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Taxonomic Study of Novel Diatom Taxa from Khandesh, Maharashtra: A Contribution to Indian Freshwater Biodiversity

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ABSTRACT: The present study documents novel diatom taxa from freshwater habitats in the Khandesh region of Maharashtra, India, contributing significantly to the understanding of regional and national microalgal biodiversity. Detailed taxonomic analysis led to the identification and description of one new species and four new varieties: *Cyclotella kanchanensis* sp. nova., *Meridion circulare* Agardh v. *elongatum* v. nova., *M. circulare* v. *khaperensis* v. nova., *M. circulare* v. *ujjwalensis* v. nova., and *M. circulare* v. *gomaiensis* v. nova. These taxa were isolated from diverse aquatic ecosystems including rivers, streams, and ponds in Jalgaon, Dhule, and Nandurbar districts. Morphological features were examined using light microscopy, with emphasis on valve symmetry, striae patterns, and cell size ranges. The newly described taxa exhibit distinct characteristics that warrant their classification as novel entities. This work enhances the taxonomic inventory of Indian freshwater diatoms and emphasizes the ecological and biogeographical importance of unexplored habitats in the Khandesh region.

KEYWORDS: Taxonomy, Diatoms, *Cyclotella kanchanensis* sp. nova., *Meridion circulare* Agardh v. *elongatum* v. noav., *M. circulare* v. *khaperensis* v. nova., *M. circulare* v. *ujjwalensis* v. nova., and *M. circulare* v. *gomaiensis* v. nova.

INTRODUCTION

Diatoms, a major group of microalgae belonging to the class Bacillariophyceae, are among the most diverse and ecologically significant organisms in freshwater and marine ecosystems. Their siliceous cell walls, or frustules, display intricate patterns and species-specific morphology, making diatoms valuable not only for ecological monitoring but also for taxonomic and evolutionary studies. In India, although considerable work has been done on diatom taxonomy, large geographical areas, especially in semi-arid and inland regions, remain poorly studied.

The Khandesh region of Maharashtra, comprising the districts of Jalgaon, Dhule, and Nandurbar, is an ecologically diverse area characterized by a range of freshwater habitats including rivers, ponds, and seasonal streams. Despite its ecological importance, the microalgal diversity of this region remains largely unexplored. The present study was undertaken to address this gap by conducting a detailed taxonomic survey of diatoms from this region.

During the course of this investigation, one new species of Cyclotella and four new varieties of Meridion circulare were identified and described: *Cyclotella kanchanensis* sp. nova, *Meridion circulare* v. *elongatum* v. nova., *M. circulare* v. *khaperensis* v. nova, *M. circulare* v. *ujjwalensis* v. nova., and *M. circulare* v. *gomaiensis* v. nova. The discovery of these taxa not only adds to the known biodiversity of Indian freshwater diatoms but also highlights the significance of regional studies in contributing to global taxonomic knowledge. This paper presents the morphological characterization, ecological context, and diagnostic features of these novel taxa, thereby enriching the understanding of diatom diversity in India and emphasizing the need for continued exploration of lesser-known habitats.

MATERIALS AND METHODS

Study Area and Sample Collection

This study was carried out in the North Maharashtra region, which includes the districts of Jalgaon, Dhule, and Nandurbar. The area has many types of freshwater bodies like rivers, ponds, streams, and small lakes. Diatom samples were collected from places such as the Gomai River, village ponds, and temporary water bodies formed after the monsoon.

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Samples were taken from stones, aquatic plants, and bottom mud. The water's temperature, pH (acidity), and electrical conductivity were also measured using portable instruments. All samples were preserved using a chemical called formalin and brought back to the laboratory for study.

Cleaning the Samples

To study the diatoms clearly, the collected samples were cleaned by removing dirt and organic matter. This was done by using nitric acid and hydrogen peroxide. The cleaned diatom shells (called frustules) were then washed with clean water and kept ready for slide preparation.

Microscope Observation

The cleaned samples were placed on glass slides using a special liquid called Naphrax, which helps to see the diatoms clearly. These slides were then studied under a high-powered microscope (1000x magnification). Important features such as the shape, size, and pattern of the diatom shells were noted carefully.

Identifying Diatoms

The diatoms were identified by comparing them with known species in scientific books and research papers. As a result, the researchers discovered one new species named *Cyclotella kanchanensis* and four new varieties of *Meridion circulare*, which were named elongatum, khaperensis, ujjwalensis, and gomaiensis. These were named based on their unique features and the places they were found.

Photos and Drawings

Photographs of the diatoms were taken through the microscope using a camera. Some drawings were also made to show their detailed features. Information like measurements, appearance, and where they were found was recorded for each new type.

