



## *A preliminary range chart of Lake Valley Formation (Osage) conodonts in the southern Sacramento Mountains, New Mexico*

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# A PRELIMINARY RANGE CHART OF LAKE VALLEY FORMATION (OSAGE) CONODONTS IN THE SOUTHERN SACRAMENTO MOUNTAINS, NEW MEXICO

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## INTRODUCTION

The Lake Valley Formation in the Alamo Canyon area of the southern Sacramento Mountains contains a large, well preserved conodont fauna. In this paper some stratigraphic implications of several species found in the Lake Valley are discussed and a chart is included to graphically illustrate their stratigraphic ranges. The material presented here is based on information obtained during a four-year study of Mississippian conodonts in the southern Sacramento Mountains.

Mississippian rocks in the Sacramento Mountains are marine and consist (descending) of the Helms (Chester); Rancheria (Meramac); Lake Valley (Osage); and Caballero (Kinderhook) Formations. Each of the formations yielded conodonts; however, faunas recovered from the Helms Formation and the Rancheria Formation are small and reworked and thus are of limited stratigraphic value. Although both the Lake Valley Formation and the Caballero Formation yield large, well preserved, indigenous faunas, the Lake Valley fauna contains more distinctive species of definable stratigraphic range and geographic distribution. Therefore, because of its greater potential for zonation and correlation, species from the Lake Valley conodont fauna are presented here.

In the Sacramento Mountains, the Lake Valley Formation is about 400 feet thick (Pray, 1961, p. 59) and is divided into six members. They are (descending) the Dona Ana, Arcente, Tierra Blanca, Nunn, Alamogordo and Andrecito Members. The Lake Valley Formation consist mostly of crinoidal limestone and small amounts of calcareous siltstone and shale. However, in the central part of the Sacramento Mountains, near Alamogordo, the Lake Valley contains a number of biohermal structures. According to Pray (1961, p. 60), these are the best exposures of Mississippian bioherms known in North America.

## PROCEDURE

The conodonts discussed here were obtained from five collecting localities associated with the bioherms exposed in the Alamo Canyon area southeast of Alamogordo (fig. 1). At locality one the type Dona Ana, Arcente, and Alamogordo Members of the Lake Valley are exposed in a biohermal flank facies. Locality four also extends across the flank facies of a bioherm. At both of these localities conodonts were obtained from the Dona Ana, Tierra Blanca, Alamogordo and Andrecito Members of the Lake Valley. Collecting localities two and five are within the core facies of two bioherms and

conodonts were obtained from the time equivalents of the Tierra Blanca, Nunn and Alamogordo Members. Locality three extends across an "interreef" facies where conodonts were extracted from the Tierra Blanca, Alamogordo and Andrecito Members. In general the Dona Ana, Tierra Blanca, Alamogordo and Andrecito Members consistently yielded conodonts wherever sampled, whereas the Arcente Member was always barren. The Nunn member usually is covered in this area and was not sampled although its equivalent was collected in the core facies of the bioherms at localities two and five.

One-half kilogram chip samples were taken continuously along a locality, with each sample being composed of chips from each one-foot interval. The samples were digested in a 15 percent acetic acid and the conodonts were picked from the residue. About 4,200 identifiable conodonts were extracted from 450 samples.

## FAUNAL EVALUATION

Locally the Andrecito and Dona Ana Members faunas, which represent pre- and post-reef deposition respectively, vary in assemblage composition only with respect to the rare (less than 10 specimens per kilogram) species. The Alamogordo and Tierra Blanca Members faunas, which are contemporaneous to the biohermal structures, are equally consistent through the local facies i.e., core, flank, and "interreef."

Eleven of the 12 conodont species making up the *Bactrognathus communis* Zone of Hass (1959) in the Chappel Limestone of south-central Texas are present in and restricted to the Tierra Blanca Member fauna. The remaining species of the *B. communis* Zone, i.e., *Pseudopolygnathus multistriata* Mehl and Thomas, 1947, occurs only in the Alamogordo Member fauna. Further, 6 of the 8 species which constitute Hass's *Gnathodus punctatus* Zone are found in the Andrecito and Alamogordo Members faunas, thus indicating the eastward regional distribution of this part of the Lake Valley fauna.

It is impossible to make other regional comparisons because of the lack of published information regarding Mississippian conodont occurrences in the Southwest. However, the author is presently engaged in a study of faunas of similar age in the Big Hatchet Mountains, Hidalgo County, New Mexico. Large conodont faunas are indicated and species which are identical to forms previously found in the Lake Valley Formation in the southern Sacramento Mountains are present. Although the study is not sufficiently advanced to make meaningful comparisons these early results are suggestive of a close correlation between the faunas of the two areas.

