References and Notes

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Silurian of Central Texas: A First Record for the Region

Abstract. *Silurian outcrops, not previously recorded from central Texas, have been identified from the Llano uplift, where they occur in collapse structures within the Lower Ordovician Honeycut Formation of the Ellenburger Group. The formation is a pinkish-gray granular limestone, contains fossils of probable Wenlock age, and is named the Starcke Limestone.*

Rocks younger than Early Ordovician and older than Carboniferous were once believed to be missing from the Llano uplift of central Texas, a tectonic outpost of older rocks surrounded by a vast expanse of Carboniferous and younger sediments. Beginning in 1945, however, a picture has emerged of remnants of once-extensive deposits of Upper Ordovician and Lower, Middle, and Upper Devonian age, preserved in collapse structures and fissures in older rocks, and as minute erosional remnants, after the parent sediments were mainly removed by erosion during one or more of many episodes of emergence (*1*). To these we now add Silurian, giving the region a known representation of all Paleozoic systems except the Permian.

Althought the fossils which establish a Silurian date were originally collected from the type locality (Fig. 1, locality 27T-10-3B) by James Lee Wilson and Barnes, on 26 March 1952, and again by W. H. Hass, Cloud, and Barnes in March 1956, and were then tentatively identified as Silurian by Cloud, other obligations at that time prevented definitive analysis of the fauna. Impetus for this came when the fossils were shown to Boucot in April 1966. He then identified the brachiopods as middle Silurian (Wenlock)—an assignment that was later supported by Palmer, who found the trilobites to be similar to those of the St. Clair limestone near Batesville, Arkansas, and by W. A. Oliver, Jr., U.S. Geological Survey, who identified the corals as closest to (but not necessarily correlative with) species from the Brownsport and Henryhouse formations. As a result, Barnes, Boucot, and Cloud, in company with W. C. Bell and James Lee Wilson, re-collected the type locality on 8 June 1966 and shipped about ½ ton of fossiliferous limestone blocks to Pasadena for processing.

Another locality (27T-6-43K, Fig. 1) was revisited because a few fossils from near it, collected by Barnes, Cloud, and George Seddon during March 1965, had suggested a Silurian age to Cloud. Previously a coral from this locality was sent to Helen Duncan, U.S. Geological Survey, and in a report of 10 April 1956 she identified it as *Favosites* with the following comment: "So far as I am able to tell, this specimen from Texas could be either Silurian or Devonian. A Late Ordovician assignment seems less likely, but that possibility is not ruled out." The analysis of these relict formations, however, is a block by block proposition. The *Favosites*-bearing, white, very coarse-grained limestone of locality 27T-6-43K is near the base of an outcrop of steeply dipping, cherty, impure limestone of the Devonian Stribling Formation, and therefore is in normal stratigraphic position to be a part of the granular limestone member of that formation. In fact, it probably does belong to the Stribling Formation, being lithologically distinct from the Silurian Starcke Limestone here discussed.

The Starcke Limestone at this locality resembles that at 27T-10-3B both lithically and faunally. It crops out on the east bank of a shallow drain about 20 feet (6 m) or so east of the outcrop of granular Stribling limestone. Because the designation 27T-6-43K was originally used for the *Favosites*-bearing limestone, however, a new locality number 27T-6-43M is assigned to the outcrop here referred to the Silurian Starcke Limestone.

All of these relict rocks rest upon or sag into Lower Ordovician carbonate rocks of the Ellenburger Group and are or were overlain by rocks of Carboniferous age (Fig. 1).

Locality 27T-10-3B (Fig. 1A), the type locality, is situated on the C. H. Dean ranch in Burnet County, Texas, 4000 feet south-southwest of Max Starcke Dam. It is 900 feet south of Flatrock Creek, 250 feet from the west boundary of the Dean ranch, and 100 feet from the mouth of a shallow, northward-flowing drain which empties into a drain flowing directly into Flatrock Creek. The Starcke Limestone here occupies a collapse structure, along with

Table 1. Fossils from the Silurian of Central Texas. Names followed by 3B or 43M indicate forms identified at locality 27T-10-3B (=USNM locality 13014) or 27T-6-43M (=USNM locality 13015) only. Absence of such designation indicates forms found at both localities.

