

## Characteristic of Sin-Ma-Htauk Cave Water at the Yetagun-Taung in Patheingyi Township, Mandalay

Chaw Rupa Zaw

### Abstract

In this research paper, water samples were collected from Sin-Ma-Htauk cave, at the Yetagun-Taung in Patheingyi township. The pH, colour, conductivity, turbidity and total dissolved solids were determined as physical parameters. The amounts of calcium, total-hardness, magnesium, chloride, alkalinity, total iron, manganese, sulphate and nitrogen nitrate were measured as chemical constituents. Dissolved oxygen and biochemical oxygen demand of the water samples were determined. The bacteriological determination was carried out for the water samples. In addition, the amount of heavy toxic metals such as As, Cu and Pb of the water samples were also determined by Atomic Absorption Spectrometry (AAS).

Keywords: physical parameters, chemical constituents, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD)

### Introduction

Water is the most basic need for human being. It is estimated that two-thirds of the human body is constituted of water. Water is led into communities for many purposes, i.e. domestic and drinking uses, industrial and commercial uses, public use and loss and waste.

The most important use of water is for drinking purpose. There is a Myanmar saying, "A life deprived of food can last seven days, but a life without water can last just one morning." The water intended for human consumption must have good quality

Good quality water means that it must be free from objectionable bacteria, other microorganisms, chemicals, industrial waste, sewage and visible suspended matters. It must not contain chemicals that are hazardous to human health of excessive amount of dissolved salts.

The most common dissolved substances in water are minerals or salts that as a group are referred to as dissolved solids. Dissolved solids include common constituents such as calcium, sodium, hydrogen carbonate and chloride, plant nutrients such as nitrogen and phosphorus and trace elements such as selenium, chromium and arsenic. In general, the common constituents are not considered harmful to human health, although some constituents can affect the taste, smell or clarity of water. Plant nutrients and trace elements in water can be harmful to human health and aquatic life if they exceed standards or guidelines. Dissolved gases such as oxygen and radon are common in natural water. Adequate oxygen level in water is a necessity for fish and other aquatic life. Radon gas can be threat to human health when it exceeds drinking water standards.

The physical and chemical analyses have been made and compared with the drinking water standard proposed by WHO, World Health Organization.

The main of this research is to determine whether the water in Sin-Ma-Htauk Cave at Yetagun Taung is drinkable or not.

### *Materials and Methods*

#### **Sampling and Storage**

Collection of the samples without contamination of other impurities is very important. So, water samples must be collected in clean plastic or glass bottles which

had been washed with a detergent of 1 :1 nitric acid and rinsed with distilled water. Then, the bottles were filled completely with water samples and capped tightly.

Samples were analysed as soon as possible after collection. However, the samples were stored when delay was unavoidable.

#### Selection of Methods

For examination of water quality, the selection of method is important in water analysis. The methods used for this investigation are shown in Table 1.

**Table 1. Methods used for Water Analysis**

No	Parameter	Method	Determination (by)
1	Colour	Pt. Co. standard	Spectrophotometer
2	Turbidity	Absorptiometric	Spectrophotometer
3	Conductivity	Direct measurement	Conductivity meter
4	pH	Direct measurement	pH meter
5	Hardness	EDTA Titrimetric	Titration
6	Calcium	EDTA Titrimetric	Titration
7	Magnesium	Calculation	Calculation
8	Chloride	Argentometric	Titration
9	Alkalinity	Titrimetric	Titration
10	Iron	Atomic Absorption Spectrometric	Atomic Absorption Spectrometric
11	Manganese	Persulphate	Spectrophotometer
12	Sulphate	Gravimetric	Precipitation
13	Dissolved Oxygen (DO)	Winkler's Method	Titration
14	Biochemical Oxygen Demand (BOD)	Iodometric	Titration
15	Microbiological examination	Multiple Tube	

