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A Preliminary Account of the Diatom Flora of Koria, Chhattisgarh

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Abstract
Water bodies contain a large number of microorganisms, like bacteria, algae, protozoa etc. Algae are the one of the very important group of the organisms. Diatoms are the well known water planktons belonging to family Bacillariophyceae (Hendy, 1980). Diatom flora of koria was observed by using acid digestion method. The present account is based on the collection of about 5 water samples from different place of koria. 18 species from 11 genera were identified from these collection sites; the genera include *Achnanthes, Amphora, Cymbella, Eunotia, Fragilaria, Gomphonema, Hantizschia, Navicula, Nitzschia, Stauroneis and Synedra*.

***Key words*:** Algae, Diatom, Koria, Forensic significance.

Introduction
Freshwater is rich and dynamic medium for all microorganisms; Diatoms are one of the dominant groups present in water. Most of the water bodies like ponds, lakes, canals and river sustain diatoms. The beautiful structures of diatoms are complex, because of the presence of a silicious cell wall which resists acid digestion and heat. Diatoms have a constant shape and size, used as taxonomic characteristic. Every water body has its own diatom diversity; so far, there are no records of the diatoms flora from Koria District of Chhattisgarh State.

Koria is one of the North-West District of Chhattisgarh State. The District is bounded on the north by Shidhi District of Madhya Pradesh on the south Bilaspur Districts on the east by its parent District Surguja and on the west by Shahdol District of Madhya Pradesh. But so, far there are no records of the diatoms from Koria in Chhattisgarh State. Hence it was thought worthwhile to study the diatoms of this region. Koria District is located on the latitude Between 23°04’42” to 23°44'46” north and longitude Between 81°46’42” To 82°33’43” east of the Chhattisgarh State. It is 700 meters above the mean sea level. The average rainfall is about 1410.9 mm. The minimum and maximum temperatures are 17^0C and 32^0C, respectively.

Materials and methods
The water samples each were 100ml collected from various ditches, pools, ponds and river. The collected water samples were preserved in 4% formalin. 85ml of each water sample was decanted off; retaining 15ml of sample including the sediment were centrifuged for 5 min. at 5000 rpm. Settled

part of the sample were mixed with concentrated acids in the ratio of (HNO_3+ HCl; 3:1) and digested over hot plate for 3-4 hour's and allow to cool. After digestion the dried diatoms were diluted with distilled water. Observation make trinocular microscope (Leica) and diagram were drawn with the help of micrometer scale.

Diatoms were identified with the help of available literature including Heurck (1869), Gandhi (1959), Sarode and Kamat (1980), Suxena (1998), and Sirmour (2009).

Observations and results

In the present communication, only 18 fresh water diatoms species belong with 11 different genera have been described (Pl. 1, Tab. 1).

***Achnanthes* sp.** Bory. (Fig. 1)
Valve 8 µm long, 2-4 µm broad. Cells are heterovalvar and are flexed in girdle view.

Amphora acutiuscula Kütz. (Fig. 2)
Length 28-35 µm, breadth 5-6µm and striae 14-16 in 10 µm, and on the ventral side very fine and marginal.

Amphora coffeoeformis Agardh var. ***africana*** Fritsch and Rich. (Fig. 3)
Valves 21-25 µm long, 4-7 µm broad, striae 20-23 in 10 µm.

***Cymbella* sp.** Kütz. (Fig. 4)
Valve 26µm long, 7µm broad, asymmetrical, raphe arcuate, striae 12-14 in10µm

Eunotia major (W.Smith) var. ***indica*** (Grun.) A. Bg. (Fig. 5)
Valves 32-39 µm long, 7-10 µm broad, sublinear, arcuate with ventral side concave and dorsal side convex. striae 15-17 in 10µm at the ends.

Fragilaria capucina Desm. (Fig. 6)
Valves 28-35 µm long, 2.9-3.5 µm broad, slender, sublinear, narrow towards the ends, ends slightly constricted, pseudoraphe distinct, liner-lanceolate, striae 16-18 in 10µm.

Fragilaria capucina var ***mesolepta*** ***(***Rabenhorst) (Fig. 7)
Valve linear to linear lanceolate, constricted at the central area. Valves 10-100 µm long, 2-6.5 µm broad, striae 15-18 in 10µm.

Gomphonema angur Ehr. (1840) (Fig. 8)
Valves obviously asymmetrical to transapical axis (heteropolar), symmetrical to apical axis. The head pole usually much wider that tail. Cells wedge-shaped in girdle view with pseudosepta visible. Apices rostrate to capitate. Raphe often slightly sinuous. Vales 13-130 µm long, 4-20 µm broad, straie 7- 18 in10µm.

