

Determining The Types Of Diatoms Padang River And Bahilang River In Tebing Tinggi City

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Abstract- Background : Drowning is a process that causes respiratory disturbances due to the entry of fluid into the airways or lungs. Until now, diatom examination is the gold standard examination to diagnose deaths because of drowning. The discovery of diatoms in tissue examination is one of the markers that shows the victim died from drowning.

Aim: To find out whether the person died from drowning or not, whether the person is still alive when drowning and to know the location of the drowned body before death so that it helps investigators determine where was the victim drowned for the first time by comparing the diatoms in the victim's body with the diatoms the water where the body was found or suspected to be a drowning death place.

Method : This research was conducted descriptively. The research sample was taken from rivers in Tebing Tinggi City, namely Sungai Padang and Sungai Bahilang .

Results : 15 diatom species were found in the Sungai Padang and 11 diatom species were found in the Sungai Bahilang. From the results of research in the Sungai Padang and Sungai Bahilang, there are similarities and differences in the types of diatoms in each river

Index Terms- Drowning, Diatoms

I. PRELIMINARY

Sinking is a process that causes interference with the entry of fluid into the respiratory tract or lungs. Drowning is not limited to water, such as rivers, lakes or swimming pools, but may also be in a puddle or ditch with only a face below the surface of the air.^{1,2}

In 2016 WHO recorded drowning cases recorded as many as 320,000 people lost their lives due to drowning, more than 90% of deaths due to drowning occurred in low and middle-income countries. Drowning is the third leading cause of death in the world where the case most often affects children aged 5-14 years.

In connection with the use of diatoms in the diagnosis of drowning, Revenstorff in 1904 was the first person to try to use diatoms as a test for drowning, although he stated that Hofmann was the first person to find it in pulmonary fluid in 1896. The basic view put forward was if someone drowned in water containing diatoms, the diatoms will penetrate the alveolar wall and bring it to the main organs such as the brain, kidneys, liver, and bones.⁸

Diatoms are microscopic creatures that live in almost every aquatic habitat. There is an enormous variety of living things. Diatoms are a class of plants, which is a single-celled alga found

in water with sufficient lighting. With a size of 40-200 microns but maybe also with a size <4-5 micron /> 1 micron, with the shape that is owned varies.^{9,10,11,12}

In a corpse submerged in water and suspected of having died due to drowning, it is necessary to determine whether the victim is still alive when drowning which is marked by intravital signs, whether there are other signs of violence, and the cause of death.¹ In uncovering criminal cases, crime scenes (TKP) is an important source of information in revealing events that have happened to victims. This is due to the fact that there is a lot of evidence (*corpus delict*) found at the crime scene which experts can speak to reveal about the events that occurred. However, the problem now, is difficult to determine where the crime scene itself, especially in the case of drowning because the victim was found far from the place where the victim drowned.

Some previous researchers have discussed the identification of diatoms, but there have been no studies or research on the types of diatoms that exist in the Padang River and Bahilang River in Tebing Tinggi City.

II. LITERATURE REVIEW

Diatom

Diatoms are a type of alga that are only seen microscopically and contain silicon particles. The shape can be round oval, triangle or rectangular.¹⁴

Diatoms have a structure that contains SiO₂ silicic acid. Silicate itself has resistance to decay. The peach alga enters the body through blood circulation so that the location of the alga shows whether the victim was drowned ante-mortally or post-mortally. Diatoms can also be searched for in the heart which has been diluted with water for hemolysis and then centrifuged and the sediment examined. When the victim is so rotten that the victim has sunk, both the skin and organs have been destroyed, the diatom examination is taken from the long bone marrow and then the same process is carried out.¹⁰