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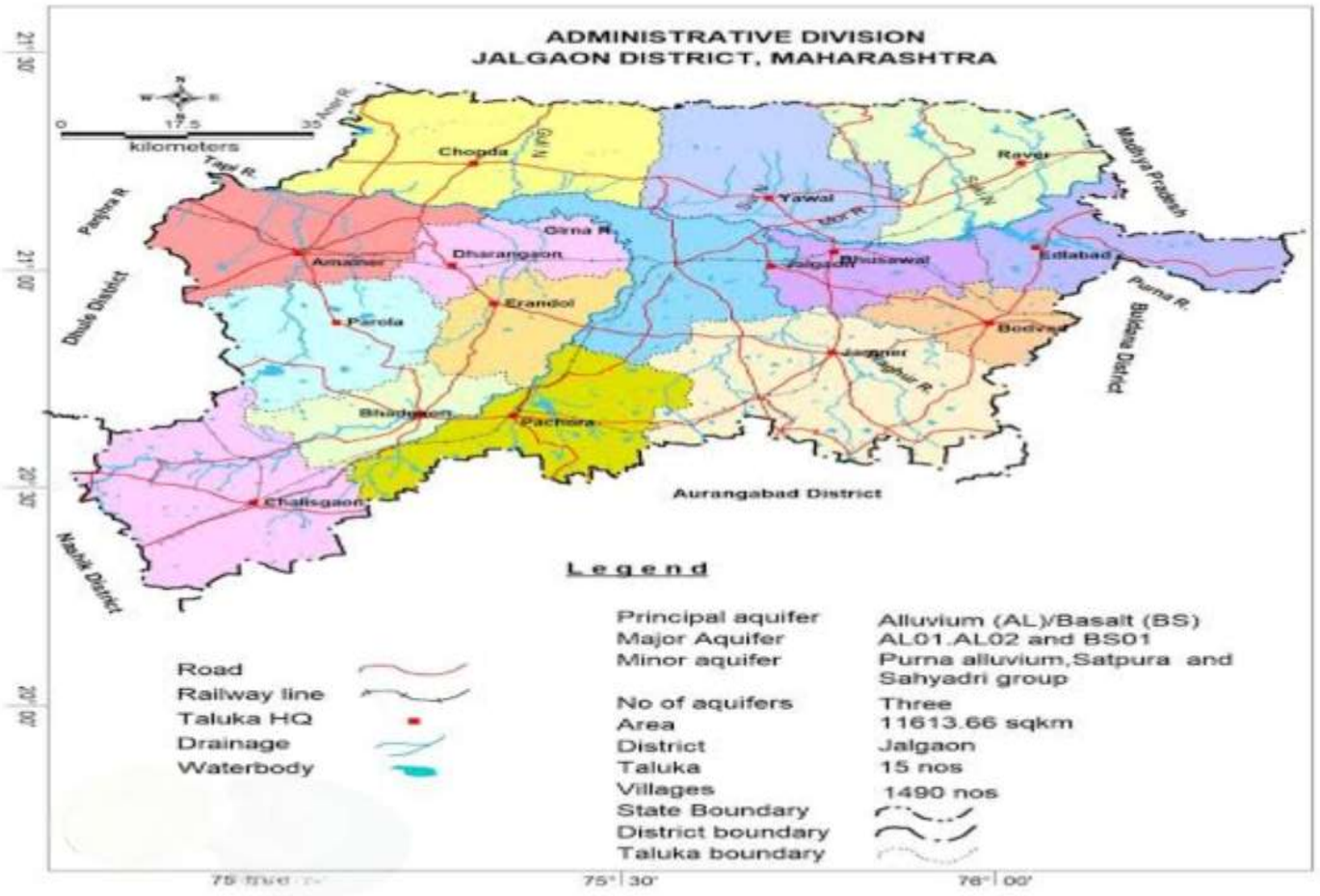

