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Notes on Iowa Diatoms. VI. Frustular Aberrations in Surirella Ovalis

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discontinuity plate characteristic of this species (Figs. 1, 3) was identical in flowers from these widely separated areas.

Conclusions

The xylem discontinuities in the vasculature of the flowers described are clearly regular, recurrent features. A survey of the literature on floral vasculature is underway to determine if similar phenomena have been reported in other groups. The only previous reports we have seen relate to flowers of the Polygonaceae (6, 7). In this family floral vascular discontinuity seems to be the rule.

If such discontinuities are of rare occurrence among Angiosperms, their presence in a certain genus or tribe could be of considerable taxonomic value. Our studies are being extended to other genera of the Psoraleae.

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Notes on Iowa Diatoms. VI. Frustular Aberrations in *Surirella Ovalis*[1]

Ryan W. Drum[2]

Abstract. Two types of frustular aberrations in cultures of *Surirella ovalis* Breb. have been observed. The first is a "notch deformity" occurring in approximately 0.1% of the population. It is produced by mechanical distortion where the cells are crowded. This deformity is passed to daughter cells in each successive vegetative division. The second type is characterized by the presence of one or more aberrant raphe canals crossing the valve face in various directions. It occurred only in cultures exposed to continuous light for two weeks. Little or no cell division occurred during this period. The raphe canal aberrations, which occurred in about 0.01% of the exposed population, may have resulted from abortive cell divisions. They were not observed to continue in later transfers of the exposed populations to normal growth conditions.

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Abnormal or disfigured diatom frustules have been seen and remarked upon by microscopists for over a century. Although these forms occur naturally, diatom cultures produce aberrant individuals with seemingly great frequency. Such forms were called "terratological" by Miquel, according to Van Heurck (1), who included extensive discussions of abnormal diatom frustules. Miquel could not explain the deformities, and only ascertained that great deformities in diatom frustules could be produced in cultures. Isolates of *Surirella ovalis* were maintained in culture in this laboratory for 18 months. Some of the frustular deformities observed are presented and discussed here.

Materials and Methods

S. *ovalis* was isolated from a pot of submerged soil found in the departmental greenhouse. The surface of the mud was colored brown by the growth of diatoms. A drop of a suspension of surface layer material was placed on agar near the edge of a petri dish. The petri dish was then wrapped with aluminum foil in which a 4 cm^2 hole was cut to allow light to enter on the side opposite the inoculum. The agar was prepared as described previously (2). After a week, the motile diatoms had moved toward the light and were no longer closely intermingled. Peripheral cells of S. *ovalis* were isolated easily and transferred to fresh culture dishes. Subcultures were made at four week intervals thereafter. The growth chamber was maintained on a schedule with a 16 hour light period alternating with an 8 hour dark period. Illumination was approximately 200 ft-candles and the temperature was 20°C. Ten cultures of the sixth transfer generation were exposed to continuous 200 candle illumination for 2 weeks at 20°C. Cells were examined in wet mounts both before and after the extended light exposure. Some of the exposed organisms were transferred to fresh medium and maintained as before.

Observations and Discussion

Normal valves of S. *ovalis,* appearing as the one shown in Fig. 1, occurred in all culture dishes. Notched frustules (Figs. 5-8), constituting about 0.1% of the population, were found to be the only type of frustular deformity in cultures growing under the conditions of alternating light and dark periods described above. Many clonal groups of individuals with identical notches were observed. The original deformity in each case may have resulted from mechanical distortion induced by cell crowding. The notched valve was reproduced in succeeding vegetative divisions. The notches are a benign type of aberration not accompanied by any obvious loss of vigor. Valve shape in daughter cells following vegetative division may not be under direct genetic

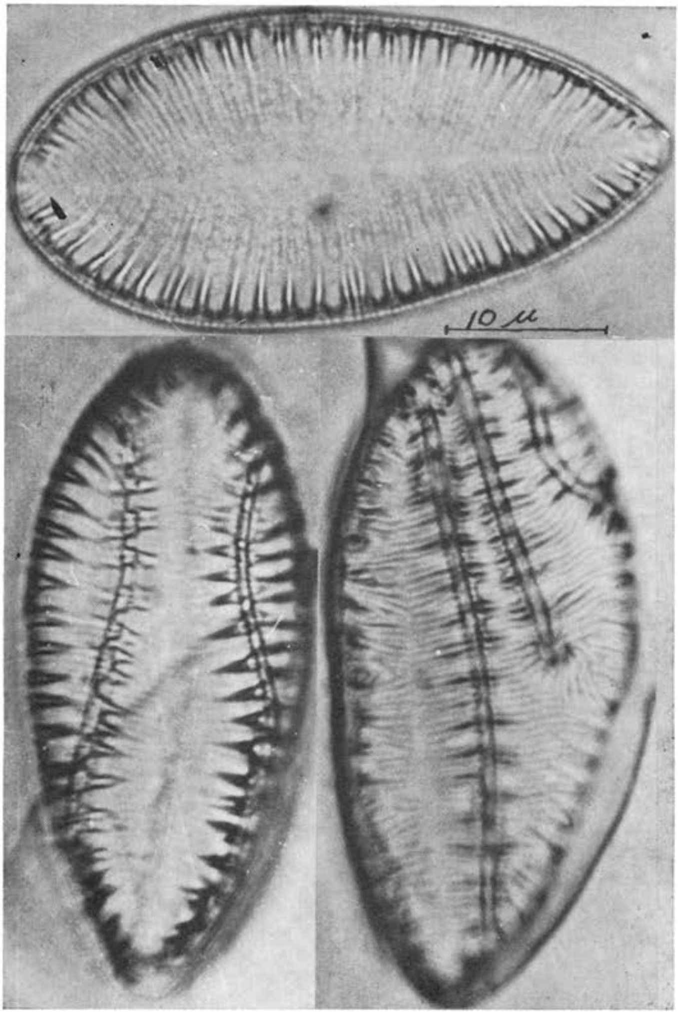

PLATE I. *Surirella ovalis*
Figure 1. Normal valve of *S. ovalis*
Figure 2-3. Two different valves, showing two or more aberrant raphe canals

control by the nucleus, since the mechanically-induced morphological changes were transferred to the daughter cells without any known alteration of the genome. Presumably, the notches would not persist after conjugation of individuals possessing them.

