

ISSN: 2584-1491 | www.iircj.org Volume-3 | Issue-5 | May-2025 | Page 01-13

Forensic Analysis of Diatoms in different ponds at Durg Rural area of Chhattisgarh

Nandini Mahilang M.Sc Forensic Science Sem 4th Department of Forensic Science Kalinga University, New Raipur, Chhattisgarh, India

ABSTRACT

Main body Diatoms are eukaryotic, unicellular, photosynthetic (autotrophic) creatures that are frequently categorized as algae. The scientific name for them is Bacillariophyceae. Background Diatom research can be used for medical-legal purposes to resolve situations involving drowned or abandoned bodies that have not been claimed. The identification of diatoms within the organs can help a drowning death diagnosis, a procedure known as the "diatom test." This study was conducted in the department of Forensic Science student included the extraction and identification of diatoms from the collected water samples from different ponds at Durg Rural area in Chhattisgarh. Conclusion This comprehensive review provides an in-depth analysis of the principles, methodologies, applications, and challenges associated with the field of forensic diatomology. Research in this area has led to the creation of a database of diatom species, which enhances the forensic potential of diatoms by providing a reference for identifying species found in forensic samples. The study of diatoms in the Durg rural area of Chhattisgarh not only enriches the existing database but also provides a valuable tool for forensic applications. This research supports the use of diatom analysis in forensic investigations, offering a scientific basis for linking individuals to specific water bodies and aiding in the determination of drowning as a cause of death.

Keywords: Diatoms, ponds, Durg Rural, Chhattisgarh, drowning death.

INTRODUCTIONS

Diatoms are unicellular, eukaryotic, photo-synthetic (autotrophic) algae with a peculiar crystalline extracellular layer or silica-based frustules with specific microstructural and symmetrical features. They are categorized into the class Bacillariophyceae and kingdom Protista. Diatoms are known to occur in over 200 genera and 100,000 species **Priyanka Kumari et al. (2023)**^[1]



ISSN: 2584-1491 | www.iircj.org Volume-3 | Issue-5 | May-2025 | Page 01-13



Light microscopy of several species of living freshwater. Credit: https://en.wikipedia.org/wiki/Taxonomy_of_diatoms

Plankton means "to wander around," and Phyto means "plants." Diatoms are phytoplankton. They are marine algae with a solitary cell . One of the largest groups of animals on Earth, diatoms come in a wide variety of shapes, sizes, and forms, but their distinct cell wall construction makes them easy to identify. The distinctive silica coating found on cell walls resists deterioration. Since it contains a significant quantity of hard but brittle silica that is hydrated (SiO2.H2O) and nanocrystalline , it aids in their ability to retain their shapes . Diatoms carry out photosynthesis because they are found in damp, well-lit environments **Vinayak Gupta et al.** (2018) ^[2] They are found in practically every aquatic ecosystem, including rivers, lakes, ponds, and oceans. They are distinguished by their great diversity, with over 200 genera and around 200,000 species currently known **Stefano Tambuzzi et. al (2024)** ^[3]

Diatoms have historically been categorized into two main structural groupings based on the shape of their valves: pennate diatoms and "centric" diatoms, which have valves with radial symmetry. However, the first group, known as the "centric" diatoms, has been generally rejected by developments in diatom taxonomy over the past 20 years as being monophyletic and not a naturally occurring systematic group. For a history of diatom classifications and a synopsis of evidence (2017)[4] advancements in DNA **ZLATKO LEVKOV** et al. They have cells that are between 2 and 200 um in size. Diatoms are either planktonic, meaning they float freely, or benthic, meaning they are connected to a substrate. One They can be found as colonies, which might resemble ribbons, fans, zigzags, or stars, or in single cells. Morphological traits such as frustule size, shape, and pattern serve as the basis for diatom classification. One An assembly of living diatoms doubles about every 24 hours by asexual multiple fission when given enough nutrients and sunlight; an individual cell can live for up to six days.