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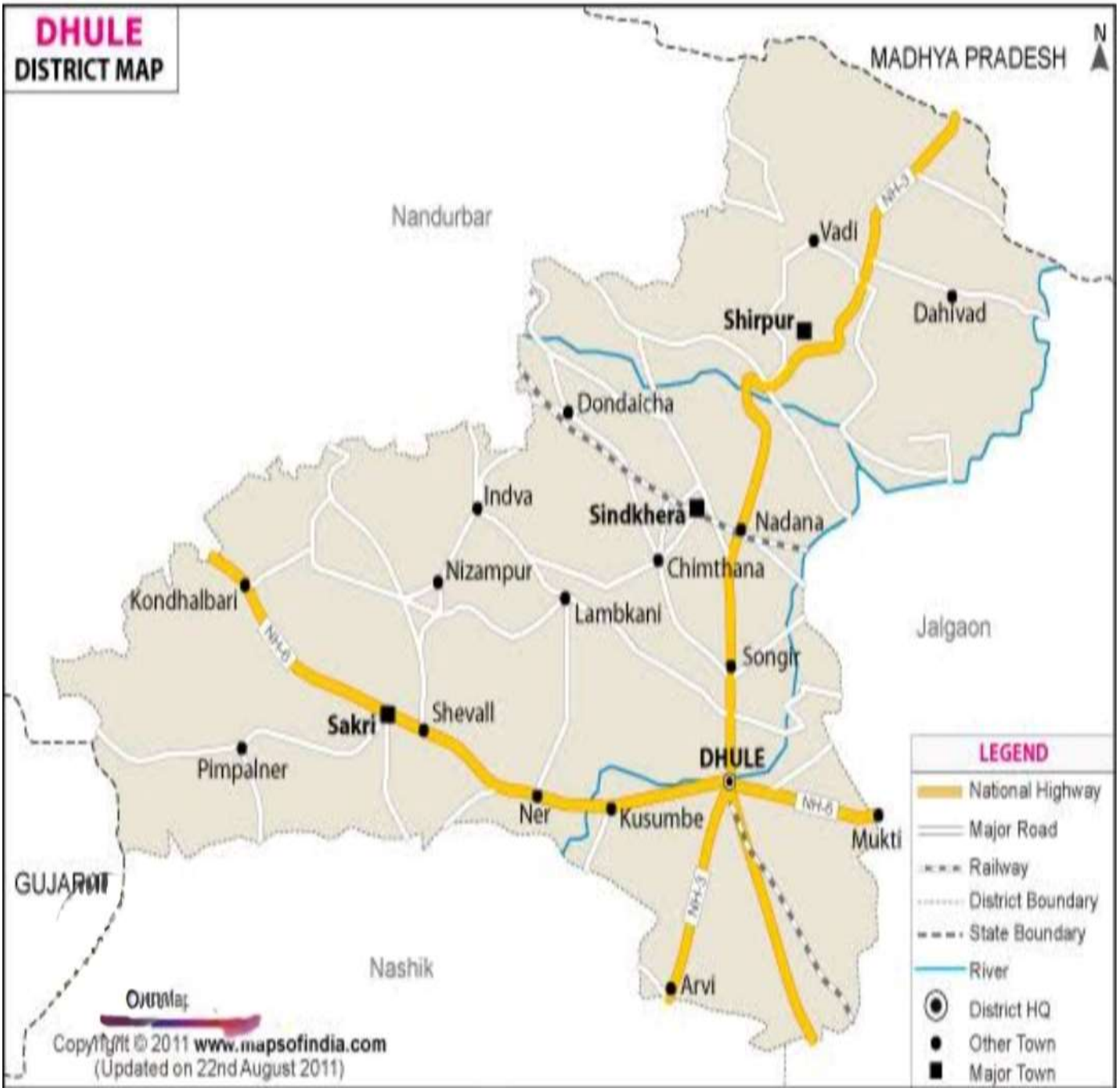