Gomphonema constrictum var. ***indica*** var. nov (Fig. 9)
Valves 30-45µm long, 10-12µm broad clavate, apex constricted broadly produced and rounded. striae about12-15 in 10µm. radical and clearly punctuate.

Hantizschia amphioxys (Ehr.) Grun. (Fig. 10)
Cells solitary Frustules isopolar but dorsiventral. Cells lie in valve or girdle view, those in girdle view being rectangular because the valve faces are flat and parallel.

Valves bilaterally asymmetrical (dorsiventral), with a slightly concave ventral margin and a convex dorsal margin. Poles rostrate or capitate, rarely (small cells only) simply rounded. Transverse striae visible regularly spaced, sometimes visibly uniseriate. Keel very excentric, keel punctuate coarse. Valves 20-210 µm long, 4 -15 µm broad, striae 11-28 in 10µm.

Navicula cuspidate Kütz. f**. *brevirostrate*** f. ***nov.*** (Fig. 11)
Valves 18-27 µm long, 5-7 µm broad, lanceolated with rounded ends. Raphe thin and straight. Axial area very narrow.

Navicula dicephala (Ehr.) Smith var. ***elginensis*** (Greg.) Cl. (Fig. 12)
Valves 20-45 µm long, 7-11 µm broad, transverse striations slightly radical, striae 10-12 in 10µm.

Navicula lanceolata (Agardh) Kütz. var. ***tenella*** A.S. (Fig. 13)
Valves 2-28µm long, 4-6 µm broad, and striae 14-16 in 10 µm

***Navicula* sp.** Bory. (Fig. 14)
Valves 8µm long, 2µm broad.

Nitzschia sigma W. Sm. var. ***rigidula*** (Fig. 15)
Valves gently sigmoid, ends attenuate narrow, length 35-60 µm long, 4-5 µm broad, carinal dots 4-14 in 10 µm.

Stauroneis phaenicenteron Ehr. f. ***capitata*** forma ***nova*** (Fig. 16)
Valves narrowly lanceolate and delicate, with large, rounded, capitate end. Raphe thick, with bifurcated terminal fissure. valves 70-113µm long, 14-21 µm broad, axial area fairly wide, central area stauroid, slightly dilated towards the sides, striae fine but distinctly punctuate and strongly radial, striae 18- 21 in 10 µm.

Synedra acus Kütz. (Fig. 17)
Valves 85- 102 µm long, 4-5 µm broad in the middle, striae fine, 12-15 in 10µm.

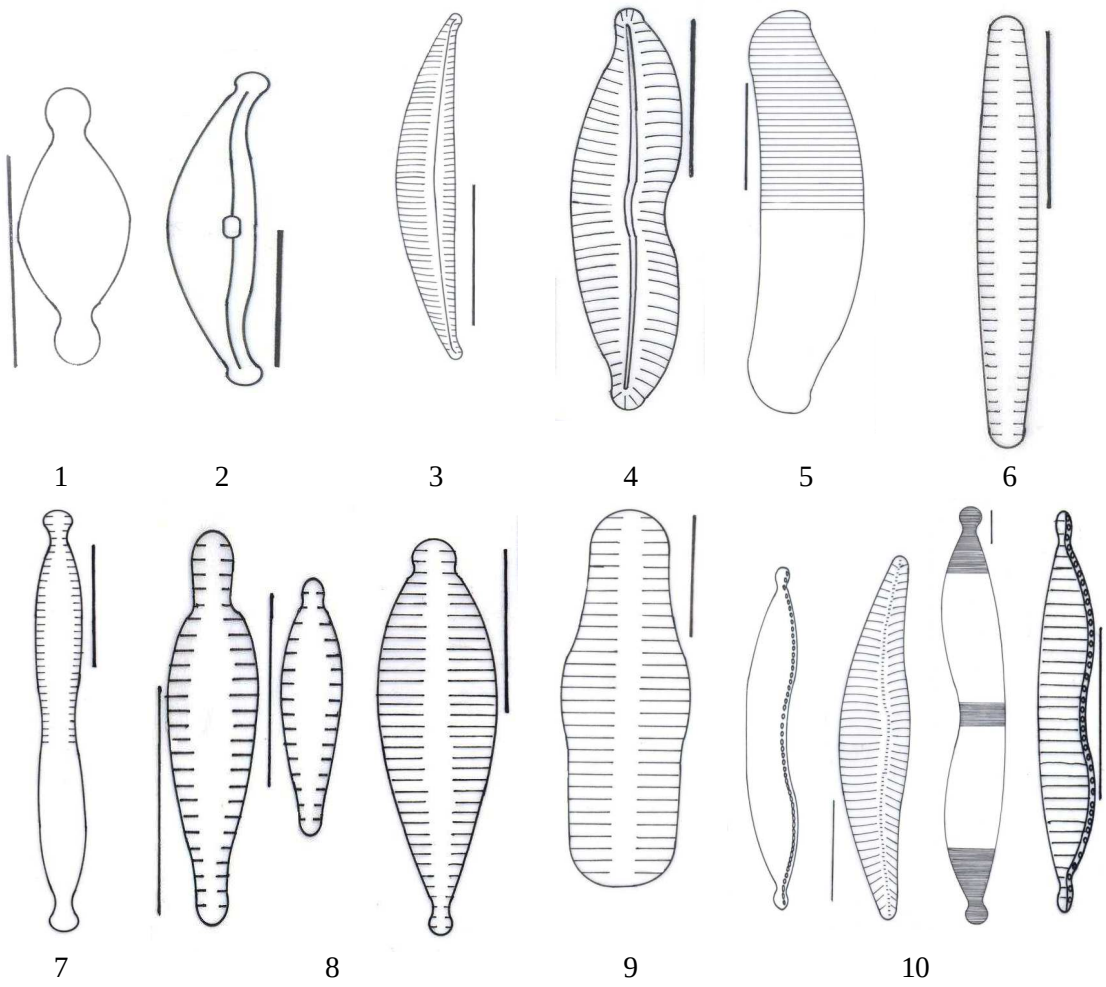
***Synedra* sp.** Ehr. (Fig. 18)
Valves 104µm long, 4-6 µm broad, striae 12-20 in10µm.