A raphe canal forms the border of each valve in the normal frustule. In the cultures exposed to two weeks' continuous light, frustules with one or more aberrant raphe canals (Figs. 2, 3, and 9-16) were found to constitute about 0.01% of the population. The percentage of cells with notched frustules continued

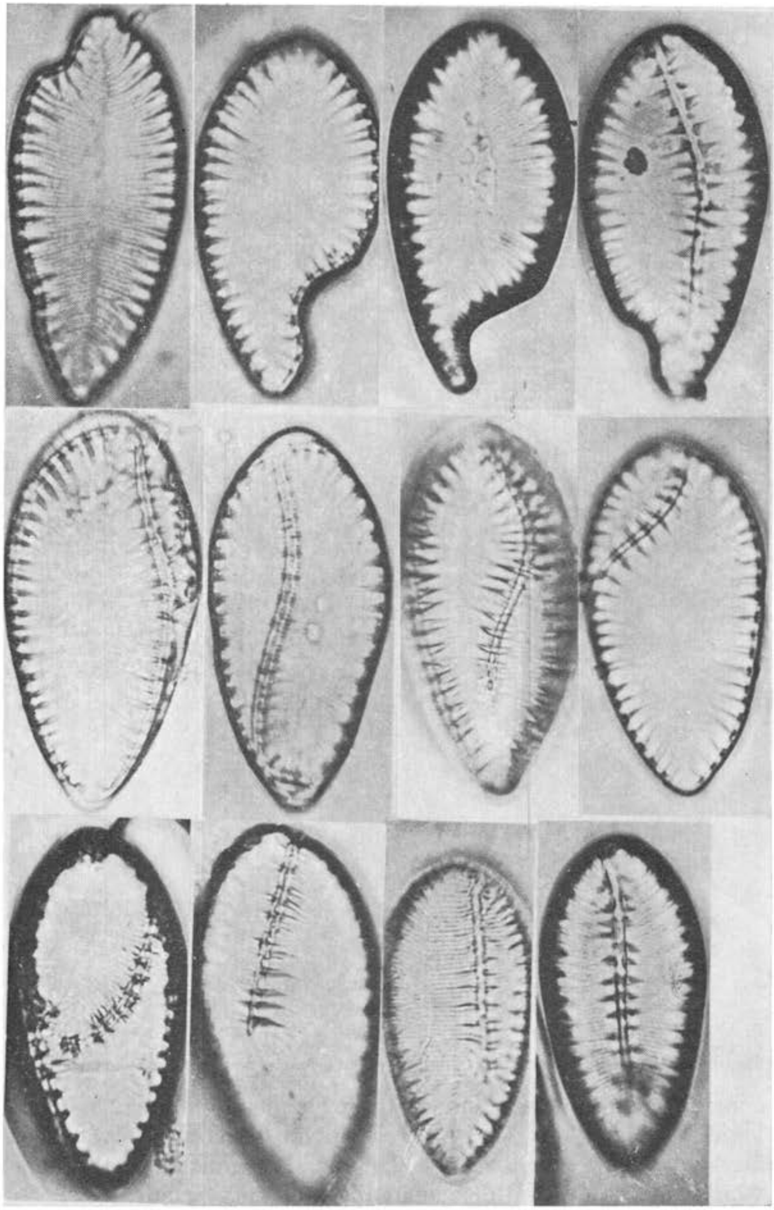

PLATE II. *Surirella ovalis*
Figure. 5-7 Valves showing the notch deformity
Figure 8. A valve with a notch deformity, and an aberrant raphe canal
Figure 9-16 Valves showing various types of aberrant raphes

about the same as reported above. An occasional notched cell also had an aberrant raphe canal (Fig. 8). Unlike the notch deformity, the aberrant raphe canal seems to be a phenomenon that is not passed to daughter cells. This type of deformity is seemingly produced by some mechanism other than simple mechanical distortion and is probably related to the continuous light condition. Desmids are similarly deformed by continuous light (3).

Apparently little or no cell division occurred in any of the diatom cultures while exposed to continuous light. The raphe canal deformities may be associated with abortive cell divisions. It is not known if the aberrant raphe canals were functional. When transferred to fresh media and removed from continuous light, normal cell division was resumed and the resultant populations were typical rather than abnormal.

Samples of the material are deposited in the Diatom collection of the Academy of Natural Sciences of Philadelphia.

Acknowledgements

I wish to express thanks to Dr. J. D. Dodd for critically reading the manuscript.

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Notes on Iowa Diatoms. VII. Rare and Little Known Diatoms from Iowa[1]

E. F. Stoermer[2]

Abstract. This paper reports the occurrence and known distribution of 44 rare taxa of diatoms in Iowa. Illustrations of the entities cited are furnished.

During the past few years a number of diatom taxa have been found in Iowa that are of particular interest because of their reported rarity or disjunct distribution (1). Several entities generally considered rare have been found to be dominant in some Iowa lakes. Certain species reported previously from marine habitats are found in considerable quantity in our lakes and rivers. Some species, originally described as fossils, have been found in the modern flora. This paper reports a number of these. Illustrations of the entities considered and literature citations are included in the hope that they will be of use to the

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