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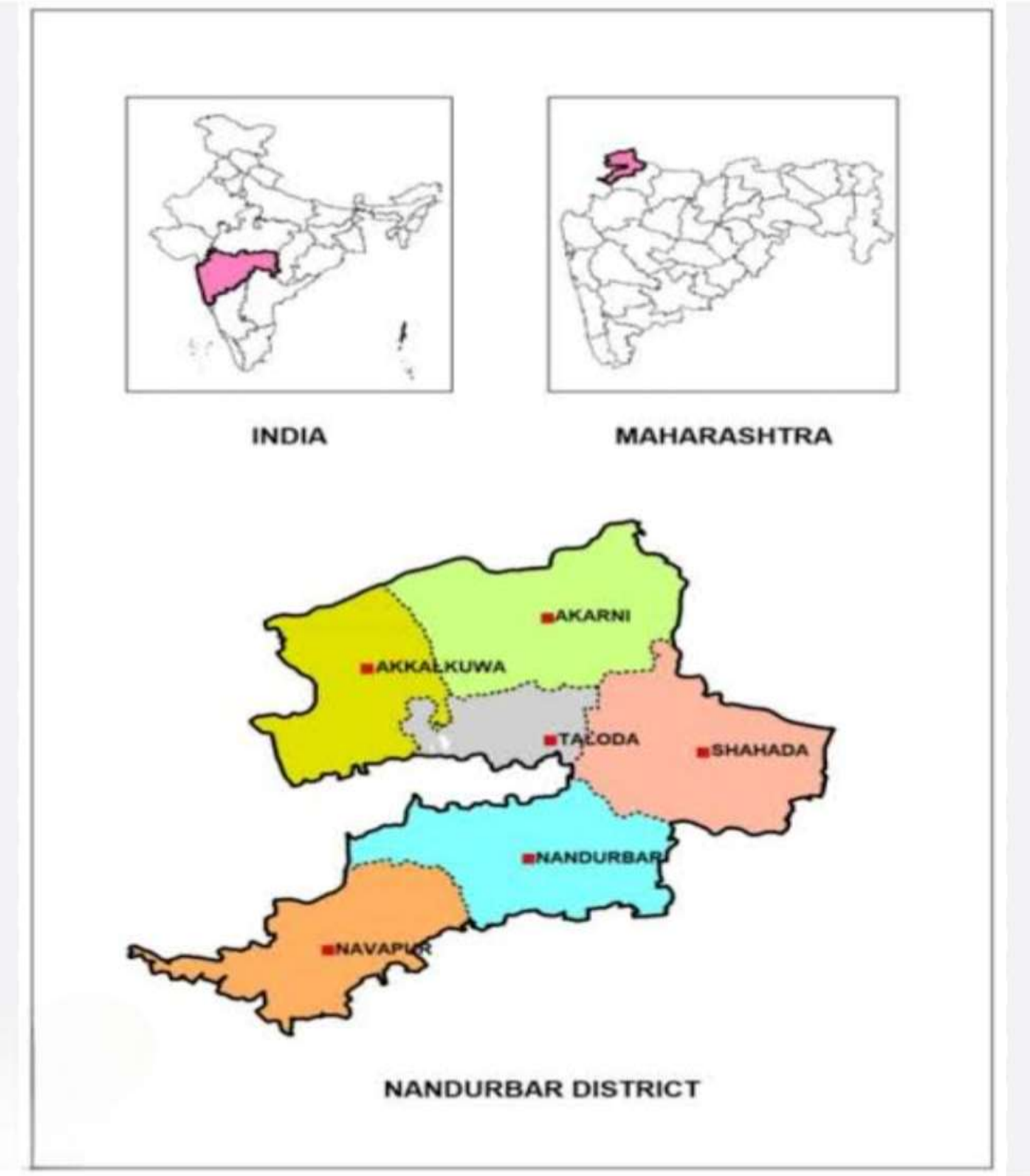

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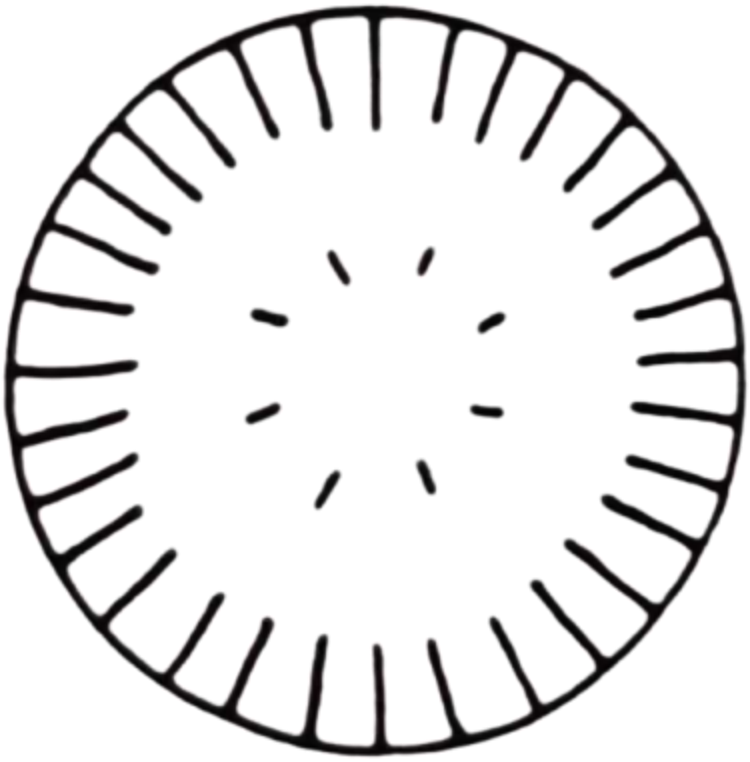
1. ***Cyclotella kanchanensis*** sp. Nova (Pl. 1, Fig. 1)

Valves 35.04 um in diameter, cell solitary, discoid, circular. Ornamentation is in outer zone, radially, evenly striated broader inner zone smooth, central field with pflexes; 6-9 striae in 10 µm. Diameter is more than any species of *Cyclotella chaetoceros* but striations differ, diamention like *C. comta* and *C. bodanica*.