In both freshwater and marine environments, diatoms represent a significant group of organisms in terms of variety, abundance, and productivity. **Ankita Tandon et al. (2023)** ^[5]



ISSN: 2584-1491 | www.iircj.org

Volume-3 | Issue-5 | May-2025 | Page 01-13



Diatoms (class Bacillariophyta) in sea water. Credit: Dr Norbert Lange / Shutterstock.com

Genus	Number of species	Genus	Number of species
Achnanthes	1	Hantzschia	1
Achnanthidium	1	Iconella	1
Amphora	2	Melosira	1
Aulacoseira	4	Meridion	1
Caloneis	2	Mayamaea	1
Chamaepinnularia	1	Navicula	4
Cocconeis	1	Neidiomorpha	1
Craticula	2	Neidium	3
Cyclotella	1	Nitzschia	1
Cymbella	3	Odontidium	1
Cymbopleura	2	Orthoseria	2
Diatoma	1	Pinnularia	15
Didymosphenia	1	Placoneis	1
Diploneis	3	Planothidium	2
Discotella	2	Platessa	1
Encyonema	2	Psammothidium	1
Epithemia	1	Sellaphora	1
Eunotia	6	Stauroneis	2
Fragilaria	2	Staurosira	1
Frustulia	2	Staurosirella	1
Gomphonema	6	Surirella	3
Halamphora	1	Tabellaria	1
Hannaea	1	Ulnaria	1

List of the diatom genera with the number of species. Credit; <u>Bülent Şahin</u> https://www.researchgate.net/

They can occasionally be found in severely decomposed carcasses because their silica-based skeletons do not easily disintegrate. The body does not normally contain diatoms. If It may be SamagraCS Publication House 3



ISSN: 2584-1491 | www.iircj.org Volume-3 | Issue-5 | May-2025 | Page 01-13

strong evidence that drowning was the cause of death if laboratory testing reveal diatoms in the body that are the same species identified in the water where the body was retrieved Verma, J Forensic Res (2013)^[6]



Diatom Test A Golden Standard Test In Drowning Cases Credit; Author(s): Int J Clin Med Imaging 2014, https://www.imagejournals.org/

Background

Diatomology is a field of study that examines and analyzes diatoms for a variety of practical uses, such as forensic sciences, water resource management, environmental monitoring, palaeoclimatology, and bioindication. Assessing and interpreting diatoms found in various forms of evidence, such as lung tissues, internal organs, and bone marrow, is the primary focus of forensic diatomology, especially in cases involving drowning or bodies retrieved from aquatic environments **Parshant Dahiya at. al (2024)**^[7]

In the context of forensic science, diatoms hold significant value, particularly in investigations related to drowning. The presence of diatoms in the bone marrow of a deceased individual can be a crucial indicator of drowning, as these organisms can enter the bloodstream and reach the bone marrow when a person inhales water containing diatoms **R**. Sirmour et **al.**(2015)^[8]. This makes diatoms an important tool in forensic investigations, providing trace evidence that can link suspects to crime scenes or confirm drowning as a cause of death **Ankita Tandon et al.** (2023) ^[5]

The diversity of diatom species varies significantly across different regions, influenced by environmental factors and seasonal changes. This diversity is crucial for forensic applications, as it allows for the identification and classification of diatoms specific to a particular area, such as the Chhattisgarh region in India. Research in this area has led to the creation of a database of diatom species, which enhances the forensic potential of diatoms by providing a reference for identifying species found in forensic samples^[5] ^[8].

Main text: Diatoms: Morphology

Diatoms are unique microalgae characterized by their siliceous cell walls, known as frustules, which are composed of two interlocking parts. These frustules are highly intricate and



ISSN: 2584-1491 | www.iircj.org

Volume-3 | Issue-5 | May-2025 | Page 01-13

vary significantly in shape and pattern, making them valuable for species identification and ecological studies Ankita Tandon et. al(2023)^[5] Manish Sharma et. al(2022)^[9] Surender Kumar et. al(2023)^[10] Diatoms belong to the class Bacillariophyceae and are unicellular, photosynthetic organisms found in a wide range of aquatic environments, including both fresh and marine waters Esha Shukla et. al⁽¹¹⁾ A. Mall^[12]. The morphological identification of diatoms can be challenging and often requires the use of optical and electron microscopes to observe their detailed structures Zheng Li et. al^[13].

