INFERRRED TIDAL FLAT PALEOVINVRNENTS IN LEIPERS LIMESTONE (ORDOVICIAN) OF ABANDONED QUARRY, DADE COUNTY, GEORGIA

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ABSTRACT
Several paleoenvironments have been recognized in exposure of the Leipers Limestone (Ordovician) in an abandoned quarry near Interstate 24, Dade County, Georgia. These paleoenvironments include part of an ancient tidal flat complex.

Facies Interpretation
1. Gray and green shale Low supratidal-high subtidal
2. Fossiliferous micrite High intertidal-low supratidal
3. Pelmicrite Intertidal
4. Biocorrenite Low intertidal-high subtidal

Short-term shifts of the strand line across the tidal flat led to cyclical admixtures of the four facies.

INTRODUCTION
Upper Ordovician carbonate rocks, belonging to the Leipers and Shellmouth Formations, are exposed in an abandoned quarry near the eastbound lane of Interstate 24 in Dade County, Georgia approximately one half mile from the Hamilton County, Tennessee border (Fig. 1). Figure 2 is an artist's sketch of the quarry face that shows the location of measured sections. Mills (1972) has given the stratigraphic sequence along I-24 in a road section.

FIG. 1: Location of Quarry along I-24, Dade County, Georgia.

FIG. 2: Artist's sketch of Quarry Exposure of Leipers Limestone along I-24.

FIG. 3: Generalized Stratigraphic Section, Leipers Limestone, Dade County, Georgia.
log. Chown (1972) included these quarry exposures in a study of Upper Ordovician rocks across northern Georgia and Southeastern Tennessee. It is the purpose of this study to develop a sedimentological model for the Ordovician Leipers Limestone. These rocks were examined for bedding geometry, large- and small-scale structures, texture and composition with the view of interpreting their sedimentological history.

**METHODS**

Figure 3 is a generalized stratigraphic section of the Leipers Limestone exposed in a quarry along I-24, Dade County, annotated for small-scale bed forms as well as texture and composition.

**Description**

Four rock types have been recognized in the Leipers Limestone:

1. Shale, green and medium to greenish gray, thin-bedded (up to 3" thick).
2. Fossiliferous micrite, light to medium gray, laminated, burrowed (vertical burrows) and bioturbated, bioclastic structures, dolomitization ranges from incipient to extensive (homb diagonal ranges from 16 to 144 microns), microfacies vari-shaped pyrite masses and slabs to fine sand-sized quartz.

**INTERPRETATION**

DeVries Klein (1971) described a fining-upward sequence of sediment across classic intertidal flats as suspensoidal sedimentation that produced high tidal flat muds and clays.

Van Straaten and Kuenen (1958) pointed out that, in tidal flat environments, clay-sized particles increase "as one passes from inlets communicating with the open sea toward the inner shores."

Shinn, Lloyd and Ginsburg (1969) indicated that modern carbonate intertidal-flats northwest of Andros Island, Bahamas, are composed of pellets. Primary sedimentary laminations are largely destroyed by burrowing organisms. Living fauna consists of gastropods, worms and burrowing fiddler crabs. Algal mats occur in the upper transitional part of the intertidal flats.

Laporte (1967) recognized ancient intertidal facies, in the lower Devonian Manlius Formation of New York State, as consisting of alternating thin beds of sparsely fossiliferous, pelleted, carbonate mudstone and skeletal calcarenite; primary structures include: scour- and fill, burrow, burrow fill, and burrow-depression and limestone-pellet concretionary glomerate. A few mudcracks indicate intermittent subaerial exposure. The supratidal facies is characterized by non-fossiliferous, calcarenite, laminated, mudcracked, dolomitic, pelletal carbonate mudstone. Mudcracks and bioclastic structures indicate frequent subaerial exposure; thin bedded, film-like sedimentary layers indicate soft carbonate laminite suggest the presence of algal mats.

Walker and Laporte (1970) summarized the work of others and listed lithologic, palaeontologic, and primary sedimentological criteria for tidal flat and shallow subtidal carbonate environments. The environments recognized are: (1) supratidal, (2) high intertidal, (3) low intertidal and (4) subtidal. Criteria for recognizing supratidal environments are similar to those given by Laporte (1967). High intertidal is marked by: mudcracks, intraclasts, thin-to-medium bedding, scour-and-fill, current burrows and bioclastic structures may be present. Low intertidal may be identified by: a small amount of mudcracking, intraclasts, thin-to medium-bedding, scour-and-fill, a few vertical burrows and a few horizontal burrows. Subtidal characteristics may be: massive or lumpy bedding and horizontal burrows.

Zenger (1972) stated that discovery of Holocene supratidal dolomite has led geologists to think much ancient dolomitization to have been supratidal and penecontemporaneous. Features such as lamination, presence of evaporites, bioclastic structures and presence of dolomite, if considered single are not indicative, but rather suggestive of supratidal conditions. It is the collective nature of these features in ancient rocks that is convincing. In certain examples the distinction between ancient intertidal and supratidal environments is equivocal. Therefore, dolomite occurrence may be interpreted as intertidal rather than entirely supratidal.

**SUMMARY AND CONCLUSIONS**

Four rock types have been observed in the Upper Ordovician Leipers Limestone exposed in an abandoned quarry along Interstate 24 in Dade County, Georgia:

- **Shale**
  - Suspension sedimentation-low supratidal high subtidal
- **Fossiliferous micrite**
  - Suspension sedimentation-high intertidal low supratidal
- **Pelletarite**
  - Low intertidal to high subtidal
- **Bioclastic**

**LITERATURE CITED**