Locality: Kanji River (Khapar)



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2. ***Meridion circulare*** **Agardh** (Pl. 1, Fig. 2)

Hustedt 1930, p. 130, f. 118

Valve 37.96- 40 µm long, 5- 7.3 µm broad, valves asymmetric, narrowly tapering towards below. In girdle view bilaterally symmetrical. Apex is broader than lower end. Transverse striae 3-5 in 10 µm, thicker striae in between radial striae. Marginal striae 20 in 10 µm. Frustules attached together to form chains, raphe absent.

Distribution of india: Ambazari Lake, Nagpur, Cauvery River, Tamil Nadu.

Locality: Patharad Dam (Bhadgaon), Hartala Lake (Muktainagar), Karwand Dam (Shirpur), Hatnoor Dam (Bhusaval).

3**.** ***Meridion circulare*** **Agardh v. elongatum v. nova** (Pl. 1, Fig.3)

Hustedt 1930, p.130, f 118

Frustules attached together to form chains, linear upper end and gradually tapering lower ends, valves 268.64 µm long, 7.3 µm broad; raphe absent; striae marginal, 20 in 10 µm.

Locality: Suki River (Raver).

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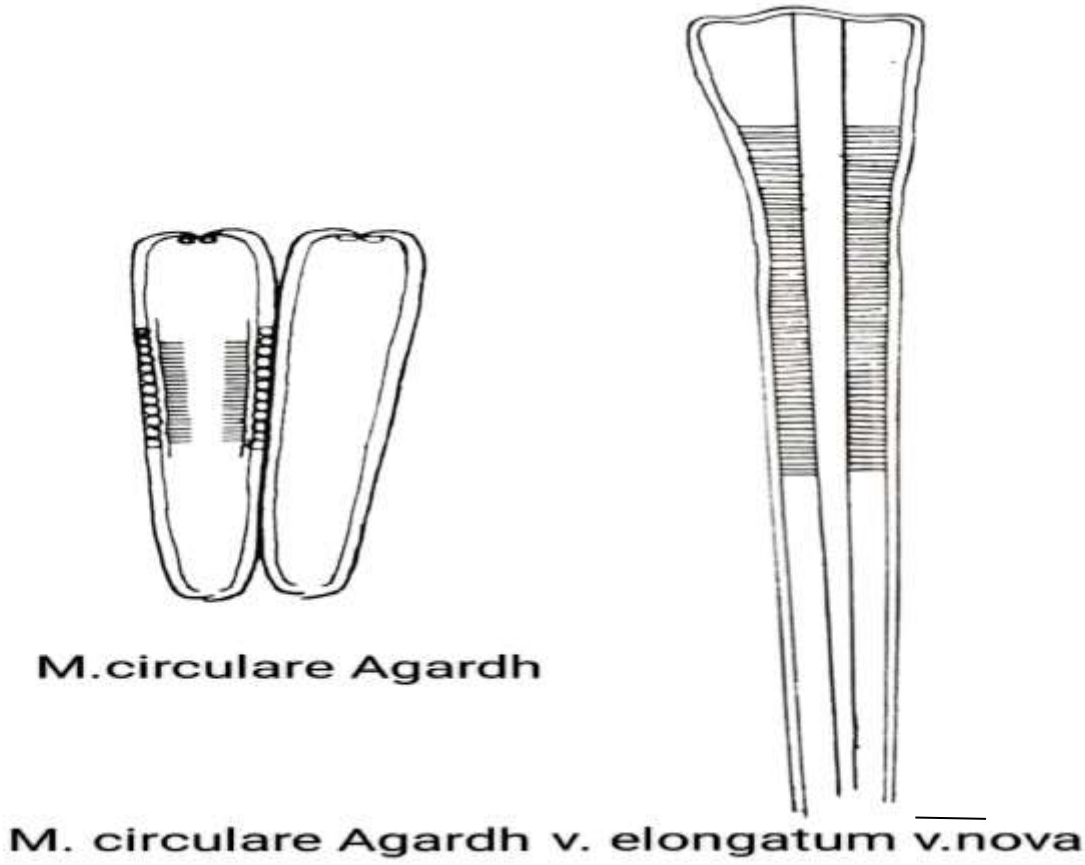

4. *Meridion circulare* Agardh v. khaparensis v. nova (Pl. 1 , Fig. 4

Hustedt 1930, p.130, f. 118

Valves 45.26- 49.64 µm long, 10.22- 13.14 µm broad, attached together to form chains, linear, upper end and gradually tapering lower ends, raphe absent. Striae thick, distinct marginal, 10-12 in 10 µm, shows rounded beaded structure of double wall. Apical end broader and lower end is gradually tapering.

Locality: Dehali River (Khapar), Panzara River (Pimpalner).