Diatom Identification

Diatoms are single-cell plants belonging to the Bacillariophyceae class of the Bacillariophyta phylum. Diatoms can consist of one single cell or a combination of several cells forming a chain. They usually float freely in bodies of water and also most of them attach to harder substrates. Diatom sticking is usually because this plant has a kind of gelatin (Gelatinous extrusion) which provides adhesion to objects or substrates. We also sometimes find some diatoms that are very slow but have the power to move.^{14,15,16}

It is called a diatom because the cell consists of two valves (two atoms), where one covers the other like a can of pastilles. Diatoms are generally unicellular (solitary), but in some species same live in colonies and co-operate with one another. From its shape, diatoms are divided into two orders based on their shape, namely circular diatom cells (Centrales diatoms) and elongated diatom cells (Pennales diatoms). The Central Order when viewed from above or below is symmetrical and circular in a radial shape. The cells can be round, oval, cylindrical, with a round, triangular or rectangular cross-section, while the Pennales Order is longitudinal or sigmoid shaped like the letter "S". Along with the median diatom cell fatigue there is a middle lane called rafe (raphe).^{17,18}

Diatom classification according to their lifestyle is also divided into 8 groups, namely: Epiphytic, Episamic, Epipellic, Endopelic, Epilithic, Endolithic, Epizoic, Fouling.^{14,16,18}

Diatom Growth Factor

Diatom distribution varies which is determined by environmental factors that influence. The distribution that affects diatoms horizontally include the following: temperature, water flow and turbidity factors.¹⁹

Drowning

Definisi

Drowning is usually defined as death from asphyxia caused by the entry of fluid into the respiratory tract. In one case the victim sank in the water so that his respiratory system was disrupted by the result of loss of consciousness and threat to the victim's soul.¹

In general, drowning is a case of an accident, either directly or because there are certain factors such as the victim being drunk or under the influence of drugs, it could even be due to the result of a murder event. Every year, around 150,000 deaths are reported worldwide due to drowning, with annual occurrences perhaps closer to 500,000. Some of the most populous countries in the world fail to report near drowning incidents. This suggests that many cases have never been brought to medical attention, events around the world make an accurate approach almost impossible.^{16,17}

Drowning diagnosis

Until now, diatom examination is a *gold standard* examination to diagnose deaths from drowning. However, this examination is still controversial because diatoms cannot always be found on the examination of the lung. This can occur in atypical drowning cases such as dry drowning, disruptive climatic factors, procedures and use of chemicals that are destructive and diatom destruction and can also be caused by pollution of sea water or fresh water.^{23,24}

A comparison between diatoms found in the victim's body and those in the waters where the victim was found is useful to strengthen the diagnosis and location of the victim's death. The discovery of diatoms in tissue examination is one of the markers that the victim died from drowning.¹

Diatom's Relationship with Drowning

Diatom checks on suspected victims of drowning are routine procedures that must be performed. Diatoms are used as

diagnostic tools to investigate drowning cases. Because of this, the diatom examination aims: ascertain whether a person died due to drowning or not, find out whether the person is still alive when drowning and know the location of the sinking body before dying.²⁹

III. RESEARCH METHODS

Research Types and Design

The type of research conducted descriptively is to determine the type of diatoms in rivers in the city of Tebing Tinggi

Location and Time of Research

The study was conducted in the Padang river and the Bahilang river in the city of Tebing Tinggi,

When the study was conducted from August to November 2019. Sampling was carried out at 09.00-11.00 WIB, because sunlight penetration for the process of photosynthesis of diatoms was considered optimal at that hour.

Sample and How it Works Research

The material used in this study is river water taken at 2 rivers in Tebing Tinggi City in different locations, namely in the upstream, middle and downstream areas at a depth of 1 meter to 2 meters from the surface of the river.

Take water from the river with a plankton net (plankton net), then the netted plankton samples will be collected in a bucket which is then poured into as many as 20 ml bottles, enter as much as 20 ml concentrated H₂SO₄ and leave for 24 hours. Heat with low heat until boiling, then pour into it a few drops of concentrated HN₀₃, until the color is clear yellow. The liquid is centrifuged for 15 minutes at 3000 rpm. The sediment (sediment) is washed with distilled water and then again the sediment (sediment) is seen under a microscope with a magnification of 100 times. Check the shape of the diatoms found, then identify.

