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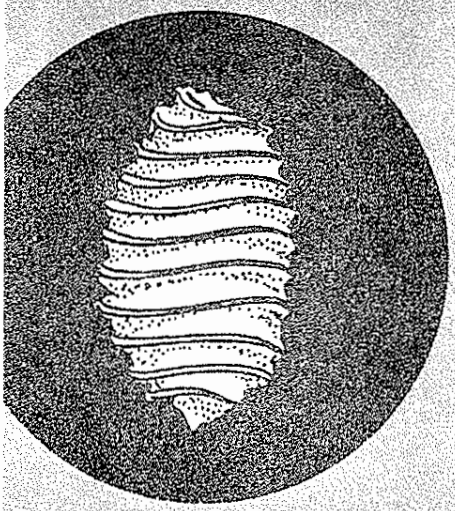

SOME RECENT (?) CHAROPHYTA IN WESTE EDMUNDS COUNTY, SOUTH DAKOTA

by Fred V. Steece

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SOME RECENT (?) CHAROPHYTA IN WESTERN EDMUNDS COUNTY, SOUTH DAKOTA [1]

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ABSTRACT

A lake deposit in Edmunds County contains an abundant flora of calcified gyrogonites of several genera of fresh water algae, of Class Charophyta. These gyrogonites are ellipsoidal in shape and range from strongly prolate to sub-spheroidal. They are characterized by 5 sinistrally spiraled cellular furrows or cellular ridges coiled so that 9-14 are visible in lateral view. Spiral cells form a small star-shaped basal plate and culminate upward into on apical point or ridge. The gyrogonites range from 925 to 1550 mu in length and from 700 to 1100 mu in width. Utricles, rarely calcified, are present and some contain gyrogonites. The flora is associated with a rich ostracode fauna and a relatively poor Molluscan assemblage.

INTRODUCTION

A Recent (?)[2] fresh-water lake deposit was sampled in the summer of 1959 on the farm of Karl Nicknish about 3 miles west of Bowdle in sec. 20, T. 123 N., R. 73 W. in western Edmunds County, South Dakota (Fig. 1).

The material was thought on field inspection to be Pleistocene volcanic ash, but detailed examination under the microscope showed it to be composed almost wholly of the calcareous remains (gyrogonites) of the fresh water algae, Class Charophyta, about 4 unidentified species of Ostracoda, and 5 species of Mollusca including *Valvata tricarinata* (Say), *Gyralus parvus* (Say), *Pisidium casertanum* (Poli).

LABORATORY PROCEDURE

The sample was washed free from silt and clay on a 250 mesh sieve, and then dried. Under a binocular microscope 372 calcified gyrogonites were picked with a fine brush and mounted on slides. A Unitron[3] photomicrography set, model ACA and 35 mm Argus C-3 camera were used to expose the slides, and a camera lucida was used to make the drawings. Numbers refer to slide and frame,

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[1]Publication authorized by the South Dakota State Geological Survey.
[2]The Recent Epoch in the Geologic time scale is the latest of the Quaternary Period in the Cenozoic Era. It is not to be confused with modern time.
[3]Unitron Division of United Scientific Co., 204-6 Milk St., Boston 9, Mass.