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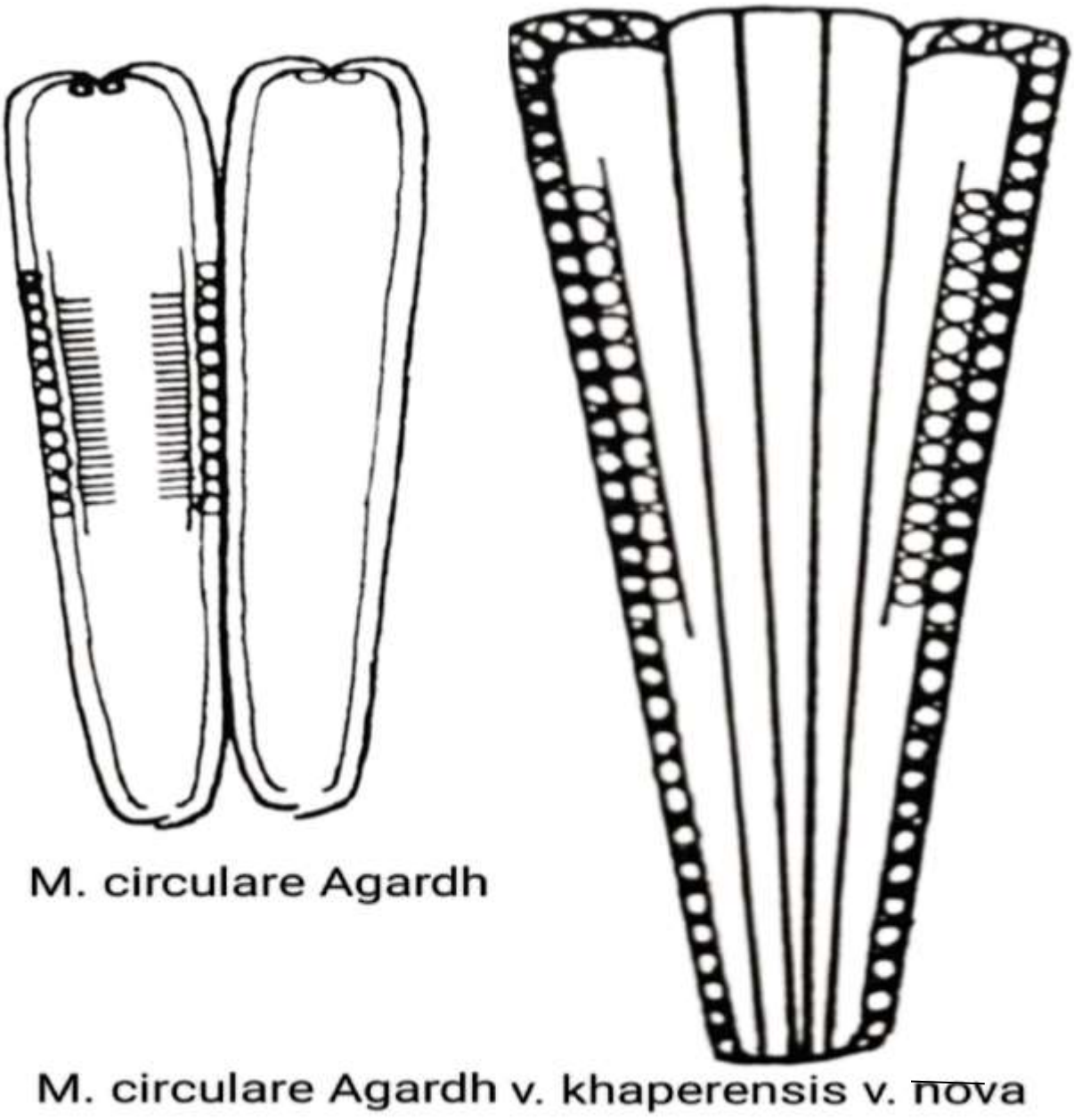

5. ***Meridion circulare*** **Agardh v. ujjwalensis v. nova** (Pl. 1 .Fig. 5)

Hustedt 1930, p.130, f. 118

Valves 84.6 µm long, 14.6 um broad, frustules attached together to form chains linear, broader upper end and narrower lower end marginal, striae 7-9 in 10 µm, in between marginal striae thick broader 5-7 distinct transverse striae into whole frustules, raphe absent. Fan shaped valve and dimensions are more than specimen.

Locality: Kanji River (Khapar).