Diatoms: Ecology

Ecologically, diatoms are significant as they are primary producers in aquatic ecosystems, contributing to the global carbon cycle through photosynthesis. They are sensitive to environmental changes, such as variations in temperature, nutrient levels, and water chemistry, making them excellent bioindicators for monitoring ecological health^{[9][10]}. Diatoms are found in diverse habitats, from rivers and lakes to moist terrestrial environments, and their distribution is influenced by specific environmental conditions **Surender Kumar et. al**^[10] **Kajol Bhati et. al**^[14]. In forensic science, diatoms are used to determine the cause and location of drowning incidents, as their presence in the organs of a deceased individual can indicate drowning as the cause of death **A. Mall**^[12] **R. Sirmour et. al**^[8]

Role of Diatoms in Forensic Investigations:

1. Determination of Drowning: Diatoms are instrumental in distinguishing between drowning and post-mortem submersion. When a person drowns, diatoms from the water are inhaled and can enter the circulatory system, eventually reaching internal organs such as the lungs, kidneys, and brain. The presence of diatoms in these organs can indicate ante-mortem drowning, as opposed to a body being placed in water after death, where diatoms would not be present in the organs due to the lack of circulation Malik Mk et. al(2013)^[15] Megha Yadav(2023)^[16] E. Girela-López et. al(2016)^[17].

2. Linking Crime Scenes: Diatoms can also be used to link suspects or victims to specific aquatic environments. The unique assemblage of diatom species in a particular body of water can serve as a "fingerprint," helping to establish a connection between the crime scene and the individuals involved. This is particularly useful in cases where clothing or other items have been in contact with water, as diatoms can persist on these surfaces and provide circumstantial evidence K. Scott et al(2021)^[18] K. Scott et al.(2014)^[19] Iwona Bogusz et al(2022)^[20].

- 3. Advancements in Detection Methods: Traditional diatom testing methods have been complemented by molecular techniques and imaging methods, enhancing the accuracy and reliability of forensic analyses. DNA metabarcoding, for instance, has been used alongside morphological identification to improve the detection rates of diatoms in forensic samples, although challenges remain due to limitations in reference databases Mengyan Liu et al. (2020)^[21] S. Tambuzzi et al(2024)^[3].
- 4. Environmental Trace Evidence: Diatoms serve as robust environmental trace evidence due to their resilience and ability to persist on various substrates. Studies have shown that diatoms can remain on clothing and other materials even after washing, SamagraCS Publication House 5



ISSN: 2584-1491 | www.iircj.org

Volume-3 | Issue-5 | May-2025 | Page 01-13

making them valuable in forensic geoscience for tracing environmental interactions K. Scott et al.(2014)^[19] Ashwini Kumar et al(2016)^[22] Iwona Bogusz et al(2022)^[20]. Methods for sample collection and analysis:

To determine the Truthful cause for death and the crime site, it is required to perform suitable sampling and investigation with error-free.

1. Morphological and Chemical Analysis

i) Materials Required:- Beakers Forceps, Tarson tubes, Disposable pipettes or droppers, Measuring cylinder, Microscopic glass slides, Cover slips ,Gloves all were taken new and fresh to avoid any contamination.

ii) Chemical used: - As required.

2. Collection of water samples :- The first step for diatom testing is sample collec-

tion **Dahiya et al.(2024)**^[7]. Collect diatom samples from the different ponds. In the case of drowning Collect diatom samples from the different sites of drowning spots, victim's cloths and even from the footwears to identify the various diatom species present.

3. Extraction of Diatoms from Water Samples:- For extraction of diatoms following techniques are frequently used:

- a) Acid digestion by conc. HCl and KMnO4
- b) Acid digestion by conc. HNO3/H2SO4
- c) H2O2 method
- d) Incineration method

4. Nitric acid method:

Using this procedure, a 10:1 ratio of concentrated HNO3 is applied to the obtained water sample.

- 2. 0.5 ml of concentrated HNO3 is added to 5 ml of water sample from the sample container in a small beaker after it has been well shaken for one to two minutes. Only the siliceous skeleton of diatoms remains when the concentrated acid breaks down the organic materials in the water.
- 3. After that, the beaker is wrapped in aluminum foil and left overnight to facilitate digestion.
- 4. The following day, the beaker's contents are moved into a centrifuge tube, and centrifugation is run for roughly ten minutes at 5,000 rpm.
- 5. The pellet is obtained by discarding the supernatant. To eliminate any last traces of acid, these steps are carried out two or three times while adding distilled water to the pellet.