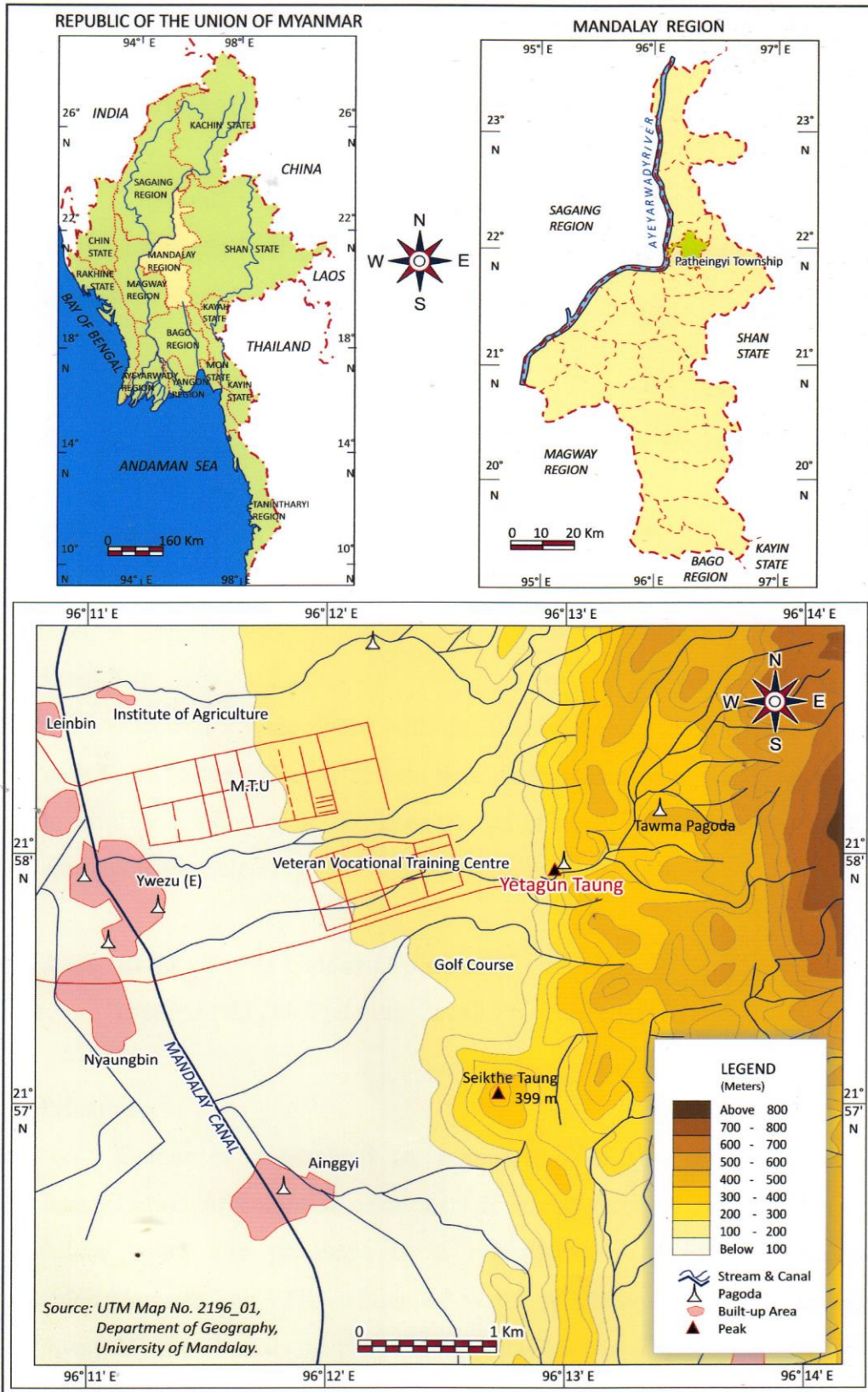


Figure 1. Location map of Yetagun Taung in Patheingyi Township

## Results and Discussion

For the present work water samples were collected from Sin-Ma-Htauk cave at the Yetagun-Taung on November 2014.

The experimental results for physical and chemical parameters of water samples collected from the Sin-Ma-Htauk cave at the Yetagun-Taung on November 2014 was given in Table 2.

**Table 2. Results of Water Samples from Sin-Ma-Htauk Cave on November 2014**

No.	Test	Unit	Results (Nov: 2014)	WHO standard	
				Higher Desirable Level	Maximum Permissible level
Physical analysis					
1	pH value	Scale	7.6	7-8.5	6.5-9.2
2	Colour	Hazen	5	5	50
3	Turbidity	N.T.U	1.60	5	25
4	Conductivity	μS/m	360	800	4000
5	Total Dissolved Solid	mg/L	271	500	
Chemical analysis					
1	Calcium as Ca	mg/L	128	75	200
2	Magnesium as Mg	mg/L	15	30	150
3	Total Hardness as CaCO <sub>3</sub>	mg/L	380	100	500
4	Total Alkalinity as CaCO <sub>3</sub>	mg/L	340	200	500
6	Chloride as Cl	mg/L	10	200	600
7	Sulphate as SO <sub>4</sub>	mg/L	<200	200	400
8	Total iron as Fe	mg/L	0.01	0.1	1.0
9	Manganese as Mn	mg/L	0.01	0.05	0.5
	Nitrogen Nitrate (N-NO <sub>3</sub> )	mg/L	8.8		45

According to Table 2, the pH of the water sample was within desirable level of WHO standard. The total hardness, total alkalinity, the amount of calcium and nitrogen nitrate of the water sample were within the WHO standard limit. The colour of the water sample is equal to the higher desirable level. The conductivity, turbidity, the total dissolved solids, the amount of magnesium, total iron, manganese, chloride and sulphate of the water sample are smaller than the higher desirable level.