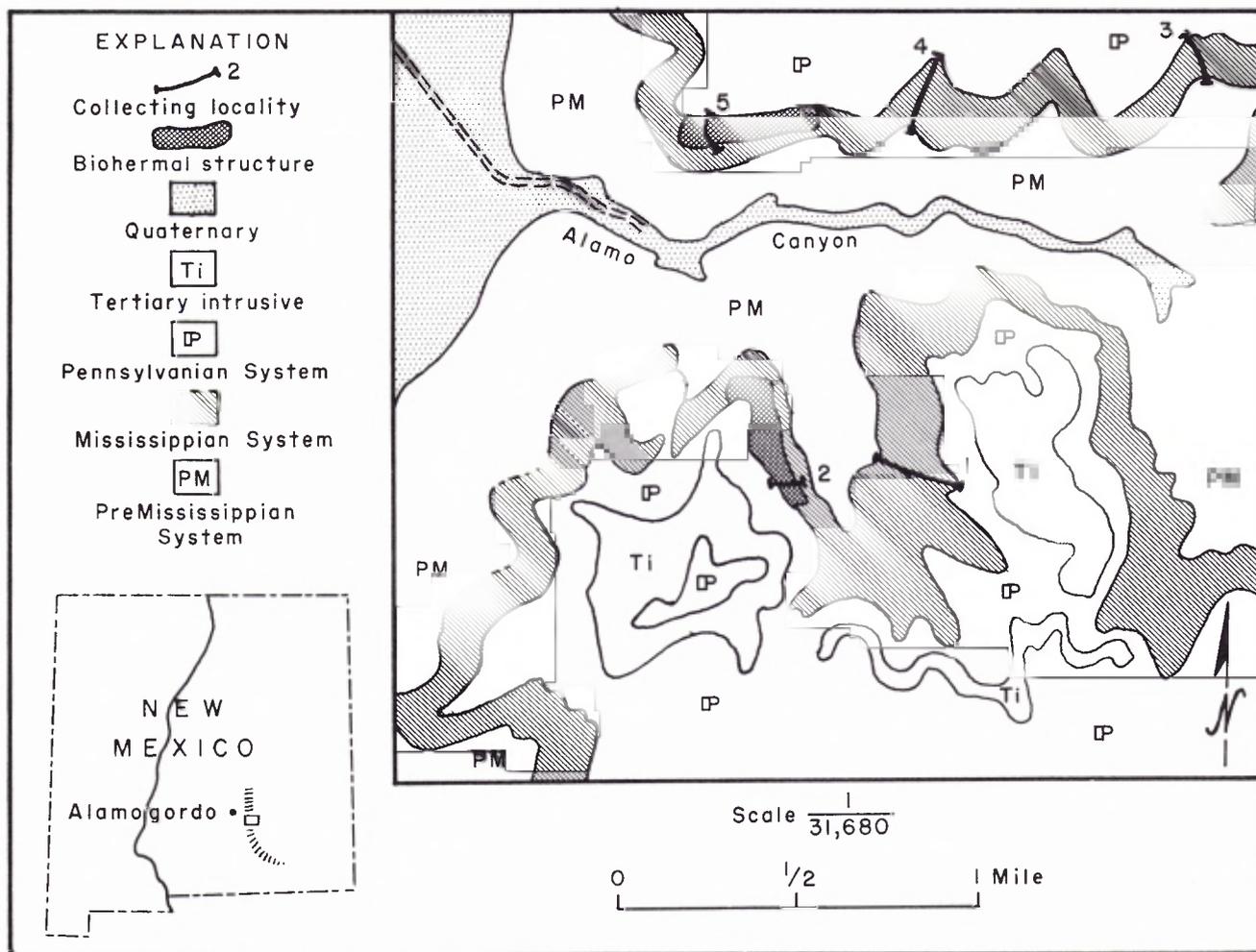


Figure 1. — Index map showing location of collecting localities in Alamo Canyon. Map adapted from Pray, 1961, pl. 1.

The interregional and intercontinental relationships of the Lake Valley Formation conodont fauna are much more complex because of assemblage variations both real and taxonomic — a matter which cannot be resolved in this preliminary range chart. However, in spite of the ramifications, some of these relationships are mentioned below.

**CHART INTERPRETATION**

*Apatognathus lipperti* Bischoff, 1956 is restricted to the Alamogordo Member. It is rare (less than 10 specimens per kilogram), delicate, and of short stratigraphic range locally. This form has been reported previously only from Germany (Bischoff, 1956; Bischoff and Ziegler, 1956). Thus it is of local and intercontinental correlative value.