Brachiopods
Amphistrophia? cf. *A. striata* (Hall) 3B
Atrypa "reticularis" (Linnaeus)
Clorinda? sp. 3B
Coelospira? sp. 3B
Coolinia sp.
Cyrtia sp. 3B
"Dolerorthis" flabellites (Foerste)
Eospirifer sp.
Howellella? sp. 43M
Kozlowskiellina (Kozlowskiellina) sp. 3B
Leangella sp. 3B
Leptaena "rhomboidalis" (Wilckens)
Meristina sp.
Mesodouvillina? sp.
Plectatrypa? sp. 43M
Plectodonta sp.
Resserella sp.
Rhynchonellids 3B
Schizoramma? sp. 3B
Streptis? sp.
Trilobites
Bumastus sp. 3B
Dalmanites bassleri (Ulrich & Delo)
Unidentified dalmanitid 3B
Corals
Enterolasma n. sp. 3B
Syringaxon sp. 3B
Cephalopod
Dawsonoceras sp. 3B
Miscellaneous megafossils
Fenestellid Bryzoa 3B
Gastropod 3B
Pterineoid pelecypod 43M
Conodonts, all 3B
Belodina sp. (a redeposited Burnam form)
Drepanodus cf. *D. subarcuatus* Furnish
**Ligonodina silurica* Branson & Mehl
**Ozarkodina* cf. *O. ziegleri tenuiramea* Walliser
Panderodus unicostatus (Branson & Mehl)
Panderodus acostatus (Branson & Branson)
**Spathognathodus* cf. *S. ranuliformis* Walliser
Spathognathodus sp.

* Forms considered significant for age assignment.

the lower glauconitic and upper cherty limestone members of the Stribling Formation and perhaps other units not exposed or not yet recognized. The area of collapse is surrounded by fine-grained dolomite and aphanitic limestone of the Lower Ordovician Honeycut Formation. The Starcke Limestone is medium- to coarse-grained, pinkish gray, massive, and locally brecciated. It crops out in an area about 50 feet across, but exposures are discontinuous because of soil cover, and neither top, bottom, meaningful estimate of thickness, nor sequence can be given.

Locality 27T-6-43M (Fig. 1B), on the R. M. Burnam ranch in Burnet County, Texas, is 4.75 miles (7.65 km) south-southeast of Marble Falls. It is 900 feet west of the east line and 1300 feet north of the south line of the Burnam ranch, on the east bank of a shallow drain about 600 feet south-southwest of the point where this drain enters Burnam Branch. The Starcke Limestone at this locality forms a bouldery outcrop less than 10 feet across. It is similar to the limestone of the type locality. Except for its slightly pinkish color it is also similar to the Upper Ordovician Burnam Limestone and coarse limestones of the Stribling Formation which occur as relict outcrops and float blocks in the same area. It is highly probable that other outcrops or float blocks of Silurian age will be found in this and the Starcke Dam areas in the future.

The brachiopods from locality 27T-10-3B are most similar to those of the St. Clair and Clarita limestones of Oklahoma and Arkansas, although the two assemblages are by no means identical. A pre-Ludlow age is demonstrated by the presence of *Streptis?*, *Leangella*, and *"Dolerorthis" flabellites*. The *Amphistrophia?* is a form not known in beds as old as Llandovery. The *Kozlowskiellina* is a form known in North America so far only from the St. Clair Limestone. This combination indicates that we are dealing with beds of Wenlock age, with an oustide limit of possible age in terms of European equivalents between about C_3 (late Llandovery) through Wenlock.

Associated trilobites and corals are consistent with a Wenlock age as indicated by the brachiopods. Fragments of associated cephalopods appear to belong to the distinctive middle Silurian to Lower Devonian genus *Dawsonoceras*.