IV. RESEARCH RESULT

Table 1. Distribution of Types of Diatoms in the Padang River at the Upstream, Middle and Downstream Stations in Tebing Tinggi City.

N O	Types of Diatoms	Stations		
		Upstream	Middle	Downstream
1	Navicula sp.	+	+	-
2	Synedra sp.	+	+	+
3	Caloneis sp.	+	+	+
4	Nitzschia sp.	+	+	-
5	Cymbella sp.	+	+	-
6	Fragillaria sp.	+	+	+
7	Cyclotella sp.	+	-	+

8	Asterionella sp.	+	-	+
9	Frustulia sp.	+	-	+
10	Surirella sp.	+	-	+
11	Netrium sp.	+	-	+
12	Eunotia sp.	+	+	+
13	Pinnularia sp.	-	+	+
14	Amphora sp.	-	+	+
15	Achnanthes sp.	-	+	+

Description : + : Found
- : Not Found

Table 2. Distribution of Types of Diatoms in the Bahilang River at the Upstream, Middle and Downstream Stations in Tebing Tinggi City.

N O	Types of Diatoms	Stations		
		Upstream	Middle	Downstream
1	Navicula sp.	+	+	+
2	Synedra sp.	+	+	+
3	Rhopaldia sp.	+	+	+
4	Nitzschia sp.	+	+	+
5	Cymbella sp.	-	+	+
6	Stauroneis sp.	+	-	-
7	Frustulia sp.	+	-	+
8	Achnanthes sp.	+	-	+
9	Gamphonema sp.	-	+	+
10	Terpsinoe sp.	-	-	+
11	Plagiotropis sp.	+	-	+

Description : + : Found
- : Not Found

Table 3. Distribution of Types of Diatoms in the Padang River and Bahilang River at the Upstream, Middle and Downstream Stations in Tebing Tinggi City

N O	Types of Diatoms	River	
		Padang	Bahilang

1	Navicula sp.	+	+
2	Synedra sp.	+	+
3	Caloneis sp.	+	-
4	Nitzschia sp.	+	+
5	Cymbella sp.	+	+
6	Fragillaria sp.	+	-
7	Cyclotella sp.	+	-
8	Asterionella sp.	+	-
9	Frustulia sp.	+	+
10	Surirella sp.	+	-
11	Netrium sp.	+	-
12	Eunotia sp.	+	-
13	Pinnularia sp.	+	-
14	Amphora sp.	+	-
15	Achnanthes sp.	+	+
16	Rhopaldia sp.	-	+
17	Stauroneis sp.	-	+
18	Gamphonema sp.	-	+
19	Terpsinoe sp.	-	+
20	Plagiotropis sp.	-	+

Description : + : Found
- : Not Found

V. DISCUSSION

Based on the above research conducted on the Padang River and Bahilang River in Tebing Tinggi City in different locations, namely in the upstream, middle and downstream areas, there are some different diatom species in both rivers, but several diatom species are found in both rivers.

In a study conducted on the Padang river at the upstream station, 12 diatom species were found, namely: Synedra sp. Caloneis sp. Nitzschia sp. Cymbella sp. Fragillaria sp. Cyclotella sp. Asterionella sp. Frustulia sp. Surirella sp. Netrium sp. Eunotia sp., At the middle station found 10 species of diatoms, namely: Navicula sp. Synedra sp. Caloneis sp. Nitzschia sp. Cymbella sp. Fragillaria sp. Eunotia sp. Pinnularia sp. Amphora sp. Achnanthes

