

Determine the Type of Diatoms in the Batangtoru River and Parsariran River in Tapanuli Selatan Regency by means of Acid Destruction

Amalan Surya Hutabarat, Asan Petrus, Nasib Mangoloi Situmorang

* Situmorang Departemen Forensik dan Medikolegal Fakultas Kedokteran Universitas Sumatera Utara

DOI: 10.29322/IJSRP.10.01.2020.p9758

<http://dx.doi.org/10.29322/IJSRP.10.01.2020.p9758>

Abstract- Victims of Drowning cases are still often found in the World of Forensic medicine today. Drowning is a condition where oxygenation occurs in the lungs due to the entry of water into the airways through the nose and mouth. In Forensic medicine, examination of diatoms in drowning victims is still very useful in diagnosis .

Diatom examination on drowning victims is used to determine whether the victim is still alive when entering the water or has died. This examination can also determine the scene of the incident or place of the victim's sinking.

This research uses a descriptive method. The sample material used came from the Batangtoru river and Parsariran river in South Tapanuli Regency. With the results of the study found 14 species of diatoms in the Batangtoru river and 14 species of diatoms in the Parsariran river.

Index Terms- Diatoms, Drowning

I. INTRODUCTION

Drowning is a condition in which oxygenation is disrupted in the lungs due to the entry of fluid into the airways through the nose and mouth.

WHO noted that in 2016 drowning cases there were 320,000 people lost their lives due to drowning. More than 90% of these drowning deaths occur in low and middle income countries. WHO also recorded the highest number of deaths in drowning cases was in Africa, with a ratio of 15-20 times higher than in Germany or the United Kingdom. In Indonesia, the death toll drowned due to natural disasters according to the National Disaster Management Agency (BNPB) of 180 people during 2017, that number is relatively more than the death toll drowning at sea according to the National Transportation Safety Committee (KNKT) in 2013 totaling 65 fatalities , while the victims died as a result of 2013 as many as 12 people. In the case of drowning which often creates difficulties for investigators is to determine where the victim first sank.

Definition of Diatoms

Diatoms are a type of algae that are only seen microscopically and contain silicon particles. The shape is usually round oval, triangle or rectangle. Along with water that enters the lungs, diatoms then penetrate the lungs and then enter the

lymphatic channels. Through the circulation of these lymph channels diatoms are delivered to the heart and then spread to several body tissues.

According to Hendey, there are as many as 15,000 species of diatoms, half of which live in fresh water and the other half live in brackish water and sea water. Diatoms have a variety of sizes, ranging from 2 μ to 1 mm in length or diameter. Some species have a length of 10-80 μ , if long enough to have a width of 10 μ .

Diatoms are included in the class Bacillariophyceae algae with the main constituent cell wall of silica. It is called a diatom because the cell consists of two valves (two atoms), where one covers the other like a can of pastiles. Diatoms are generally unicellular (solitary), but in some species there are those who live in colonies and co-operate with one another. Diatoms are very useful in environmental studies because their species distribution is influenced by water quality and nutrient content and their presence is very abundant in marine sediments such as at sea, estuary, lake, pond, or river, as well as diatom fossils that can be used as indicators of water quality better than water quality. with saprobitas index because diatoms are more sensitive especially those related to the conductivity parameters, organic content.

Diatom classification according to lifestyle is divided into 8 groups:

1. Epiphytic known as the diatom group attached to other larger plants.
2. Epipsamic is known as a group of diatoms that live and grow on sand.
3. Epipellic are known as diatom groups that live and grow on the surface of clay (mud) or sediments.
4. Endopelic known as a group of diatoms that grow in cavities of clay (mud) or sediments.
5. Epilithic known as diatom groups that grow and attach to the surface of the fiber.
6. Endolithic, known as the diatom group that grows in cavities at the bottom of ships.
7. Epizoic which is known as diatom group which is attached to common animal invertebrate base coat.
8. Fouling, known as a diatom group attached to hard objects that are mounted or placed on the base of the mantle.

Definition of River

The river is the flow of air at the surface of the land that flows into the sea. The river based on its physical condition is divided into 3 namely:

1. Upstream: in the upstream condition of heavy water flow, the rocks are also large and the erosion that occurs is vertical downward erosion (waterfall).
2. Middle part: in this part the river water flow is rather calm, the rocks are also not big anymore and the erosion that occurs laterally / horizontally.
3. Downstream: in this part the flow of water is calm, the rocks are gone turns into thick / sand and is rare.