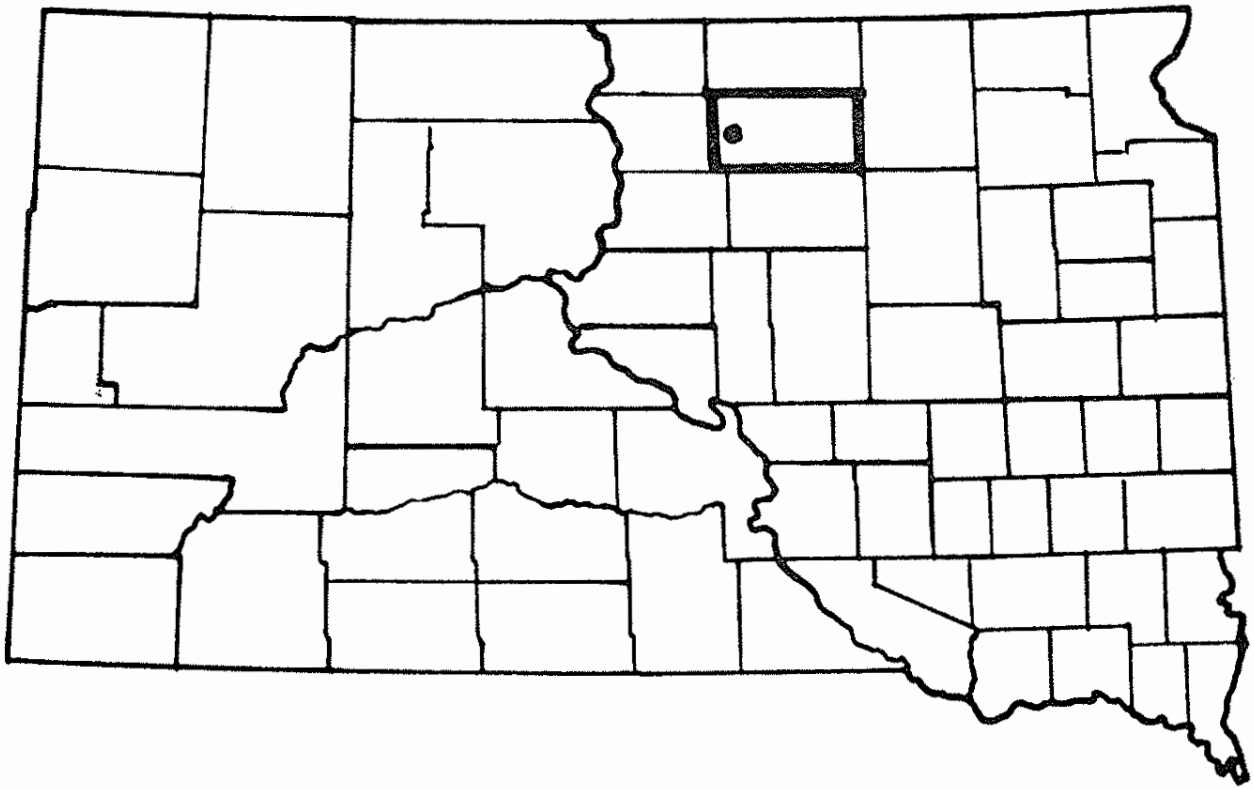


Figure 1. Index Map of South Dakota Showing the Charophyte Location in Western Edmunds County.

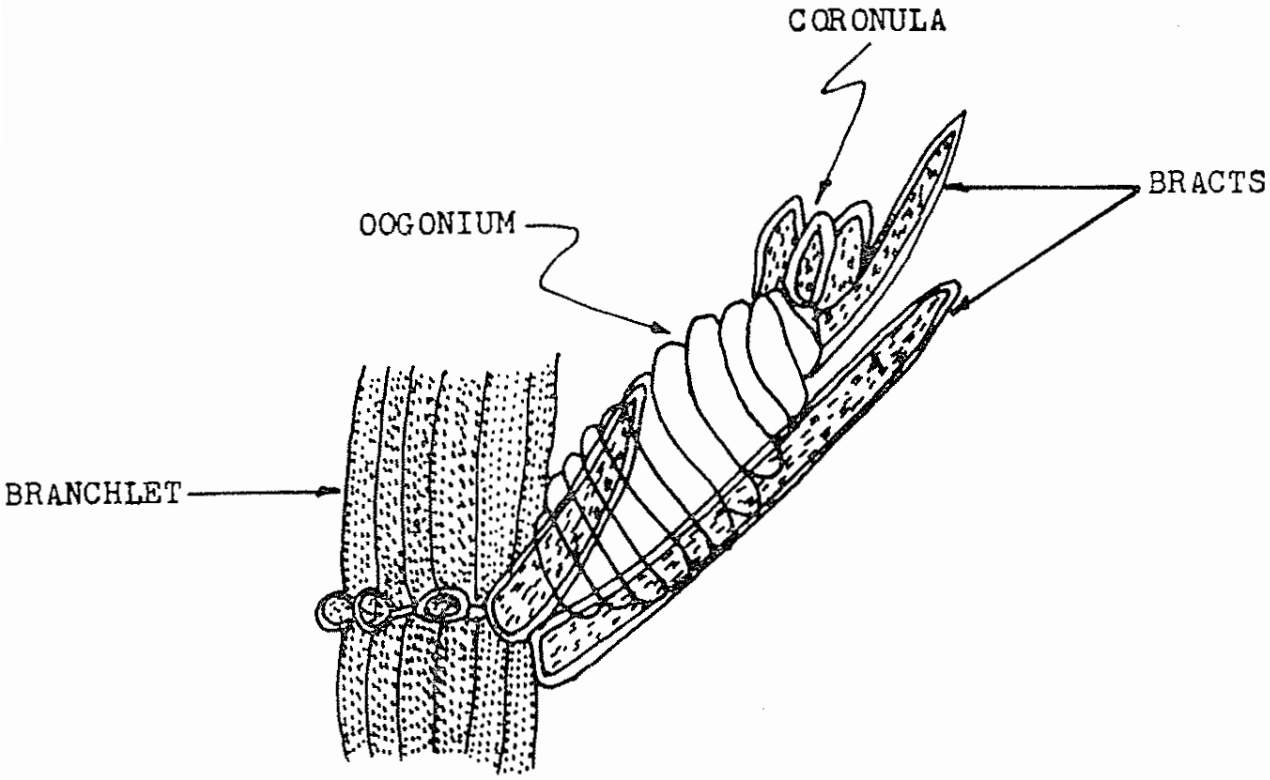
and all are deposited in the State Geological Survey paleontological collection in Vermillion.