Innovation

ISSN: 2584-1491 | www.iircj.org

Volume-3 | Issue-5 | May-2025 | Page 01-13

- 6. Analyze the diatoms morphologically under a microscope, the above process is repeated for additional water samples that were collected.
- **5. Preparation of Microscopic slide:-** After final centrifugation, the pellet is diluted with 1 ml distilled water. The above solution is poured over 2 microscopic slides, covered with cover slip, and left it to air dry. The microscopic slides prepared above are then observed under Compound microscope at 10X and 40X magnifications. The diatoms were identified based on their morphological characteristics.
- **6.** Identification of Diatoms:- photographs, structure have to matched with the standard database Diatoms of North America
- 7. Forensic Applications: Explore the potential forensic applications of diatom analysis in criminal investigations involving different ponds at Durg Rural area.

Table 1 Characteristic properties to distinguish between ante-mortem (true) drowning and post-
mortem (false) drowning (M. Thakar et al.2010, D. Rana et al. 2016, A. Rana et al. 2018, Honey
Singh 2022, A. Vinayak et al.2013, Ashwathi Vijayan et al. 2022, Amandeep Kaur et al. 2018,
Megha Yadav 2023, M. S. Sankhla et al. 2016, N. Kaushik et al.2016)

Characteristic	Ante-Mortem Drowning (True	Post-Mortem Drowning (False	
Property	Drowning)	Drowning)	
Presence of Diatoms in Organs	Diatoms are found in distant organs such as the brain, kidneys, lungs, and bone marrow due to circulation while the person was alive.	Diatoms are not found in distant organs because there is no circulation to transport them.	
Circulation	Active circulation allows diatoms to be transported throughout the body.	Absence of circulation prevents diatoms from entering and being transported within the body.	
Diatom Test	Positive diatom test indicating diatoms in vital organs supports ante-mortem drowning.	Negative diatom test or absence of diatoms in vital organs suggests post-mortem drowning.	
Diatom Species Correlation	Diatom species in the body match those in the water body where drowning occurred, indicating the site of drowning.	Lack of correlation between diatom species in the body and the water body suggests the body was placed in water post-mortem.	



ISSN: 2584-1491 | www.iircj.org

Volume-3 | Issue-5 | May-2025 | Page 01-13

In summary, the presence and distribution of diatoms in the body, particularly in distant organs, are key indicators distinguishing ante-mortem from post-mortem drowning. Ante-mortem drowning is characterized by active circulation that allows diatoms to reach various organs, while post-mortem drowning lacks this circulation, preventing diatom transport. The correlation of diatom species between the body and the water source further aids in determining the drowning site.

Challenges and limitations:

Environmental Variability

One of the primary challenges in the forensic analysis of diatoms is the variability in diatom species due to environmental factors. Diatom diversity is influenced by local ecological conditions, which can vary significantly even within a small geographic area like Durg in Chhattisgarh. This variability can complicate the establishment of a consistent diatom profile for forensic purposes, as the species present in one pond may differ from those in another due to differences in water chemistry, temperature, and other environmental factors **Ankita Tandon et al. (2023)**^[5], **Surender Kumar et al. (2023)**^[10].

Seasonal Changes

Seasonal variations also pose a significant limitation. The composition of diatom communities can change with the seasons, affecting their abundance and diversity. This seasonal fluctuation can lead to inconsistencies in diatom profiles over time, making it challenging to use them as reliable forensic markers unless the timing of the sample collection is carefully controlled and documented **Ankita Tandon et al. (2023)** ^{[5],} **Surender Kumar et al. (2023)**^[10].

Site-Specificity

Diatoms exhibit site-specificity, meaning that certain species may only be found in particular locations. This specificity can be both a strength and a limitation. While it allows for precise location matching in forensic cases, it also requires comprehensive mapping and documentation of diatom species across different sites to be effective. Without such detailed mapping, the forensic utility of diatoms is limited **Surender Kumar et al. (2023)**^[10].

Database Limitations

The effectiveness of diatom analysis in forensic investigations heavily relies on the availability of a comprehensive and accurate database of diatom species. In regions like Chhattisgarh, where diatom diversity has not been extensively studied, the lack of a robust database can hinder forensic applications. Efforts to create such databases are underway, but they require significant time and resources to develop and maintain Ankita Tandon et al. (2023) ^[5], R. Sirmour et al.(2015)^[8].