Conclusion with forensic importance

Forensic science is an area of applied science that uses physical evidence to piece together the events that occurred at suspected crime scenes. Forensic botany is defined as the use of plant evidence in court. Forensic botany is subdivided into several botanical subspecialties, including plant anatomy, plant systematic, palynology, plant ecology and limnology (the study of freshwater ecology) was suggested by Vaughn *et al*. (2006). Quatrehomme *et al.* (1997) said that freshwater ecology or limnology can be applied to a subset of forensic cases.

When a person drowns in freshwater, diatoms are taken in along with water into the lungs. The diatoms are dispersed to the internal organs of the body. The diatom test is performed by extraction of bone marrow from an intact femur, heating the marrow in a nitric acid solution and centrifuging to pellet the solids (Coyle *et al.*, 2001). The solids are examined on slides by microscopy for the presence of diatom species.

In particular, aquatic plants like algae and diatoms have been useful to link



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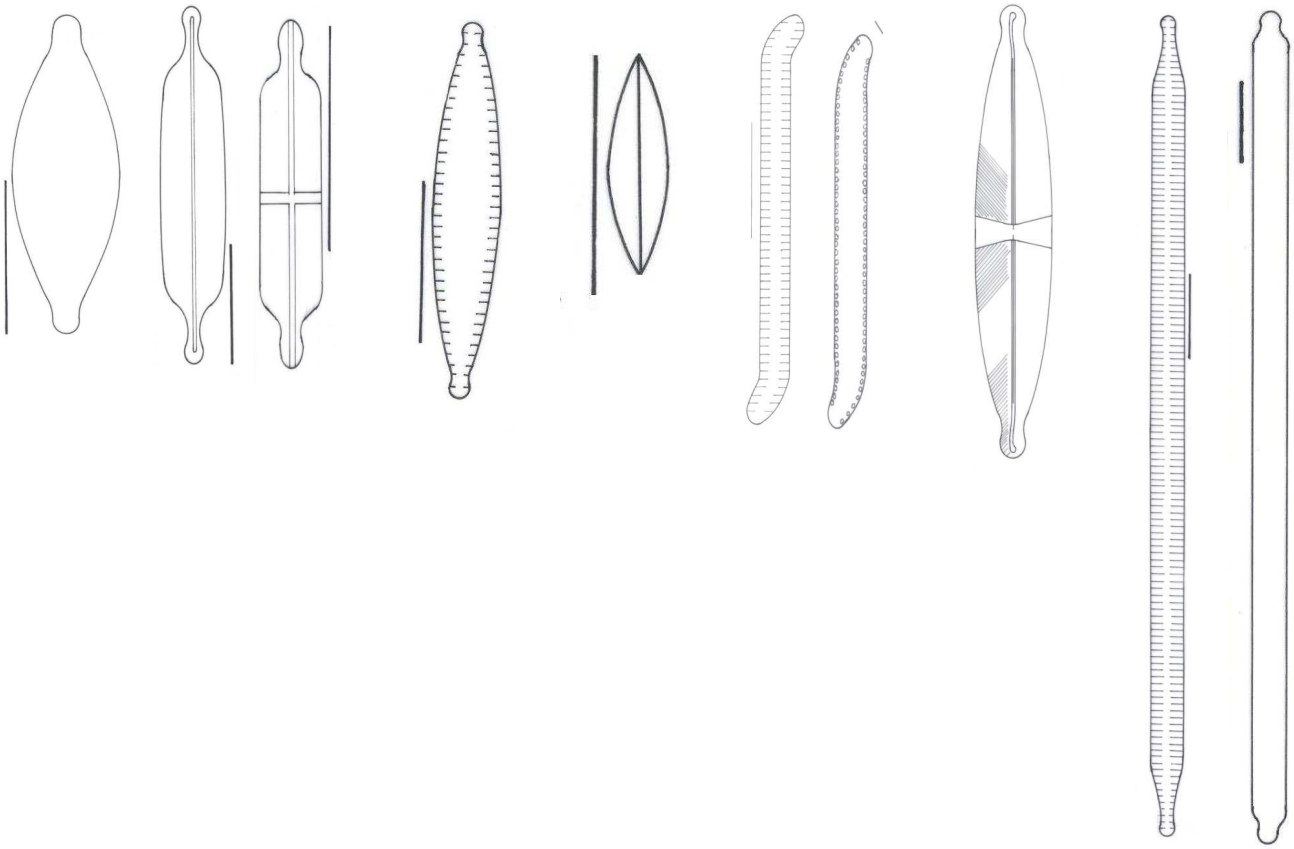

