

William N. Orr
and
James B. Zaitzeff

Miocene Silicoflagellates from Southeast Oregon

Several groups of pelagic marine organisms which occur as fossils are currently receiving considerable attention for their value as chronological and environmental indicators. In addition to the somewhat better known groups including the Radiolaria and Foraminifera, many other pelagic microfossils are of particular interest. Some of the latter groups include Coccoliths, Discoasters, Ebridians, Diatoms, and Silicoflagellates.

With the exception of the Foraminifera, most of the above-mentioned microfossil groups are poorly known in the Pacific Northwest, primarily because of the paucity of sediments in this area favorable to their occurrence and preservation.

The marine Mesozoic and Tertiary sections of California have, by contrast, a number of sedimentary units well known for their diverse and abundant assemblages of siliceous and calcareous microfossils.

During the course of study of fossil diatoms from near Bandon in southeastern Oregon, a number of Silicoflagellate skeletons were noted in the diatom slide preparations.

The purpose of the present paper is to report the occurrence of these Silicoflagellates in Oregon and to chronologically relate the sediments at Bandon to units in California.

Locality and Age

A small exposure of diatomite on the beach at Bandon State Park south of Bandon, Oregon has yielded an assemblage of Diatoms, Radiolaria and Silicoflagellates. The Diatom flora collected from this locality (Orr, 1969) includes some fifteen species. Within the flora, species of the genus *Coccolithus* are clearly dominant. Many of the diatoms are cosmopolitan, long ranging species, but four—*Stephanopyxis appendiculata* Ehrenberg, *Arachnoidiscus decorus* Brown, *Actinocyclus cubitus* Hanna and Grant, and *Actinoptychus bismarkii* Schmidt—are stratigraphically restricted in California to Late Miocene sediments (Wornardt, 1967).

Silicoflagellates from the diatomite at Bandon include: *Distephanus ornamentus* (Ehrenberg), *Distephanus speculum* (Ehrenberg), *Distephanus speculum* var. *pentagonus* Lemmermann and *Distephanus* sp. Mandra (1968) has reported most of these species from Tertiary sediments in California. *D. speculum* was recorded in Eocene as well as Miocene sediments in California, but *D. ornamentus* and *D. speculum* var. *pentagonus* are apparently restricted to the late Miocene in California and elsewhere. Mandra (1968) regards *D. ornamentus* as stratigraphically restricted to the Delmontian stage.

Systematics

Phylum Protozoa

Class Mastigophora

Order Silicoflagellata Borgert 1891

Genus *Distephanus* Stöhr 1880

Type species *Dictyocha speculum* Ehrenberg 1838

Distephanus sp.

(Figs. 5, 6)

Tubular, siliceous skeleton consists of a six-sided basal ring with prominent attenuated spines projecting from each of the six corners. Short accessory spines project from points opposite each major spine on the basal ring in a direction away from the apical ring. Apical ring is circular and supported by six elongate bars which bisect the basal sides. Accessory spines on the apical rings are small and project away from the basal ring from positions opposite each supporting bar on the apical ring. Size: with spines 50-70 μ spines 15-20 μ .

Specimens conforming to Figs. 5, 6 of this report resemble various species of *Distephanus*. Bandon forms are apparently unique in that the accessory spines on the apical ring as well as on the basal ring are directly opposite the internal bars and basal spines, respectively.

Distephanus speculum (Ehrenberg)

(Fig. 2)

Dichtyocha speculum Ehrenberg 1854 pl. 18 Fig. 57

Distephanus speculum (Ehrenberg) Mandra 1968 Fig. 61

Skeleton tubular, siliceous, consisting of a hexagonal basal ring separated from a smaller hexagonal apical ring by internal bars bisecting the corners of the basal ring. Radiating spines of variable length project from the corners of the basal ring. Size: with spines 35-45 μ spines 5-10 μ .

Occurrence: This species is common in the Bandon diatomite. Mandra (1968) reports it in variable percentages in sediments from the Eocene and Miocene in California with highest frequencies in the Sisquoc formation and Buttle diatomite.

Distephanus speculum (Ehrenberg) var. *pentagonus* Lemmermann

(Figs. 3, 4)

Distephanus speculum (Ehrenberg) var. *pentagonus* Lemmermann 1901

p. 264, pl. 11, Fig. 19 Mandra 1968 Figs. 62, 69

Tubular, siliceous skeleton consists of a pentagonal basal ring. Apical ring pentagonal or irregular supported by five interradial bars. Radiating spines of variable length form the corners of the basal ring. No apical accessory spines.