The forensic analysis of diatoms in the Durg rural area of Chhattisgarh faces several challenges, including environmental variability, seasonal changes, site-specificity, and the need for comprehensive databases. Addressing these limitations requires detailed ecological studies and



ISSN: 2584-1491 | www.iircj.org

Volume-3 | Issue-5 | May-2025 | Page 01-13

the development of extensive diatom databases to enhance the reliability and applicability of diatom analysis in forensic investigations.

RESEARCH GAPE

The forensic analysis of diatoms in the Durg rural area of Chhattisgarh presents several research gaps that can be explored:

- Regional Specificity: While there has been research on diatom diversity in various parts of Chhattisgarh, including major rivers, there is a lack of specific studies focusing on the ponds in the Durg rural area. This presents an opportunity to explore the unique diatom species present in these smaller water bodies and how they might differ from those in larger river Ankita Tandon et al. (2023)^[5], R. Sirmour et al.(2015)^[8].
- 2. Environmental and Seasonal Influences: The existing studies highlight the influence of environmental factors and seasonal variations on diatom diversity. However, there is a gap in understanding how these factors specifically affect diatom populations in the ponds of Durg, which may have different ecological conditions compared to larger water bodies **Ankita Tandon et al. (2023)**^[5].
- Forensic Application Enhancement: Although there is a database of diatoms for Chhattisgarh, the specific application of this data for forensic purposes in the Durg area remains underexplored. Developing a localized database for Durg could enhance the forensic potential of diatoms in this region, particularly for drowning cases R. Sirmour et al.(2015)^[8].
- Comparative Analysis: There is a need for comparative studies between diatom populations in ponds and other water bodies within Chhattisgarh to better understand the ecological and forensic implications of diatom diversity across different environments Ankita Tandon et al. (2023)^[5], R. Sirmour et al.(2015)^[8].

Focusing on the diatom diversity in the ponds of Durg rural area could fill existing research gaps by providing insights into regional specificity, environmental influences, and enhancing forensic applications.

FUTURE ASPECT

Future Prospects for Forensic Analysis of Diatoms in Durg Rural Area, Chhattisgarh

The forensic analysis of diatoms in the Durg rural area of Chhattisgarh holds significant potential for advancing both forensic science and ecological studies. Here are some future prospects based on current research:

 Enhanced Forensic Databases: The creation of a comprehensive database of diatom species specific to the Durg area can significantly enhance forensic investigations. Such a database would allow for more precise identification of diatom species found in forensic samples, thereby improving the accuracy of linking suspects to crime scenes, particularly in drowning cases Ankita Tandon et al. (2023)^[5], R. Sirmour et al.(2015)^[8].



ISSN: 2584-1491 | www.iircj.org Volume-3 | Issue-5 | May-2025 | Page 01-13

- Improved Crime Scene Investigation: By understanding the specific diatom communities present in different ponds and water bodies in Durg, forensic scientists can better determine the location of drowning incidents. This specificity can aid in distinguishing between different water bodies, which is crucial in forensic investigations Ankita Tandon et al. (2023)^[5], R. Sirmour et al.(2015)^[8].
- 3. Environmental Monitoring and Biomonitoring: Diatoms are sensitive to environmental changes, making them excellent bioindicators. Future research could focus on using diatom communities to monitor environmental health and changes in the Durg area. This could provide valuable data for both ecological studies and forensic applications, as changes in diatom populations could indicate environmental disturbances that might correlate with forensic cases Manish Sharma et al.(2022)^[9].
- 4. Interdisciplinary Research Opportunities: The study of diatoms in forensic contexts opens up opportunities for interdisciplinary research, combining ecology, biology, and forensic science. This can lead to the development of new methodologies and technologies for diatom analysis, further enhancing their application in forensic investigations Manish Sharma et al.(2022) ^[9]. R. Sirmour et al.(2015) ^[8].
- Technological Advancements: Future research could explore the use of advanced technologies such as DNA barcoding and machine learning algorithms to improve the identification and classification of diatom species. These technologies could streamline the process of diatom analysis, making it faster and more reliable R. Sirmour et al.(2015) [8].

The forensic analysis of diatoms in the Durg rural area of Chhattisgarh presents numerous opportunities for advancing forensic science and environmental monitoring. By developing comprehensive databases, improving crime scene investigations, and leveraging technological advancements, researchers can enhance the utility of diatoms in forensic contexts.

