, dissolved oxygen and temperature.

1.2 Objective of study

1.2.1 To identify the ecological environment effect on the presence of *Euglena sp.*
1.2.2 To learn the life cycle and processes in *Euglena sp.*
1.2.3 To use the right tools and technique to measure the dependent variable.
1.2.4 To identify the family of *Euglenoid.*
1.2.5 To use the right technique for isolating protozoa.

1.3 Hypothesis

1.3.1 Ho: All the ponds have no significant difference on the presence of *Euglena sp.*
1.3.2 Ha: At least one pond have significant difference on the presence of *Euglena sp.*

1.4 Variables

1.4.1 Dependent variable: The presence of *Euglena sp.*

1.4.2 Independent variable: Site of sampling

Methodology

2.1 Experimental unit

Euglena sp. was chosen for observation. It is a single cell flagellate eukaryotes which is in class of *Mastigophora*. To be specific it is in sub class of *Phytamastigophora*. This is due to it have chloroplast which can make its own food by doing photosynthesis. It was obtained or sampled from ponds beside library of UMT.

2.2 Materials

-Bottle (600ml)

-Glass microscope slides

-Drawing paper

-Pencil and eraser

-Light microscope

-Turbidimeter

-pH meter

-D/O meter

2.3 Procedures

1. About 600ml of water from three sites were sampled.
2. On the same day, the environment parameters were recorded: pH, temperature, turbidity and dissolve oxygen.
3. The water samples were brought to lab to be analyzed for the presence of *Euglena sp.*
4. The water samples were pour into centrifuge tubes and pellets were obtained by 5000rpm for 5 minutes.
5. One or two drops of the water samples were placed onto the center of a clean microscope slide.
6. A drop of methyl cellulose was added to slow down the motion of the protist.
7. A cover slide was gently placed over drop.
8. The slide was observed for about 15 minutes before its dries out by using light microscope.
9. The picture of the protist was drawn.

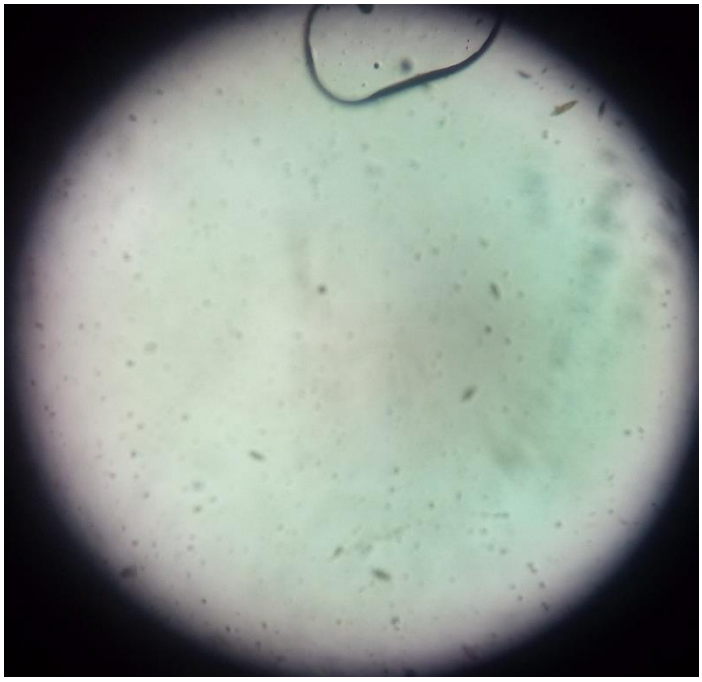
Result

3.1 Table for turbidity, temperature, dissolve oxygen, pH and presence of Euglena

Variables	Temperature (ºC)			pH			Turbidity (NTU)			Dissolve oxygen (mg/l)			Euglena sp.	
Replicates	R1	R2	Mean	R1	R2	Mean	R1	R2	Mean	R1	R2	Mean	Presence	Explaining
K1	31.5	31.5	31.5	5.6	5.6	5.6	27.0	27.3	27.2	4.4	3.9	4.2	Yes	Most abundance
K2	30.1	30.0	30.1	8.8	8.4	8.6	20.5	26.8	23.7	8.2	8.2	8.2	Yes	Less abundance than K1
K3	30.0	30.6	30.3	11.6	11.8	11.7	23.0	22.6	22.8	4.6	4.6	4.6	Yes	Least among the sites