Size: with spines 35-40 μ spines 5-10 μ

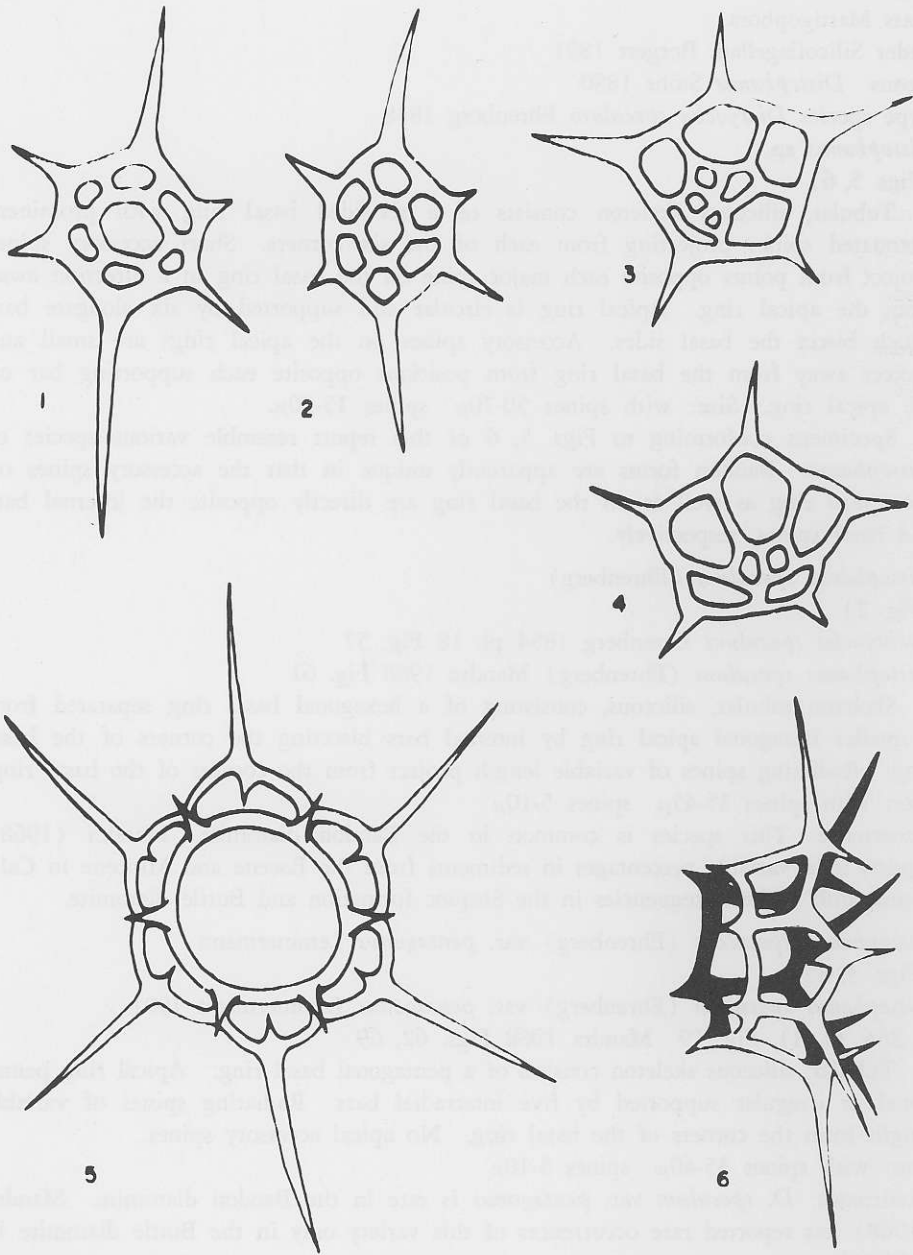
Occurrence: *D. speculum* var. *pentagonus* is rare in the Bandon diatomite. Mandra (1968) has reported rare occurrences of this variety only in the Buttle diatomite in California.

Distephanus ornamentus (Ehrenberg)

(Fig. 1)

Dichtyocha ornamentum Ehrenberg 1844, p. 80 1854 pl. 22 Fig. 49

Distephanus ornamentus (Ehrenberg) Hanna 1928 pg. 11 Figs. 11-19, Mandra 1968 Fig. 78



Figures 1 to 6.

Skeleton is tubular, siliceous consisting of a six-sided basal ring with six spines of variable length radiating from the corners. Small accessory spines on inside of basal ring. Apical ring supported by short internal bars projecting from between the basal spines.

Size: with spines 45-50 μ spines 5-10 μ

Occurrence: This form is not common in the Bandon diatomite. Mandra (1968) has reported the species in high frequencies from the Monterey formation and somewhat less in the Buttle diatomite in California. Specimens described in Europe are from Miocene (Sarmation?) sediments there. Although it was not recorded in the Sisquoc formation, Mandra (1968) regards the species as a Delmontian index because of its isolated occurrence in the Monterey and Buttle diatomite.

Conclusions

Silicoflagellates of the Bandon diatomite show the highest degree of similarity to the fauna of the Delmontian Buttle diatomite in California. Three forms co-occur in both units in similar frequencies. The presence of the Delmontian species *Distephanus ornamentus* (Ehrenberg) in the Bandon diatomite corroborates the late Miocene age earlier indicated by diatoms.

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