The Drowning Definition

Drowning is death due to the entry of fluid into the respiratory tract. Fluid that causes drowning is usually in the form of water, although a number of other liquids can also cause drowning. Sometimes a person who is unconscious will sink when he drops his face into a pool of water, such as epilepsy during a sudden attack but drowning generally appears as a result of total body submergence. In this case drowning denotes death from the entry of water into the respiratory tract, whether it is with a sinking body or not.

Drowning of Mechanisme

Understanding of the mechanism of drowning according to Brouardel quoted by Tedeschi et al (1977) found five stages as follows:

1. The surprise stage which lasts for 5 to 10 seconds.
2. The first stage of respiratory arrest that lasts about one minute.
3. The deep respiration phase which lasts for about one minute.
4. The second stage of respiratory arrest that lasts about one minute.
5. Gasps terminal stage (last breath) lasting 30 seconds.

Diatom's Relationship with Drowning

This diatom is used as a diagnostic tool for investigating drowning cases, because of this the diatom examination is intended :

- a. Determine whether someone died by drowning or not.
- b. Knowing whether people are still alive when drowning.
- c. Knowing the location of the sinking body before dying, by comparing the diatoms found in the body of the victim with the water diatoms where the bodies were found or suspected as a place to drowning.

The pathophysiology of how people drown can be found diatoms in their bodies is through the media of water, basically when a living person sinks into water containing diatoms, some diatoms will enter the lungs and stomach, diatoms contained in water can enter the lungs the lungs and circulatory system and other internal organs such as the brain, kidneys, liver and bone marrow.

Procedure

Take water from the river at a depth of 1 meter to 2 meters from the surface of the water with plankton net (plankton net), then the netted plankton samples will be collected in a bucket which is then poured into a 20 ml bottle and preserved using 3 drops of lugol solution and labeled, then taken to the laboratory in each ingredient mixed with concentrated sulfuric acid solution with the same volume, then left for 24 hours, then heated with low heat until boiling and then dripped with concentrated nitric acid until the liquid is clear, then each is put into a centrifuge tube of the same size and the number of even tubes at a speed of 3000 rpm for 15 minutes the sediment (sediment) is washed with aquadest then in the centrifuge again for 15 minutes at a speed of 3000 rpm and then the sediment (sediment) viewed under a microscope with magnification 100 times

II. RESEARCH METHODS

The type of research conducted descriptively is knowing the type of diatoms in the Batangtoru river and Parsariran river in South Tapanuli Regency in assisting the Case of the sinking victims.

III. RESEARCH RESULT

Table 1. Distribution of diatom species in the Batangtoru river in Tapanuli Selatan Regency

Location	Diatom Type	Stasiun		
		Upstr eam	Cent ral	Downs tream
Batangtoru River	Aulacoseira sp	+	+	+
	Coscinodiscus sp	+	+	+
	Navicula sp	+	-	-
	Synedra sp	+	-	+
	Caloneis sp	+	-	+
	Nitzschia sp	+	-	+
	Bacillaria sp	+	-	+
	Fragillaria sp	+	+	+
	Frustulia sp	+	+	+
	Surirella sp	+	+	+
	Netrium sp	+	+	+
	Eunotia sp	-	+	-
	Amphora sp	-	+	-
Achnanthes sp	-	+	-	

Description:
 + : found
 - : not found

From the table above it can be seen that there are various different types of diatoms found at each station, but also found the same type of diatoms at each station.

From the above data it can be seen that in the two rivers the same diatom species are found but there are also different diatom species found.

Table 2. Distribution of diatom species in the Parsariran river in Tapanuli Selatan Regency

Location	Diatom Type	Stasiun		
		Upstream	Central	Downstream
Parsariran River	Navicula sp	+	-	+
	Synedra sp	+	-	+
	Bacillaria sp	+	-	+
	Nitzshia sp	+	-	+
	Cymbella sp	+	-	+
	Netrium sp	+	+	+
	Cyclotella sp	+	+	+
	Asterionella sp	+	+	-
	Surirella sp	+	+	-
	Caloneis sp	+	+	-
	Eunotia sp	+	-	-
	Pinnularia sp	+	+	-
	Amphora sp	+	+	-
	Frustulia sp	+	+	-

Description:

- + : found
- : not found

Table 3. Distribution of diatom species in the Batangtoru river and Parsariran river in Tapanuli Selatan Regency.