3.2 Pictures on the experiment

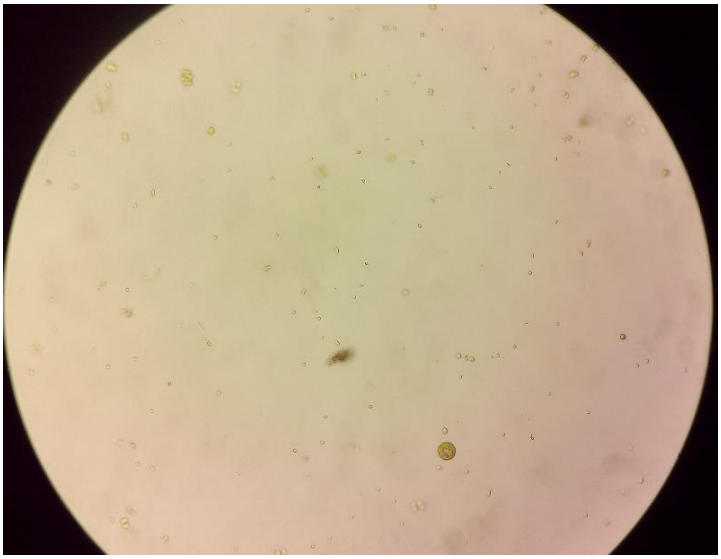
POND 1(K1)



Magnification: 40 × 10

Magnification: 40 × 10

POND 2(K2)



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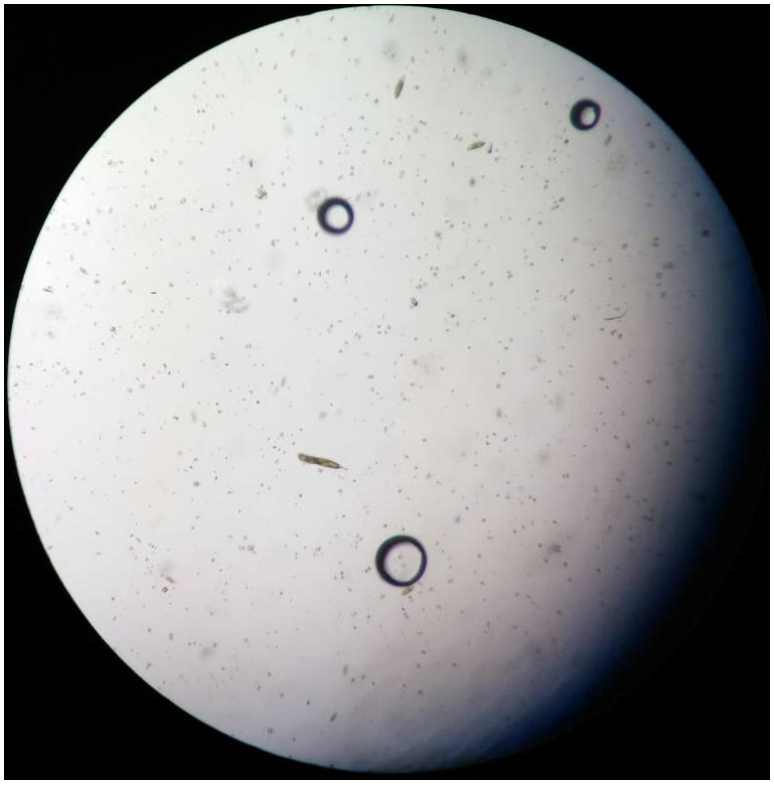
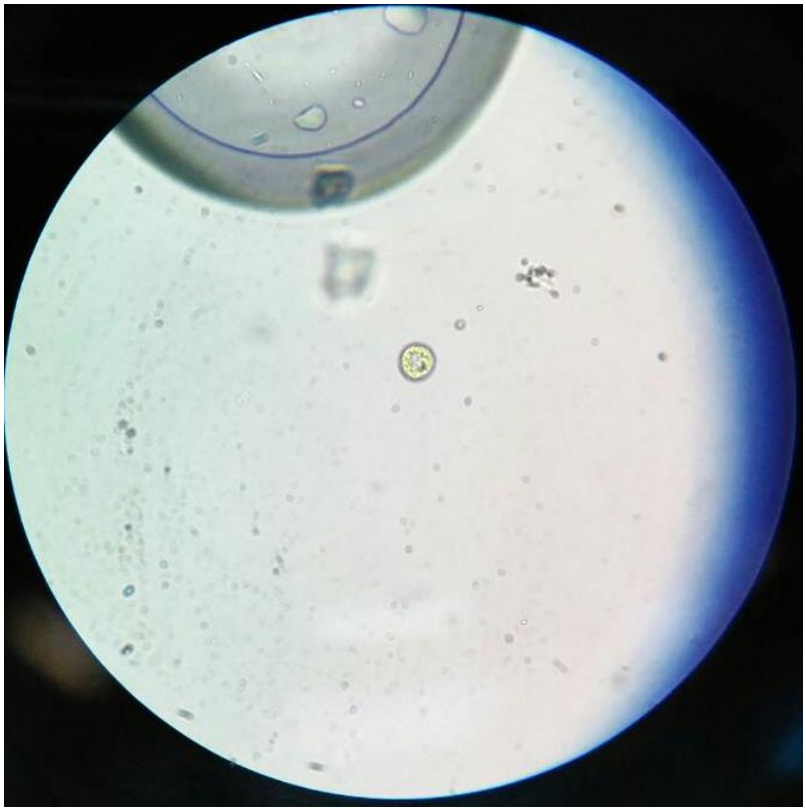


Magnification: 40 × 10

POND 3(K3)

Magnification: 40 × 10



Magnification: 40 × 10

Picture show *Euglena sp.* forming cyst in unfavorable condition.

