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Walter V. Searight
University of South Dakota

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THE MICROFAUNA OF THE SULLY MEMBER OF THE PIERRE

WALTER V. SEARIGHT

The upper Cretaceous of the Great Plains, from Kansas northward, is divided, from the base up, into the Dakota, Graneros, Greenhorn, Carlile, Niobrara, Pierre, Fox Hills, and Lance. The Pierre formation has recently been divided along Missouri River in South Dakota into five members on the basis of lithology. These subdivisions, beginning with the lowermost were named the Gregory, Sully, Virgin Creek, Mobridge and Elk Butte.¹ In the type locality of the Sully member, in and opposite Sully county, South Dakota, it has been divided into three zones and these zones have been observed along Missouri River in South Dakota and also in northern Nebraska. Microfossils have been found in each member of the Pierre and some of these faunas are characteristic of the member in which they occur.

The microfauna of the Sully consists of representatives of the foraminifera, radiolaria, silicispongia, echinoidea, and fishes. It is the middle zone, the Oacoma, which contains the most abundant fauna, which makes possible the recognition of the member from isolated doubtful outcrops and from sub-surface samples. The forms which occur most commonly may be listed as follows:

Radiolaria

Foraminifera.

- Pelosina complanata* Franke
- Glomospira charoides* var. *corona* Cushman and Jarvis
- Saccorhiza ramosa* H. B. Brady
- Ammodiscus glabratus* Cushman and Jarvis
- Bulimina pupoides* d'Orbigny
- Pulvinulinella velascoensis* (Cushman)
- Gyroidina depressa* Alth
- Cribrostomoides trinitatensis* Cushman and Jarvis
- Haplophragmoides rugosa* Cushman and Waters
- Haplophragmoides excavata* Cushman and Waters
- Silicosigmollina californica* Cushman and Church
- Spiroplectamina anceps* Reuss
- Globigerina cretacea* d'Orbigny
- Globigerinella aspera* (Ehrenberg)

¹ Searight, W. V., Lithologic stratigraphy of the Pierre formation of the Missouri valley in South Dakota: S. Dak. Geol. Survey, Rept. of Inv. No. 27 (1937).

Guembelina globifera (Reuss)
Guembelina plummerae Loetterle
Epistomina cf. *E. caracolla* (Roemer)

Fish teeth and other microscopic fish remains.

Of these forms radiolaria and fish remains are ubiquitous, occurring in the Niobrara and all members of the Pierre, with the possible exception of the Elk Butte member of the Pierre. Chalk facies fossils, such as *Globigerina cretacea*, *Globigerinella aspera*, *Guembelina globifera*, and *Gyroidina depressa* occur at many positions in both Niobrara and Pierre.

Agglutinated foraminifera, however, such as *Glomospira charoides* var. *corons*, *Pelosina complanata*, *Cribrostomoides trinitatensis*, *Silicosigmoilina californica*, and *Spiroplectammina* are restricted in position. Some of these, indeed, are not known to occur at stratigraphic positions other than the Sully. For example, *Glomospira charoides* var. *corona*, *Cribrostomoides trinitatensis*, and *Pulvinulinella trinitatensis* appear to occur only in the Sully member of the Pierre. *Pelosina Complanata*, *Saccorhiza ramosa*, *Silicosigmoilina californica*, *Haplophragmoides rugosa* and *H. excavata* recur far above this member in the Mobridge. A variety of *Ammodicus glabratus* differing from the form in the Sully is found in the overlying Virgin Creek.

This fauna, characteristic of the Oacoma, has thus far been noted in two areas other than South Dakota. Several representatives were originally described from the island of Trinidad by Cushman and Jarvis² and the fauna has also been noted by Cushman in Mexico. In these places, however, this assemblage occurs in the uppermost Cretaceous, whereas in the Missouri valley province it occurs well down in the Montana. The fauna as originally described thus appears to be considerably younger than that which occurs in the upper Missouri area.

The Agency shale, which lies below the Oacoma zone, in the Sully, contains a microfauna which includes Oacoma zone fossils. For example, the characteristic agglutinate of the Oacoma, *Glomospira charoides* var. *corona*, extends downward into the Agency nearly, it not actually, to the base. In addition to the ubiquitous chalk facies fossils such as those previously mentioned, the lower part of the Agency contains *Buliminella carseyae* Plummer, *Bolivina explicata* Cushman, *Eouvigerina achuleata* Cushman, *Guembelina plummerae* Loetterle, *Pleurostomella* sp. cf. *P. austinana* Cushman, and *Planulina taylorensis* (Carsey). This association

² Cushman and Jarvis, Proc. U. S. Nat. Mus. Vol. 80, Art. 14.

does not occur, so far as known, in the Oacoma, but is characteristic of the upper Gregory marl, as originally described, which immediately underlies the Agency. The fauna of the Agency thus, containing as it does, an assemblage of both Gregory marl fossils and Oacoma, forms faunal gradation between the beds overlying and underlying the Agency. This Agency fauna is widespread, occurring in outcrops at Fort Pierre, Rosebud bridge, and at Yankton. It also appears in the cuttings from several wells in western South Dakota. Thus the Agency, formerly supposed to pinch out south of the Great Bend, is represented in a thin zone between the Gregory marl and the Oacoma.

The Verendrye contains a microfauna similar to that of the Oacoma and is in need of further study. It appears to lack *Glomospira charoides* var *corona*, the characteristic form of the other zones of the Sully. Microscopic skeletal parts of silicispongia occur practically throughout the zone at Oacoma and probably elsewhere.

The microfauna of the Gregory marl is to be discussed in a forthcoming paper. It may be said, however, that studies of the zones of the Sully and of the Sully and of the Gregory marl indicate that the chalky beds of the Gregory underlying the Agency faunal zone are closely related to the Sully. The relationship of the Gregory marl to the underlying bituminous, fish scale bearing bentonitic shales between the Gregory marl and Niobrara appears not to be close. The beds previously described as the upper Gregory should therefore be included in the Sully as the lowermost zone of that member. It is suggested that the name Gregory be retained for these beds.

The underlying beds described as the lower Gregory are definitely contemporaneous with the Sharon Springs of Kansas³ and Eastern Colorado⁴ and the name is adopted for the beds between the Niobrara and the Gregory zone of the Sully as revised.

³ Elias, M. K., The geology of Wallace county, Kansas, Kans. Geol. Survey, Bull. 18, p. 58, 1931.

⁴ Dane, C. H., Pierce, W. G., and Reeside, J. B., Jr., The stratigraphy of the upper Cretaceous rocks north of the Arkansas river in eastern Colorado, U. S. Geol. Survey Prof. Paper 186, p. 225, 1936.

DEPARTMENT OF GEOLOGY,
UNIVERSITY OF SOUTH DAKOTA,
VERMILLION, SOUTH DAKOTA.