sp., and at the downstream station 12 diatom species were found, namely: : *Synedra* sp. *Caloneis* sp. *Fragillaria* sp. *Cyclotella* sp. *Asterionella* sp. *Frustulia* sp. *Surirella* sp. *Netrium* sp. *Eunotia* sp. *Pinnularia* sp. *Amphora* sp. *Achnanthes* sp. Diatom species found in the Bahilang river at the upstream station found 8 species, namely: *Navicula* sp. *Synedra* sp. *Rhopaldia* sp. *Nitzschia* sp. *Stauroneis* sp. *Frustulia* sp. *Achnanthes* sp. *Plagiotropis* sp., The central station found 6 species of diatoms, namely: *Navicula* sp. *Synedra* sp. *Rhopaldia* sp. *Nitzschia* sp. *Cymbella* sp. *Gamphonema* sp., and at the downstream station 10 diatom species were found, namely: *Navicula* sp. *Synedra* sp. *Rhopaldia* sp. *Nitzschia* sp. *Cymbella* sp. *Frustulia* sp. *Achnanthes* sp. *Gamphonema* sp. *Terpsinoe* sp. *Plagiotropis* sp.

Diatom distribution varies depending on the environmental factors that influence it. The distribution that affects diatoms horizontally include the following:

a. Temperature factor

Where the temperature can affect the photosynthesis process in the waters both directly and indirectly. Diatoms are widespread in subtropical climates.

b. Water flow

Waters currents, where currents largely determine the distribution of diatoms that live as planktonic.

c. Turbidity

The more turbid aquatic ecosystem, the level of O₂ is also reduced and the sunlight is difficult to penetrate a certain. Thus inhibiting the process of photosynthesis and growth of the diatoms themselves.¹⁰

VI. CONCLUSION

Based on the results of the research conducted, it can be concluded :

1. Found 15 species of diatoms in the Padang river, namely: *Navicula* sp. *Synedra* sp. *Caloneis* sp. *Nitzschia* sp. *Cymbella* sp. *Fragillaria* sp. *Cyclotella* sp. *Asterionella* sp. *Frustulia* sp. *Surirella* sp. *Netrium* sp. *Eunotia* sp. *Pinnularia* sp. *Amphora* sp. *Achnanthes* sp.
2. Found 11 species of diatoms in the Bahilang river, namely: *Navicula* sp. *Synedra* sp. *Rhopaldia* sp. *Nitzschia* sp. *Cymbella* sp. *Stauroneis* sp. *Frustulia* sp. *Achnanthes* sp. *Gamphonema* sp. *Terpsinoe* sp. *Plagiotropis* sp.
3. Diatom species in the Padang river that are not found in the Bahilang river are *Caloneis* sp. *Fragillaria* sp. *Cyclotella* sp. *Asterionella* sp. *Surirella* sp. *Netrium* sp. *Eunotia* sp. *Pinnularia* sp. *Amphora* sp.
4. Diatom species in the Bahilang river that are not found in the Padang river are *Rhopaldia* sp. *Stauroneis* sp. *Gamphonema* sp. *Terpsinoe* sp. *Plagiotropis* sp.
5. In the Padang and Bahilang rivers, there are some different types of diatoms found in the two rivers, but there are several types of diatoms that are found in both rivers. This can occur because some diatoms can adapt quickly so that they can live in various environmental conditions, while some are only able to live in certain conditions.
6. There are differences in the types of diatoms found in the Padang river and the Bahilang river so that it can help the

investigator in revealing the crime scene or where the victim was first found, especially in the case of the victim drowning,

VII. SUGGESTION

1. Diatom identification results in this study, have not provided a comprehensive picture of the type of diatoms and the abundance of diatoms in the Padang River and the Bahilang river in Tebing Tinggi City which have only been carried out in a limited time span. Therefore it is necessary to do further research in a longer time span.
2. Diatom images in this study are less clear because it uses a mobile camera, it is hoped that subsequent studies will use a special camera that is compatible with a microscope.
3. Doing the same next research on rivers in Tebing Tinggi City.

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