

ORDOVICIAN THROUGH SILURIAN CARBONATE BASE-OF-SLOPE APRON SEQUENCE,
NORTHERN SEWARD PENINSULA, ALASKA

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EXPANDED ABSTRACT

A lower Paleozoic metamorphic complex is exposed along the northern coast of the Seward Peninsula. This complex contains several carbonate sections that have been recrystallized under lower greenschist facies conditions, but remain relatively undeformed. Three of these sections are located at Cape Deceit and about 0.9 miles (1.5 km) west of Cape Deceit on Kotzebue Sound. Clast size, sedimentary structures, and mineralogy are used to determine grain size for sedimentologic interpretations. The stratigraphic relationships of the three sections are complicated by both extensive normal faulting and poor exposures, but paleontologic data and facies relationships indicate they form a single stratigraphic sequence. This sequence is formally named here as the Deceit Formation and is designated as the composite stratotype for the newly named formation (fig. 1). The three sections are informally referred to as the dolostone and limestone member, the shale and limestone member, and the limestone member.

Mutti and Ricci Lucchi's (1972) sedimentary facies of turbidites, as modified for carbonate aprons by Mullins and Cook (1986), were used in the analysis of these carbonate apron sediments. Facies A sediments are defined as clast-supported carbonate conglomerates and breccias. Facies C sediments have the characteristics of classical turbidites. Facies D sediments are defined as being calcarenites interlayered with finer carbonate sediments and muds. Facies F sediments are defined as debris flows and submarine slides of semi-consolidated sediment. And Facies G sediments consist of fine-grained, peri-platform ooze and basal muds and shales. Facies B and E as defined by Mutti and Ricci Lucchi (1972), do not apply to carbonate apron sediments.

The dolostone and limestone member is composed of massive, matrix supported, disorganized, carbonate megabreccias and breccias which have been extensively faulted, fractured, and hydrothermally altered. It is at least 200 feet (60 m) thick and represents large, debris flow deposits (Facies F). Conodonts collected from this member by previous workers range from Ordovician through Devonian. A questionable Late Silurian coral and bivalve collection at Cape Deceit has also been documented but never duplicated.

The shale and limestone member is greater than 230 feet (70 m) thick and consists predominantly of graptolitic shale with interbedded, coarsely crystalline, parallel- and ripple-laminated limestone and minor chert (siliceous Facies G and Facies D). The upper 50 feet (15 m) contains no graptolitic shale and consists of coarsely crystalline limestone interbedded with argillaceous limestone and clay shales (Facies G). Very coarsely crystalline limestone beds compose the basal 8 feet (2.5 m) of the member. These beds have erosional bases and contain graded bedding, rip-up clasts, and parallel laminations near the top (Facies A). Graptolites collected from this member are Middle and Late Ordovician and possibly Early Silurian. Conodonts from this member are Ordovician.

The limestone member is greater than 607 feet (185 m) thick and is divided into two units. The top 160 feet (49 m) of the upper unit consists of matrix- and grain-supported, megabreccias, breccias, and conglomerates with a minor amount of clast supported breccias (Facies F and A) interbedded with thinner sections of argillaceous limestone (Facies G). The remainder of the upper unit is a sequence of interbedded medium to coarsely crystalline limestone and argillaceous limestone and contains coarsening- and thickening-upward cycles, 15 to 50 feet (5-15 m) thick. The medium to coarsely crystalline limestone contains graded and planar bedding, parallel laminations, and rip-up clasts (Facies C and D). Conodonts collected from the top part of this unit are Middle to Late Silurian. The lower unit is a sequence of interbedded medium to coarsely crystalline limestone and dolomite and finely crystalline, argillaceous limestone and dolomite that fines and thins upward. The medium to coarsely crystalline limestone and dolomite beds exhibit normal grading, cross and parallel laminations and rip-up clasts (Facies D). Conodonts from this unit range from Ordovician through Silurian.

The paleontologic data can be used to reconstruct the Deceit Formation from the three relatively undeformed sections as shown in Figure 1. The sedimentology of the reconstructed section indicates this formation was deposited along the lower part of a carbonate platform margin slope and its proximal basin plain. The limited exposure of the formation along the coastline makes it difficult to determine the geometry of the slope deposits. The thick section of debris flow deposits (Facies F) indicates that a base-of-slope carbonate apron would be the most appropriate depositional model. The limestone and dolostone member (Facies F) along with the top 110 feet (35 m) of the limestone member (Facies F and A with interbeds of Facies G) would form the inner apron facies where sheets of debris flows and proximal turbidite beds were deposited. Farther down the slope, the outer apron facies is represented by the remainder of the limestone member (Facies C, D, and A interbedded with Facies G) where both proximal and distal turbidite deposition is prevalent. The limestone and shale member represents the peri-platform and hemipelagic oozes and distal turbidites deposited beyond the apron margin on the basin plain.