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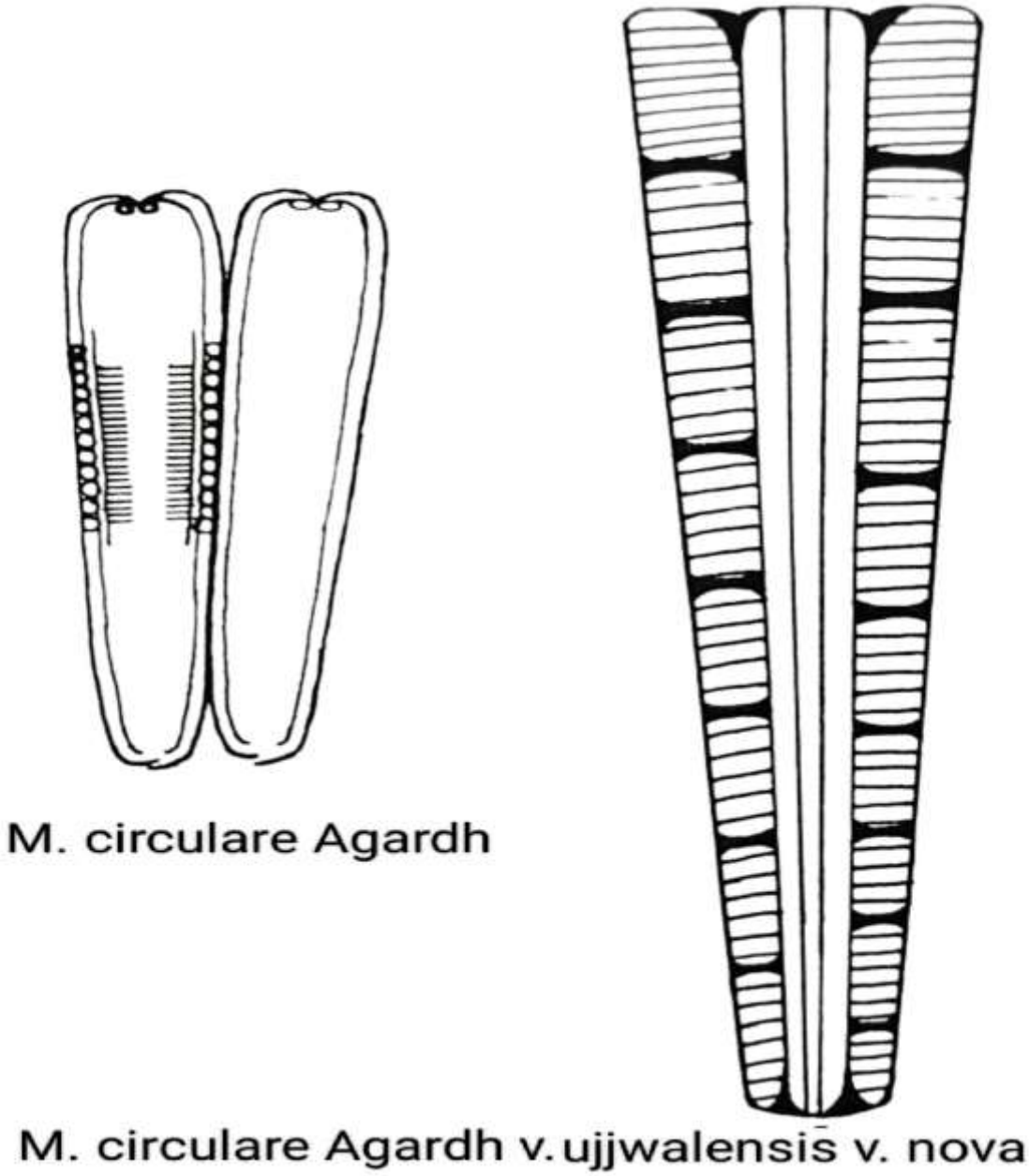

6. ***Meridion circulare*** **Agardh. v. gomaiensis v. nova** (Pl. 1, Fig. 6)
Hustedt 1930, p.130, f. 118
Valves 51.1- 52.26 um long, 11.68 um broad, frustules attached together to form chains upper end broader and lower end gradually tapering, outer margin wavy; marginal striae 14-16 in 10 um, thin and small; raphe absent. Transverse striae are absent.
Locality: Gomai Dam (Shahada), Panzara River (Pimpalner).