A large quantity of the limestone from locality 27T-10-3B has also been dissolved in acetic acid, and the residues have been studied by Miller. Microfossils obtained include a mixed conodont assemblage in which forms of Silurian aspect are abundant. Reworked elements include Burnam and other Ordovician conodonts.

Fossils so far identified are listed in Table 1.

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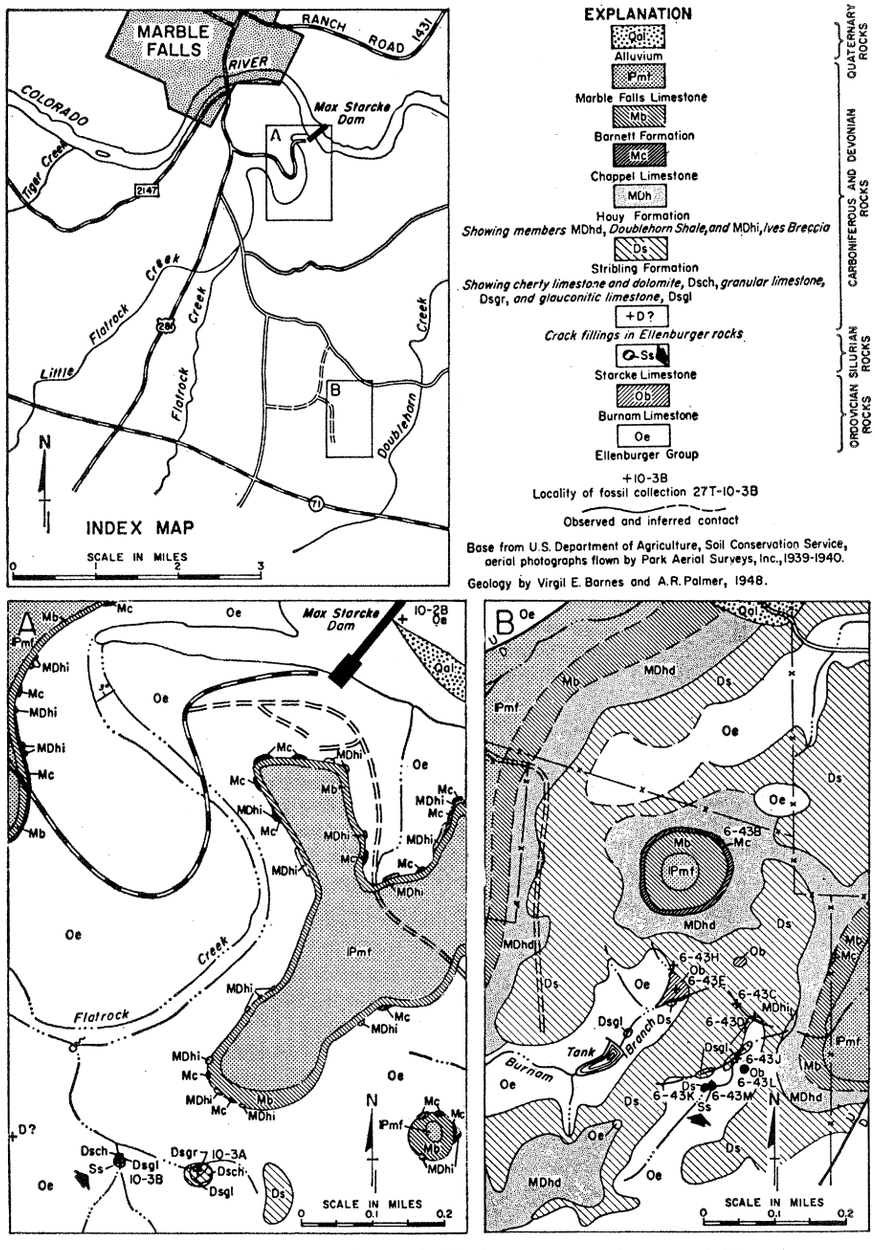

Fig. 1. Location and geology of Silurian outcrops in central Texas.

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