No	Diatom Type	River	
		Batangtoru	Parsariran
1	Navicula sp	+	+
2	Synedra sp	+	+
3	Bacillaria sp	+	+
4	Nitzshia sp	+	+
5	Cymbella sp	-	+
6	Netrium sp	+	+
7	Cyclotella sp	-	+
8	Asterionella sp	-	+
9	Surirella sp	+	+
10	Caloneis sp	+	+
11	Eunotia sp	+	+
12	Pinnularia sp	-	+
13	Amphora sp	+	+
14	Frustulia sp	+	+

IV. DISCUSSION

From the results of the above study it can be seen that diatoms can be found in fresh and marine waters, in this case the study used freshwater samples. The abundance of diatoms in a waters varies greatly determined by environmental factors that influence it. The distribution that affects the abundance of diatoms include the following:

- a. Temperature factor, where temperature can affect the process of photo synthesis in waters both directly and indirectly.
- b. Waters currents, where currents largely determine the distribution of abundance of diatoms living as planktonics.
- c. Turbidity, the more turbid the aquatic ecosystem, the level of O2 levels is also reduced and sunlight is difficult to penetrate a certain depth. Thus inhibiting the process of photosynthesis and diatom growth itself.

In addition to the factors above that can affect the presence and abundance of diatoms in a waters there are other factors namely: environmental factors that can affect the growth and spread of phytoplankton, both physical and chemical factors, such as salinity, light, nutrients and PH.

V. CONCLUSION

1. Found 14 species of diatoms in the Batangtoru river with the same diatom species distribution found at the upstream, central and downstream stations, namely, Aulacoseira sp, Coscinodiscus sp, Aulacoseira sp, Fragillaria sp, Frustillia sp, Surirella sp, Netrium sp.
2. The type of diatom found at the upstream station but not found at the central and downstream stations, namely Navicula sp, this is very helpful in the application of the Determination of the first place where the victim sank, where if found diatoms in the lungs of a drowned victim, the type of navicula sp is confirmed to be the first victim the river was submerged in the Batangtoru river upstream station.
3. The type of diatom found at the central station but not found at the upstream and downstream stations namely Eunotia sp, Amphora sp, Achnanthes sp. then it is confirmed that the victim first sank, namely at the central station.
4. In the Parsariran river there were 14 diatom species found where the distribution of diatom species found at the upstream, central and downstream stations, namely Netrium sp and Cyclotella sp.
5. The type of diatom found at the upstream station but not found at the central and downstream stations, Eunotia sp. This is very helpful in the application to determine the location of the case where the victim first drowned. at the upstream station.

6. The type of diatom that is not found in the Batangtoru river but found in the parsariran river, namely, *Cymbella* sp, *Cyclotella* sp, *Asterionella* sp, *Pinnularia* sp, this is due to the different turbidity levels in the river where the turbidity river is higher than the parsariran river which is very high affect diatom photosynthesis itself.
7. The abundance of diatoms in each river varies greatly because it is influenced by environmental, chemical and physical factors.

VI. SUGGESTION

1. The results obtained in this study do not provide an overall picture of the shape, type, and abundance of diatoms in the Batangtoru and Parsariran rivers. This causes the need for further research at different times, circumstances and locations.
2. The results of diatom photographs obtained in this study are less clear because it only uses a mobile digital camera that is less compatible with a microscope, so further research is expected to further diatom images need to use a special camera that is compatible with a microscope.
3. Such research is expected to be developed by other researchers in different rivers in the South Tapanuli Regency, especially in one stream.