3.3 Drawing of *Euglena sp.*

Magnification: 40 × 10

Organelles of locomotion: Flagella

Class: Mastigophora

Sub classs: Phytamastigophora

Genus: Euglenoid

Discussion

4.1 The relationship between the presence of *Euglena sp.* and environmental variables.

It is observed that the temperature is not affecting the presence of *Euglena sp.* at the sites. The temperature at all sites are almost the same which is in between 30ºC to 32ºC. According to Sittenfeld A. et al. (2002), stated that *Euglena sp.* need hot and acid environment to survive.

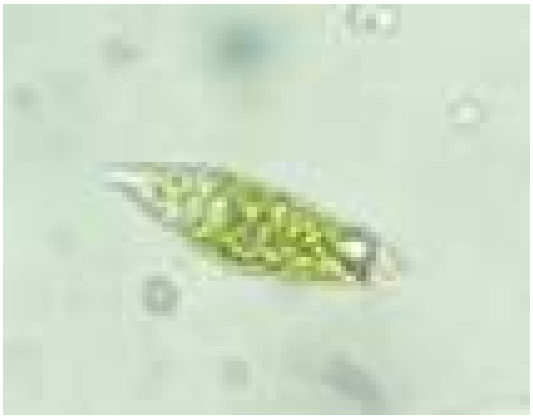
Based on the table, it also showed that the pH at all sites are different where pond 1(K1) have acid condition. The other ponds such as pond 2 (K2) is slightly alkali meanwhile pond 3(K3) can be considered as highly alkali. This might influence the presence of *Euglena sp.* as the presence of *Euglena sp.* is abundance in pond 1(K1) can be due to favorable pH. According to Danilov R.A & Ekelund N.G.A (2001), discussed that the suitable Ph for this microorganism is between pH 3 to pH 8.

The turbidity at Pond 1 (K1) is the highest, followed by pond 2 (K2), and pond 3 (K3). The presence of *Euglena sp*. is also highest in Pond 1 (K1), followed by pond 2 (K2), and pond 3 (K3). Thus, it can be indicate that the higher the turbidity, the higher the abundance of *Euglena sp.* This can be because the turbidity have nutrients needed for their growth such as phosphorus and nitrogen. Most of the species are found in ditches and stagnant pool which are the eutrophic region (Halahurich M. ,nd).

Dissolved oxygen in the sites are controlled by the turbidity. The higher the value of turbidity, the lower the dissolved oxygen. Thus Biochemical Oxygen Demand (BOD) is higher. The presence of *Euglena sp.* is highest in high turbidity and low dissolved oxygen. There is study by Mahapatra D.M et al. (2013), *Euglena sp.* can be used to treat wastewater by increasing production of oxygen by photosynthesis. This will increases the BOD value.

4.2 Observation

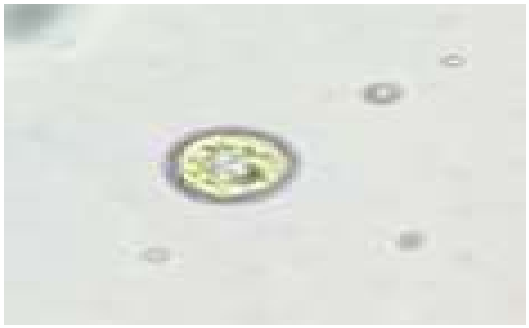
Based on three ponds, we can conclude that we were observing a species of *Euglena sp.* It was observed that the posterior portion is being larger and more rounded. However, the flagella cannot be located as only light microscope has being used. Then, we also locate eyespot (stigma) in the anterior portion of the organism's body. The eyespot appears red under the microscope. Besides, we can differentiate the organism based on the color. It have green color as it contain chloroplast that have function to do photosynthesis.



Observed *Euglena sp.*

In pond 2 (K2) and pond 3 (K3), we were observed something interesting as the *Euglena sp.* change its shape. For the first phase, it slow down its motion as it may release its flagella. Then, it the elongated body became shorter and shorter. Lastly, it transform fully into round shape. We think that it become cyst due to unfavorable conditions. Based on Lonergan T. A. (1983), the population of these cells become spherical due to low capacity of photosynthesis (example: in dark condition).

Cyst in Pond 2 (K2)



Cyst in pond 3 (K3)

Conclusion

As a conclusion, this experiment can identify the environmental factors that affect the presence of *Euglena sp.* in three pond at UMT. Some of the factors pH, turbidity and dissolve oxygen. In the other hand temperature is not considered as the factor because it is macroclimate which the value is almost the same at the three sites. Through this experiment, the life cycle of this microorganisms are observed. Besides, the use of right tools to obtain the accurate parameter in these experiment is a valuable knowledge. This experiment enable us to identify the family of *Euglenoids* based on their characteristics. In this experiment, the technique used to isolate the protozoa is used.

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