11 12 13 14 15 16 17 18

Plate 1. Figures 1. *Achnanthes* sp., 2. *Amphora acutiuscula*, 3. *Amphora coffeoeformis* var. *Africana*, 4. *Cymbella* sp., 5. *Eunotia major* var. *indica*, 6. *Fragilaria capucina*, 7. *Fragilaria capucina* var *mesolepta*, 8. *Gomphonema angur*, 9. *Gomphonema constrictum* var. *indica*, 10. *Hantizschia amphioxys*, 11. *Navicula cuspidate* f. *brevirostrate*, 12. *Navicula dicephala* var. *elginensis*, 13. *Navicula lanceolata* var. *tenella*, 14. *Navicula* sp., 15. *Nitzschia sigma* var. *rigidula*, 16. *Stauroneis phaenicenteron* f. *capitata*, 17. *Synedra acus*, 18. *Synedra* sp.

Table 1. Genera identified from different sites.

Name of the species	Sites of collection				
	a	b	c	d	**e**
Achnanthes sp. Bory.	—	—	—	—	+
Amphora acutiuscula Kütz.	+	—	—	—	—
Amphora coffeoeformis Agardh var. *africana* Fritsch and Rich.	+	—	—	—	—
Cymbella sp. Kütz.	—	+	—	—	—
Eunotia major (W. Smith) var. *indica* (Grun.) A. Bg.	+	—	—	—	—
Fragilaria capucina Desm.	—	—	—	+	—
Fragilaria capucina var *mesolepta (*Rabenhorst)	—	—	—	—	+
Gomphonema angur Ehr.(1840)	—	+	—	—	—
Gomphonema constrictum var. *indica* var. *nov*	—	+	—	—	—
Hantizschia amphioxys (Ehr.) Grun. (1877)	+	—	—	—	—
Navicula cuspidate Kütz. f. *brevirostrate* f. *nov.*	—	—	+	—	—
Navicula dicephala (Ehr.) Smith var. *elginensis* (Greg.) Cl.	—	—	+	—	—
Navicula lanceolata (Agardh) Kütz. var. *tenella* A.S.	+	—	—	—	—
Navicula sp. Bory.	—	—	+	—	—
Nitzschia sigma W. Sm. var. *rigidula*	—	—	+	—	—
Stauroneis phaenicenteron Ehr. f. *capitata* forma *nova*	—	+	—	—	—
Synedra acus Kütz.	—	—	+	—	—
Synedra sp. Ehr.	—	+	—	—	—

a = Jamnahama Pond, b = Gaj River, c = Near arrigation Colony Pond, d = Near mandir Pond, e = Near Jail Pond

suspects to a crime scene or to establish that drowning occurred in freshwater. There are no works on diatom taxonomy of the Koria District. Present study has highlighted the occurrence and distribution of diatom flora in the study area.

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