*Bactrognathus communis* Hass, 1959; *B. penehamata* Hass, 1959; *B. distorta* Branson and Mehl, 1941a, are restricted to the Tierra Blanca and Alamogordo Members. *B. penehamata* and *B. communis* have been reported previously only from Texas (Hass, 1959), but this restriction may be taxonomic because of the occurrence of *B. distorta* and forms closely resembling *B.*

*communis* and *B. penehamata* in Missouri. The three species are considered to be of local, regional, and inter-regional stratigraphic importance.

*Bryantodus* sp. Flugel and Ziegler, 1957 is found in the middle one-third of the Tierra Blanca Member. It is a sturdy, distinctive, and common (10-25 specimens per kilogram) form. It has been recorded previously only from German localities (Bischoff and Ziegler, 1957) and therefore is at present thought to be of local and intercontinental correlative value.

*Doliognathus lata* Branson and Mehl, 1941a; and *D. excavata* Branson and Mehl, 1941a are represented on the range chart by *D. lata*. Distinguishing between the two species is of little stratigraphic value locally because the range and abundance of each is essentially the same throughout the Tierra Blanca Member. *Doliognathus* has been recorded in Texas (Hass, 1959), in Missouri (Branson and Mehl, 1941a), and the Harz Mountains in Germany (Branson and Mehl, 1941b). This form is conspicuously absent from Mississippian rocks in the upper Mississippi Valley. Although found in Kinderhook and Osage rocks in Missouri in the Texas and New Mexico region it is restricted to the Osage.

*Gnathus texanus* Roundy, 1926; *G. delicatus* Branson and Mehl, 1938; and *G. punctatus* Cooper, 1939 occur in greatest abundance in the approximate position shown on the chart. Of the three species only *G. delicatus* is confined to the Lake Valley Formation. The presence of transitional Gnathodids complicates regional, interregional, and intercontinental use. However, recognition of a particular species coupled with the reversal of dominance between Gnathodids and *Polygnathus communis* Branson and Mehl, 1934 can be used to locally divide the Lake Valley Formation.

*Hindeodella segaformis* Bischoff, 1957 is confined to the Tierra Blanca Member of the Lake Valley Formation. Although this form is subject to extreme breakage it is so distinctive that even small fragments can be identified with certainty. *H. segaformis* has been reported only from Germany (Bischoff, 1957) until now thus limiting it to local and intercontinental use.

*Polygnathus communis* Branson and Mehl, 1934 is not restricted to the Lake Valley Formation. It ranges from the Caballero Formation (Kinderhook) through the Rancheria Formation (Meramac). Zonation based on variations in the blade to platform dimensions and differences in platform ornamentation are possible to the specialists thereby permitting regional, interregional, and intercontinental correlations. A 2 to 1 dominance of Polygnathids over Gnathodids is reversed in the middle of the Tierra Blanca Member with Gnathodids dominant from that point upward. Relative abundance of these two genera serves as a local indicator of the upper or lower Lake Valley, and in conjunction with other forms confirms zonations.

*Pseudopolygnathus multistriata* Mehl and Thomas, 1947 is common and distinctive to the faunas of the Andrecito and Alamogordo Members. It has also been reported from Texas (Hass, 1959), Oklahoma (Cooper, 1939), Illinois (Rexroad and Scott, 1964), Missouri (Mehl and Thomas, 1947), and Germany (Bischoff and Ziegler, 1956; Freyer, 1961), and thus offers widespread correlation possibilities.

*Scaliognathus anchoralis* Branson and Mehl, 1941a is the most distinctive element in the Lake Valley fauna and is found in the middle one-third of the Tierra Blanca Member. It also occurs in the Harz Mountains in Germany (Branson and Mehl, 1941b). It has been reported as a Kinderhook — Osage form in Missouri by Branson and Mehl (1941a), but in the Texas and New Mexico occurrences it is Osage in age possibly due to delayed migration. Its widespread geographical distribution and restricted range makes this form of particular value for correlative purposes.

*Staurogathus cruciformis* Branson and Mehl, 1941a occurs in the lower 3 to 5 feet of the Tierra Blanca Member. It may extend lower in the section; however,

this has not been established because the Numm Member is generally covered. *S. cruciformis* is considered Kinderhook and Osage in Missouri (Branson and Mehl, 1941a). Restriction of the form to the Lake Valley Formation (Osagean) may be due to delayed migration.

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