LITERATURE REVIEW

Diatoms, a group of microalgae with siliceous cell walls, are prevalent in various aquatic environments and have significant forensic applications, particularly in drowning cases. Their presence and diversity in water bodies can serve as crucial trace evidence in forensic investigations by linking individuals to specific locations.

Diatom Diversity and Forensic Applications

Research has highlighted the importance of diatoms in forensic science, especially in establishing drowning as a cause of death through the detection of diatoms in bone marrow **Ankita Tandon et al. (2023)**^[5], **R. Sirmour et al.(2015)**^[8]. The diversity of diatom species varies significantly across different regions, influenced by environmental factors and seasonal changes. This variability makes diatoms valuable in forensic investigations, as they can provide location-specific evidence **Ankita Tandon et al. (2023**)^[5].

Diatom Studies in Chhattisgarh



ISSN: 2584-1491 | www.iircj.org

Volume-3 | Issue-5 | May-2025 | Page 01-13

In Chhattisgarh, studies have focused on identifying and cataloging diatom species to enhance their forensic utility. One study conducted a taxonomic analysis of diatoms from various rivers in the region, identifying 34 different species. This research aimed to fill the gap in understanding diatom diversity in Chhattisgarh and to contribute to a database that could be used in forensic investigations **Ankita Tandon et al.** (2023)^[5]. Another comprehensive study provided a detailed procedure for identifying and classifying diatoms in Chhattisgarh's water bodies, creating a parametric database that serves as a valuable resource for forensic cases, particularly those involving drowning **R. Sirmour et al.**(2015)^[8].

Implications for Forensic Investigations

The creation of a diatom database specific to Chhattisgarh is a significant advancement for forensic science in the region. It provides a scientific basis for diatom analysis and enhances the ability to use diatoms as trace evidence in criminal investigations. This database not only aids forensic scientists but also opens new avenues for research and application in aquatic ecology **R**. Sirmour et al.(2015)^[8].

The studies conducted in Chhattisgarh underscore the forensic potential of diatoms, particularly in drowning cases. The development of a regional diatom database enhances the ability to use these microalgae as trace evidence, providing a robust tool for forensic investigations in the area.

DISCUSSION

- 1. The forensic analysis of diatoms in different ponds in the Durg rural area of Chhattisgarh offers significant insights into both ecological and forensic applications. Diatoms, as unique microalgae with siliceous cell walls, are prevalent in water bodies and serve as crucial indicators in forensic investigations, particularly in drowning cases. Their presence in a victim's bone marrow can scientifically establish drowning as the cause of death, making them invaluable in forensic science **Ankita Tandon et al.** (2023)^[5], **R. Sirmour et al.**(2015)^[8].
- The diversity of diatom species is influenced by environmental factors and varies across different regions. This variability is crucial for forensic applications, as it allows for the establishment of a diatom database specific to a region, which can be used to link suspects to crime scenes or determine the location of drowning incidents. In Chhattisgarh, extensive research has been conducted to identify and classify diatom species, resulting in a comprehensive database that enhances the forensic potential of diatoms Ankita Tandon et al. (2023)^[5], R. Sirmour et al.(2015)^[8].
- 3. The studies conducted in Chhattisgarh have identified a significant number of diatom species, contributing to a better understanding of their diversity in the region. This database not only aids forensic investigations but also provides a platform for further research in aquatic ecology. The parametric characterization of diatoms in this database is particularly useful for forensic cases, as it allows for precise identification and classification of diatoms found in various water bodies Ankita Tandon et al. (2023)^[5], R. Sirmour et al.(2015)^[8].

ISSN: 2584-1491 | www.iircj.org

Volume-3 | Issue-5 | May-2025 | Page 01-13

The forensic analysis of diatoms in the Durg rural area of Chhattisgarh underscores the importance of regional diatom databases in forensic science. These databases facilitate the identification and classification of diatoms, thereby enhancing their application in forensic investigations, particularly in drowning cases. The research conducted in Chhattisgarh serves as a valuable resource for both forensic scientists and aquatic ecologists, providing a foundation for future studies and applications.