The Deceit Formation is correlative with and may have been related to the platform carbonates of the York Mountains of the western Seward Peninsula as their deep-water equivalents. Another lower Paleozoic carbonate platform to slope sequence exists in the Baird Mountains of the western Brooks Range; its relationship to the rocks of the Seward Peninsula is still uncertain.

Reviewers not cited.

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REFERENCES CITED

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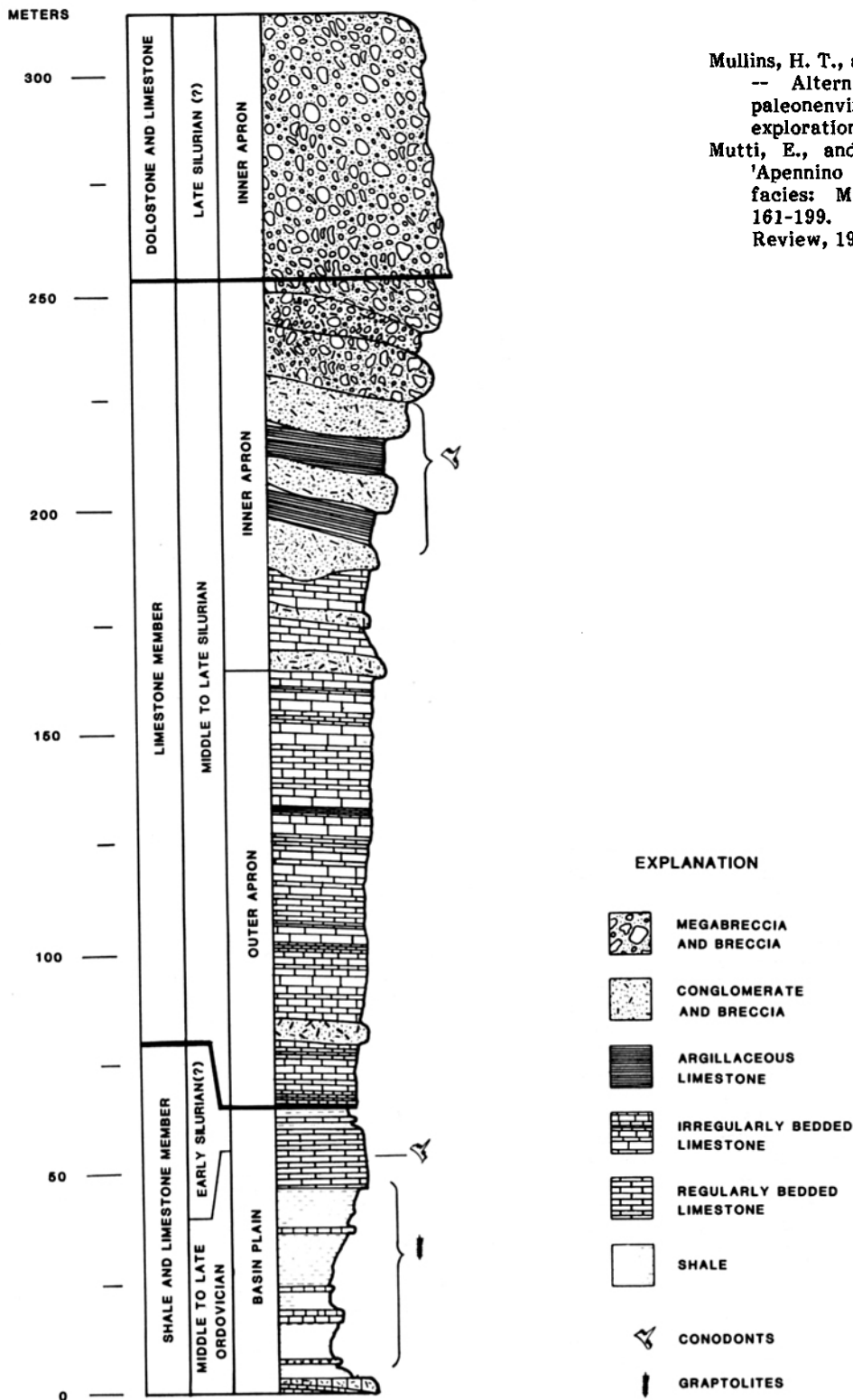


Figure 1. Reconstructed stratigraphic section of the Deceit Formation: a prograding base-of-slope apron sequence. Horizons containing significant paleontologic evidence are indicated. Informal member terminology, ages, and environmental interpretations are shown as well.