REFERENCES

- [1] Idris AM. Penerapan Ilmu Kedokteran Forensik dalam proses penyidikan. Edisi Revisi. Cetakan kedua. Jakarta: Sagung Seto; 2011.p.65-70.
- [2] World Health Organization [Internet]. World Health Organization. [cited 30 July 2019]. Available from: https://www.who.int/violence_injury_prevention/drowning/en/
- [3] Data Bencana Indonesia 2017 [Internet]. Badan Nasional Penanggulangan Bencana; 2018 [cited 30 July 2019]. Available from: <https://bnpb.go.id/uploads/24/buku-data-bencana/buku-data-bencana-2017-compressed.pdf>
- [4] Knight, Bernard. Forensic Pathology. Oxford University press. 1996.
- [5] Manuel dkk. Automatic screening and multifocus fusion methods for diatom identification. Republik Ceko. 2009.
- [6] Campbell N dkk. Biologi. Penerbit Erlangga. Jakarta. 2003.
- [7] Gani, Husni. Diagnosa Drowning, Penerbit Erlangga. Jakarta. 2002.
- [8] Simanjuntak M. Pengaruh Suhu, Salinitas dan Silikat terhadap Kelimpahan Fitoplankton di Perairan Digul Laut Arafura, Jurnal ISSN Lingkungan hidup Jakarta. 2007.

- [9] Amri A. Tenggelam (Drowning), in Amri A. Eds. Ilmu Kedokteran Forensik. Edisi 2. Medan. 2007.
- [10] Reece J B , Mitchell L G. Biologi. Terjemahan Mahameru Jakarta. 2003.
- [11] Teddesh C.G et.al. Forensic Medicine. W.B Saunder Company. 1997.
- [12] M.G Forero et al. Analysis and screening of diatoms by Shape from Contour. Spanyol. 2009.
- [13] Yeanny M S. Komunitas Fitoplankton sebagai Bioindikator kualitas air sungai Belawan. USU Medan. 2011.
- [14] Knight, Bernard. Forensic Pathology. Oxford University Press. New York. 2000.
- [15] Gonzales TA, Vance M, Helper M, Umberger CJ. Legal Medicine Pathology and Toxicology-Appleton-Century-Crofts, INC. New York. 1954.
- [16] Camps, E. et al. Operational Death and Complications (Including Those Under Anesthesia). In: Gradwohl's Legal Medicine Third Edition, Great Britain. 1976.
- [17] Shamsudin L. Diatom air tawar morfologi dan taksonomi. Kuala Lumpur;1991: p.174-235.
- [18] Charles bold H, James Wynne M. Introduction to the algae.2nd ed.United states of america: Library of cospen cataloging; 1985: p.465-473.
- [19] Hii tan T, Pin leaw C.Marine micro-phytoplankton of singapore with a review of harmful microalgae in the region. National university of singapore. 2016;34(0217-2445):78-96
- [20] Edmondson W. Fresh water.2nd ed. Washington: University of washington; 1959: p. 140-184.
- [21] Arifiani purnomo A, Junitha I, Suartini N. Variasi spesies diatom pada tipe perairan berbeda untuk kepentingan forensik sebagai petunjuk kematian akibat tenggelam. Jurnal simbiosis III. 2015;I(2337-7244):247-257
- [22] Al- Handal A.Y & Wulf A, Ephyphitic diatoms from King George island, Antartica; 2008: p. 421.
- [23] Srivastava N, Suseela M, Toppo K, Lawrence R. Fresh water algal diversity of central india. International journal of research and development in pharmacy & life science [internet]. 2018 [cited 06 December 2019];4:3046. Available from: <http://ijrdpl.com>
- [24] South. G. Robin & A. Whittick, Introduction to Phycology; 1987: p. 96..
- [25] Sancetta. C. Processes Controlling the Accumulation of Diatom in Sediments, Norwich: University of East Anglia, 1989.
- [26] Aryawati R. Kelimpahan dan sebaran fitoplankton di Perairan Berau Kalimantan Timur[Tesis], Bogor; Institut Pertanian Bogor;2007.

AUTHORS

First Author – Amalan Surya Hutabarat, Departemen Forensik dan Medikolegal Fakultas Kedokteran Universitas Sumatera Utara, Email : surya.amalan@yahoo.com
Second Author – Asan Petrus, Departemen Forensik dan Medikolegal Fakultas Kedokteran Universitas Sumatera Utara
Third Author – Nasib Mangoloi Situmoran, Departemen Forensik dan Medikolegal Fakultas Kedokteran Universitas Sumatera Utara