CHAROPHYTA

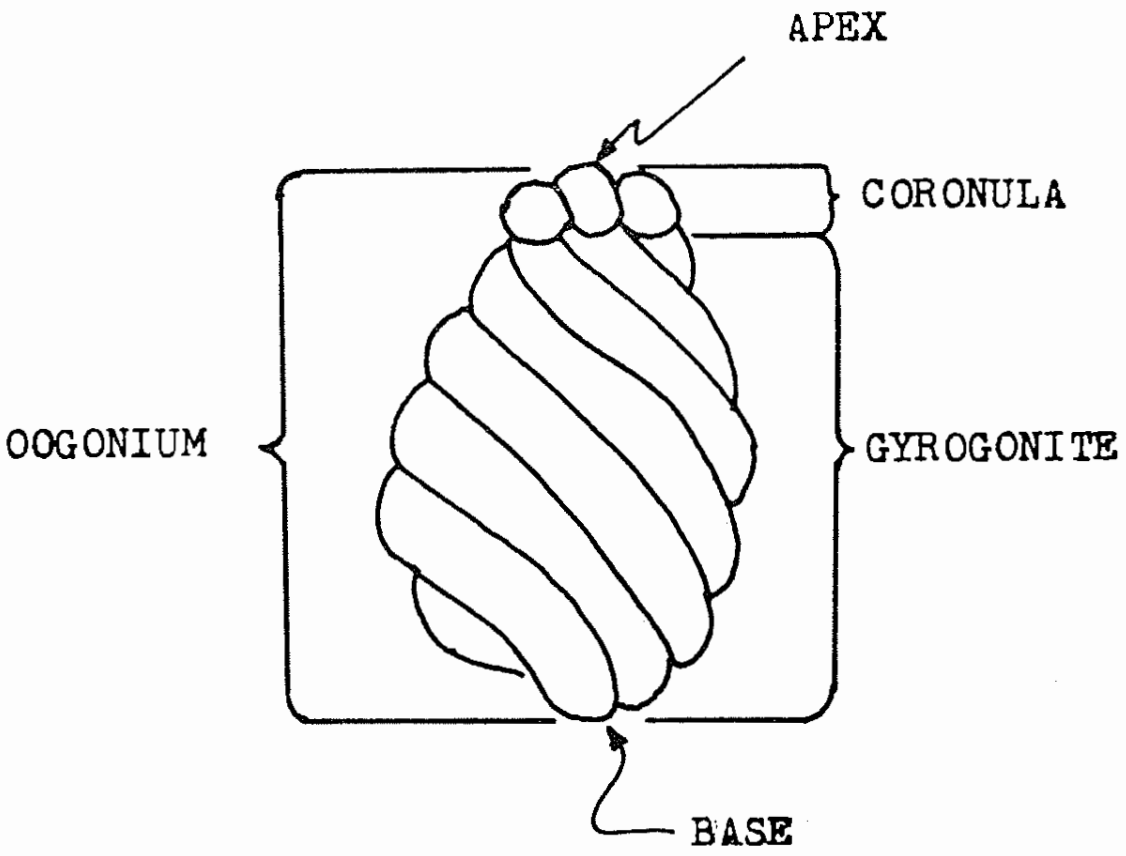
Morphology. Modern Charophyta live in quiet or slow moving fresh or brackish water. The plant ranges from several inches to 6 feet in height, and occurs mostly in alkaline water. It consists of a *rhizoidal root* system and one or more main stems made up of alternating *nodes* and *internodes* from which *branchlets* grow. The branchlets, also consisting of nodes and internodes, contain the reproductive organs, the *oogonium* and the *antheridia,* on the nodes. From the nodes grow small leaflike *bracts.*