DO and BOD of the water sample were determined and the results were presented in Table 3.

**Table 3. DO and BOD Values of Water Samples**

Parameters	Results November 2014	WHO Standard	
		Higher Desirable level	Maximum Permissible level
DO (mg/L)	5.10	Above 5	-
BOD (mg/L)	8.40	-	2

According to table 3, DO values for the water sample has 5.10 mg/L is above with WHO standard higher desirable level. So, the water sample has adequate dissolved oxygen in distribution system for drinking water.

BOD value for the water sample has 8.40 mg/L. Higher BOD value of water sample indicate the water is polluted.

The bacteriological examination of water sample was done at Public Health Laboratory, Mandalay. The results were described in Table 4.

**Table 4. The Results of Bacteriological Examination of Water Samples**

No.	Parameter	Results
1.	Probable Coliform	5/5
2.	<i>Escherichia Coli</i> Count	Isolated

According to Table 4, *Escherichia coli* counts was isolated and probable coliform count was observed. Therefore, from the point of view of bacteria the water sample was found to be unsatisfactory.

The trace amount of heavy metals such as copper, arsenic and lead in water sample were determined by AAS and the results were described in Table 5.

**Table 5. Determination of the Heavy Toxic Elements Present in Water Samples**

No.	Heavy Metal Analysis	Unit	Result	WHO Standard	
				Desirable	Imperative
1	Arsenic as As	mg/L	Nil	-	0.01
2	Copper as Cu	mg/L	Nil	1.0	2.0
3	Lead as Pb	mg/L	Nil	-	0.01

### Conclusion

From the study of the physical and chemical parameters, the pH of the water sample was within WHO standard. The total hardness, total alkalinity, the amount of calcium and nitrogen nitrate of the water sample were within the WHO standard limit. The colour of the water sample is equal to the higher desirable level. The conductivity, turbidity, the total dissolved solids, the amount of magnesium, total iron, manganese, chloride, sulphate of the water sample are smaller than the higher desirable level.

The bacteriological results show that the quality of water is unsatisfactory. The value of dissolved oxygen of water sample was higher than WHO standard higher desirable level: The BOD value of water sample was higher than maximum permissible level. According to AAS, toxic metal such as As, Cu and Pb are not found in the water sample.

From the observed data, the water from Sin-Ma-Htauk cave at Yetagun-Taung in Patheingyi township should not be used for drinking purpose without treating. But this water sample is found to be suitable for domestic use and agricultural use.

### Acknowledgements

The author would like to thank our deep appreciation to Rector, Pro-rectors and Head of Professor at Chemistry Department from Mandalay University for allowing to present this paper and also special thanks to Rector, Pro-rectors and Committee Members from Dagon University for allowing to read this research paper.

### References

- AWWA. (1975). "Simplified Procedures for Water Examination". American Water Work Association Inc., New York.
- Chatterjee, A.K., (1975). "Water Supply and Sanitary Engineering", 1<sup>st</sup> ed., Metcalf and Eddy, Inc., New York.
- HACH Company. (1985). "Water Analysis, Hand book", Loveland, Colorado.
- Lenoro, S.C., Arnold, E.G., (1999). "Standard Methods for The Examination of Water and Wastewater", 20 ed., American Public Health Association, Washington D.C., USA.
- Moe Moe Myat, (1998). "Studies On The Characteristics of Well Water from Myitnge Town". Department of Chemistry. University of Mandalay, Myanmar, MSc (Thesis)
- Myo Myint (1998). "Studies On The Characteristics of Water in Myaung Area", Department of Chemistry, University of Mandalay, Myanmar, MSc (Thesis)
- Noedell, E., (1961). "Water Treatment for Industrial and Other Uses", 24 ed. Combridge University Press, London.
- Steel, E.W., (1960). "Water Supply and Sewerage". 4th ed., Mc Graw Hill Kogakusha Book. Co., Ltd, Tokyo.
- WHO (1971). "International Standards for Drinking Water", 3rd ed., World Health Organization, Geneva.
- WHO (1993). "Guidelines for Drinking-water Quality", 2nd ed., Vol.1. Recommendations. World Health Organization, Geneva.