CONCLUSION

Innovation

- The forensic analysis of diatoms in different ponds in the Durg rural area of Chhattisgarh highlights the significant role these microorganisms play in forensic investigations, particularly in drowning cases. Diatoms, being unique microalgae with siliceous cell walls, are prevalent in water bodies and can serve as crucial trace evidence in forensic science. Their diversity and presence can link suspects to crime scenes, making them invaluable in forensic investigations Ankita Tandon et al. (2023)^[5], R. Sirmour et al.(2015)^[8].
- Research conducted in Chhattisgarh has focused on identifying and classifying diatom species, contributing to a comprehensive database that enhances the forensic potential of diatoms. This database is particularly useful in establishing drowning as a cause of death by detecting diatoms in the bone marrow of deceased individuals Ankita Tandon et al. (2023)^[5], R. Sirmour et al.(2015) ^[8]. The diversity of diatom species varies across different regions, influenced by environmental factors and seasonal changes, which underscores the importance of region-specific studies Ankita Tandon et al. (2023)^[5]

In conclusion, the study of diatoms in the Durg rural area of Chhattisgarh not only enriches the existing database but also provides a valuable tool for forensic applications. This research supports the use of diatom analysis in forensic investigations, offering a scientific basis for linking individuals to specific water bodies and aiding in the determination of drowning as a cause of death.

REFERENCES

- 1. Priyanka Kumari et al. (2023) Diatom Examination From Ganga River at Vindhyachal -A Forensic Approach ^[1]
- 2. Vinayak Gupta et al. (2018) *Examination Of Fresh Water Diatoms Of Southern Range Of Himachal Pradesh- A Forensic Approach*^[2]
- 3. Stefano Tambuzzi et. al (2024) Forensic Diatom Analysis: Where Do We Stand and What Are the Latest Diagnostic Advances? ^[3]
- 4. ZLATKO LEVKOV et al. (2017) *The use of diatoms in forensic science: advantages and limitations of the diatom test in cases of drowning*^[4]
- 5. Ankita Tandon et al. (2023) *Identification of diatoms from different rivers in Chhattisgarh* [5]
- 6. Verma, J Forensic Res (2013) Role of Diatoms in the World of Forensic Science [6]
- 7. Parshant Dahiya at. al (2024) A comprehensive review of forensic diatomology: contemporary developments and future trajectories [7]
- 8. R. Sirmour et al. (2015) Investigation of Diatom Diversity of Central India Chhattisgarh^[8]



ISSN: 2584-1491 | www.iircj.org

Volume-3 | Issue-5 | May-2025 | Page 01-13

- 9. Manish Sharma et. al(2022)*A* detailed study of diatoms a Bacillariophyta community from Rewalsar and Prashar lakes of Himachal Pradesh, their bio-monitoring characteristics and forensic significance ^[9]
- 10. Surender Kumar et. al(2023)Diatomological mapping of water bodies of Delhi region for forensic consideration^[10]
- 11. Esha Shukla et. al(2023) Identification of Diatom Genera at Different Ghats of Saryu River at Ayodhya Uttar Pradesh for Forensic Consideration⁽¹¹⁾
- 12. Mall (2021) Study of Diatom Flora of Kaalesar Ghat of Rapti River at Gorakhpur for Forensic Consideration^[12]
- 13. Zheng Li et. al(2019) Barcoding for diatoms in the Yangtze River from the morphological observation and 18S rDNA polymorphic analysis.^[13].
- 14. Kajol Bhati et. al(2019) Diatoms databank of Delhi, India: Forensic identification of diatoms based on morphology^[14]
- 15. Malik Mk et. al(2013) Role Of Diatoms In Forensic Investigation: Case Studies From Haryana ^[15]
- 16. Megha Yadav(2023)ROLE OF DIATOMS IN DETERMINATION OF TIME SINCE DEATH IN FORENSIC SCIENCE^[16]
- 17. E. Girela-López et. al(2016)Diatoms in Forensic Analysis^[17].
- 18. K. Scott et al(2021)Freshwater diatom persistence on clothing II: Further analysis of species assemblage dynamics over investigative timescales.^[18]
- 19. K. Scott et al.(2014)*The transferability of diatoms to clothing and the methods appropriate for their collection and analysis in forensic geoscience.*^[19]
- 20. Iwona Bogusz et al(2022)Diatoms from inland aquatic and soil habitats as indestructible and nonremovable forensic environmental evidence^[20].
- 21. Mengyan Liu et al.(2020)Comparative study on diatom morphology and molecular identification in drowning cases.^[21]
- 22. Ashwini Kumar et al(2016)Role of study of diatoms in forensic investigations-A two year retrospective study^{[22}