The oogonium is composed of a coronula consisting of 5 or 10 small cells and the gyrogonite. The coronula does not calcify and therefore is not normally preserved. The gyrogonite consists of 5 sinistrally spiraled cells which may be either cellular ridges or furrows depending on the amount of calcium carbonate secreted by the plant (cf Fig. 3E and F). Within the gyrogonite is the oosphore membrane, which is commonly preserved as a dark colored film with oblique markings where it was attached to the inside of the gyrogonite. Rare calcified utricles which are apparently modified bracts or spine cells occur as hull-like structures partly enveloping several of the gyrogonites (Fig. 3A).

Figure 2. Diagram of Charophyta Showing Partial Morphology of the Plant

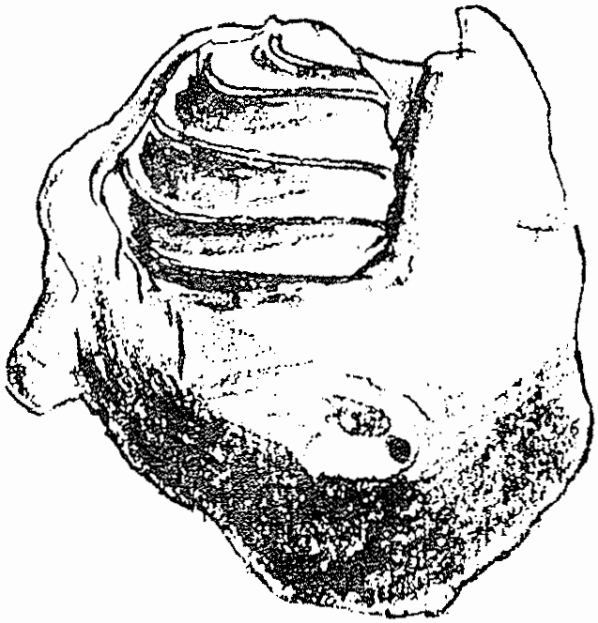


A. PARTS OF THE CHARA PLANT (AFTER DARRAH, 1942).

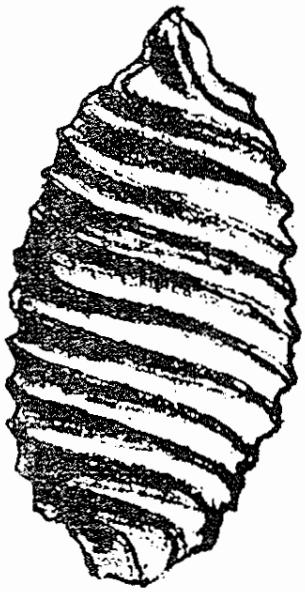


B. PARTS OF THE OOGONIUM.

Figure 3. Drawings of Some Gyrogonites Showing Some Characteristics of the Recent (?) Charophyta. (all figs. about x45)



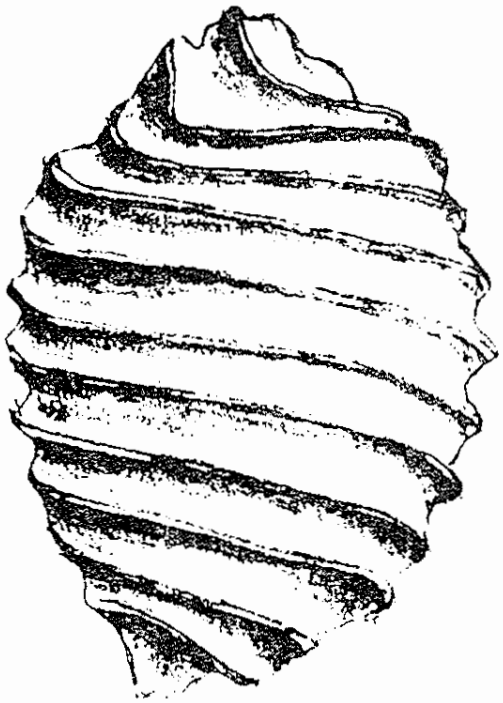
A. Gyrogonite in portion of Utricle. (N-4-57)



