

## PRELIMINARY FORAMINIFERAL POPULATION COUNT IN UPPER NIOBRARA CHALK

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### INTRODUCTION

The purpose of this study was to determine the number of foraminifera in a given quantity and the percentages of the more important genera. The Niobrara chalk used for this investigation was taken from the Smoky Hill member, which is the upper member of the formation. Three grab samples were obtained at the spillway of the Marindahl Dam, about 5 feet below the top surface of the formation or below the 4th rust-colored bentonitic lamination. These reddish laminations are about an inch thick. The Marindahl Dam is located about 20 miles northeast of Yankton, South Dakota.

As far as it is known, there has been no previous work on a population count of the Niobrara formation. However, abundant, common, rare, and trace observations have been made by Bolin (1) and Sevon (4).

### PREPARATION OF SAMPLE

The chalk was trimmed as near as possible to a cubic centimeter by means of a coping saw and a razor blade. The sample weighed 1,526 mg. The chalk broke up readily when placed in water and gently boiled and washed in a 230 mesh sieve. Usually five half-hour boilings were sufficient to loosen the matrix, however the process was continued until the boiling water was no longer cloudy with the matrix sediment.

### METHODS OF PICKING AND COUNTING

A Spencer binocular scope with a magnification of 80x and a 000 sable hair brush were used for nearly all of the work of picking and counting. The first step in processing the microfossils was the separation of fossils from the remaining matrix, which was roughly about 1/6 of the volume of any given processed sample. The fossils were then separated into their respective genera and picked en masse and transferred to trays to be counted.

The use of water helped a great deal in the manipulation of the specimens, both in counting and in separation. If too much water is used, the surface tension will work against the transfer by filling in between any two stacks of microfossils that are being worked. However, by keeping the water supply low it is possible to transfer rapidly and accurately. The drying-out process is rapid under a

lamp, but the brush serves as an excellent container for small amounts of water. No attempt was made to use other liquids in this manner.

### RESULTS OF MEASUREMENTS

After picking about 1,500 specimens, it became obvious by the amount still to be processed that the number of fossils was much greater than anticipated. Three test samples were run at this time and their dry weight averaged 0.7 mg. The average number of specimens of foraminifera in the samples was 290. The dry weight of the remaining unsorted sample was 995.8 mg., which is 1,422 times the average dry weight of the test samples. Computation revealed an estimated 412,380 foraminifera unpicked, plus the 2,417 which were picked. This makes a gross total of 414,797 foraminifera in a cubic centimeter.

On the basis of the 2,417 specimens picked and identified, only to the genera, the following results in number and percentage were obtained: (2, 1)

	Number	Per Cent
<i>Globogerinella</i>	805	38
<i>Globogerina</i>	456	19
<i>Gumbelina</i>	389	16
<i>Loxostoma</i>	194	8
<i>Globotruncana</i>	168	7
<i>Bulimina</i>	57	2
	2,169	90

The remaining 248 specimens, representing about 10% of the total amount picked, were not identifiable or were less than 2% of the total, and were therefore not tabulated. There were several other foraminifera genera, and three ostracods in the fauna. Also a few spores and plant fragments were recovered.

### CONCLUSIONS

In the preceding statistics it is noted that nearly 75 per cent of the population is congregated in 3 pelagic genera (including approximately 6 species). The heavy concentration of similar genera were also noted in the work of Bolin (1), with the addition of *Globotruncana* in quantities of 7 per cent or enough to be considered quite common.

The tremendous numbers of foraminifera represented by the pelagic, calcareous *Globergerina*, *Globogerinella*, and *Gumbelina* indicates a very favorable habitat (3). The fauna suggests an open-sea, moderately deep sublittoral environment (about 300 meters or

less), which appears to have had a well-oxygenated bottom. The dominant forms are planktonic and were accumulated presumably by the ocean currents in an environment similar to the foraminiferal oozes of present oceans.

Evaluation of the investigation must take into consideration that only one sample was analyzed and only an estimate made of the total. The sample was mixed thoroughly so that the random sampling would be representative of a true relationship to the percentages in the cubic centimeter sample. Many tests must be made in order to draw a true picture of the foraminiferal count of the Niobrara chalk.

#### BIBLIOGRAPHY

1. Bolin, E. J., Microfossils of the Niobrara Formation of Southeastern South Dakota, S. Dak. Geol. Survey, Rept. Invest. 70, 74 (1952).
2. Jones, D. J., "Introduction to Microfossils," 349, Harper and Brothers, New York (1956).
3. LeRoy, L. W., and Schietz, N. C. Niobrara-Pierre Boundary Along the Front Range, Colorado Bull. Amer. Assoc. Petroleum Geol., 42, 2444-2464 (1958).
4. Sevon, W. D., "Geology of the Marindahl Quadrangle, South Dakota" M. A. Thesis, State Univ. of S. Dak., 100 (1957).