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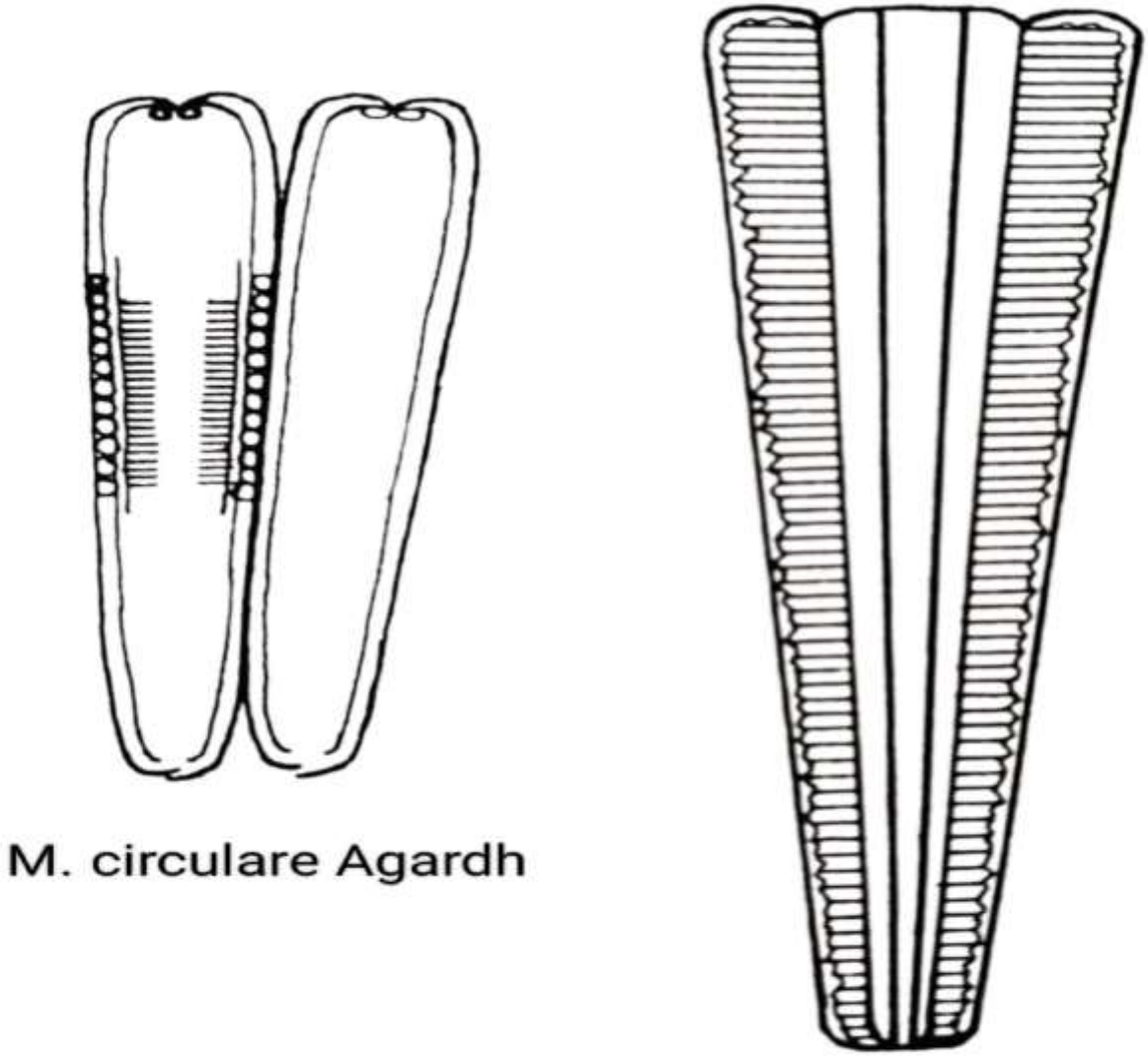

RESULTS

In this study, scientists found five new types of diatoms from freshwater places in North Maharashtra (Jalgaon, Dhule, and Nandurbar). These include one completely new species and four new varieties of an already known diatom species.

1. *Cyclotella kanchanensis* (new species)

This diatom was found in a pond near Jalgaon. It is round in shape and has a special pattern of fine lines. It looks different from other Cyclotella types and is smaller in size. Because it is completely new, it is named as a new species.

2. *Meridion circulare* var. elongatum (new variety)

This was found in a stream in Dhule. It has a long, narrow shape and forms chains of connected cells. It looks like Meridion circulare but is longer, so it is considered a new variety.

3. *Meridion circulare* var. khaperensis (new variety)

Found near Khaper village in Nandurbar, this variety has a slightly curved shape and is bigger than the usual type. It is named after the village where it was found.

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4. *Meridion circulare* var. ujjwalensis (new variety)

This was discovered in a stream called Ujjwal in Jalgaon. It has a broader body and fewer lines on its surface. The cells are joined in chains and look different from other varieties.

5. *Meridion circulare* var. gomaiensis (new variety)

This type was found in the Gomai River. It is small and smooth in shape with a unique pattern on its shell. It is different enough to be called a new variety.

These diatoms were seen under a microscope and studied carefully. Their pictures and drawings were made, and all their features were recorded. Each one had special differences that make them new and important additions to the list of Indian freshwater diatoms

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