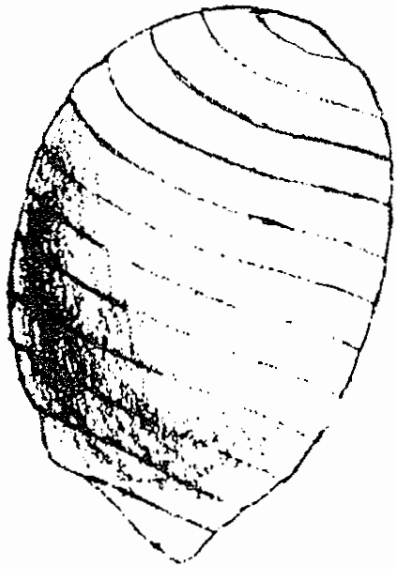
B. Lateral view of Gyrogonite with 14 Cellular Furrows. (N-4-26)

C. Basal View of Gyrogonite. (N-6-13)

D. Apical View of Gyrogonite. (N-6-20)



E. Lateral View; 12 Cellular Furrows. (N-9-19)



F. Lateral View; 12 Cellular Ridges. (N-9-42)

The gyrogonites from Edmunds County are ellipsoidal in shape and range from strongly prolate to sub-spheroidal (cf Fig. 3B and E). The spiral cells are coiled so that 9-14 are visible in lateral view, the greater number being visible in the more prolate forms. On the base of the gyrogonite is a star-shaped plate, one spiral cell beginning between any two of its points (Fig. 3C). In the center of the basal plate is a circular or star-shaped orifice, opening into the gyrogonite. The apex of the gyrogonite is formed by the culmination of the 5 cells in a point or short ridge (Fig. 3D). The point is usually raised and projects slightly from the main body. The gyrogonites range from about 700 to 1100 mu (mu = micron or 1/1000 millimeter). in width and from 925 to 1550 mu in length. The ratio of width to length ranges from 1.32 to 2.91 but most commonly is 1.6-1.8.

Classification. The plants in Class Charophyta belong to the subkingdom Protoctista (Peck, 1957) and are divided into three orders based on the character of the gyrogonites. Order Sycidiales includes Paleozoic forms having vertical rather than spiral cells; Order Trochiliscales are dextrally spiraled Paleozoic gyrogonites; and Order Charales are sinistrally spiraled gyrogonites ranging from Devonian to present. Order Charales is divided into four families, the most important being the Characeae which includes all living charophytes and fossil charophyte remains that do not differ appreciably from living ones. The Characeae have four subfamilies, of these we are concerned with Chareae and Nitelleae. Most gyrogonites of these subfamilies have been referred to the genera *Chara, Tolypella, Sphaerochara, Obtusochara,* and *Praechara.* Gyrogonites of these subfamilies have relatively few characteristics that are of value in separating them into either genera or species; the gyrogonites described in this paper, however, probably belong to genus *Chara.*

Geologic Importance. Fossil Charophyta have worldwide distribution and range from lower Devonian to Recent in age. They occur mainly in Devonian, Upper Jurassic, Lower Cretaceous, upper Upper Cretaceous and Cenozoic nonmarine sedimentary rocks. (Peck, 1957).

Because of their nature and relatively limited occurrence, the Charophyta are not as useful for stratigraphic correlations or for dating as marine fossils are. Further study of them in relation to their geological setting will, however, make them more useful for differentiating geologic periods.

ACKNOWLEDGEMENTS

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REFERENCES CITED

1. Darrah, W. C., An Introduction to the Plant Sciences, Wiley, New York (1942).
2. Peck, E. R., North American Mesozoic Charophyta, U.S.G.S. Prof. Paper 294-A, 43 p., 8 plates, 7 figs. (1957).