72-324

(544)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

RECONNAISSANCE GEOLOGIC MAP OF THE WEST HALF OF THE SOLOMON QUADRANGLE, ALASKA

By

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Open-file report

1972

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This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards or nomenclature.

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INTRODUCTION

The Solomon quadrangle adjoins the Bering Sea east of Nome, Alaska. It has a common west border with the Nome quadrangle (Sainsbury and others, 1972b) and a common north border with the Bendeleben 1:250,000-scale quadrangle.

Part of the area was mapped by Smith (1910), who discussed the rocks in some detail. The rocks mapped by Smith were remapped in 1971 along with the unmapped part of the west half of the Solomon quadrangle. Maps covering half the area of the present report have been issued in preliminary form at a scale of 1:63,360 (Sainsbury and others, 1972, 1972a). Consequently, only a brief text accompanies this map.

The east half of the Solomon quadrangle has been mapped by Thomas P. Miller, U.S. Geological Survey (unpublished). Mapping techniques of the various workers led to different maps and results; hence the map of the west half is presented only in preliminary form--a final compilation of the entire Solomon quadrangle may incorporate changes.

MAPPING METHODS

Geologic mapping was done by a combination of traverses by foot, by vehicle along roads, by helicopter, and by light aircraft. Map units selected are those established by Sainsbury elsewhere on the Seward Peninsula and in part by Smith (1910). Because of the extreme structural complexity, many details of the geology have been omitted from this map. The readers are referred to the cited reports for details and discussion of the map units.

GENERAL GEOLOGY

Stratigraphy

York Slate

The oldest rocks consist of the York Slate, generally a graphitic and carbonaceous quartz siltite which resembles slate and was so called by previous workers. Composed principally of silt-sized quartz grains, the York Slate is highly siliceous and is marked by numerous small deformed quartz veinlets. By variations in the amount of calcite and chloritic mica, the York Slate grades to quartz-calcite-mica schist or quartz-chlorite-graphite schist. Where the rocks are intensely deformed, the graphite or carbonaceous matter is largely expelled and the slate is a quartz-mica schist or gneiss of light color.

Thin dark limestones occur within the York Slate and are especially common near the top. Many are shown on the map.

Intercalated(?) within, and transitional above the York Slate, are large expanses and great thicknesses of metamorphosed mafic rocks. Two groups are differentiated. In the west, chloritic schists which appear to be metamorphosed mafic intrusive rocks cut out much of the slates. Within the chloritic schists are numerous more massive bodies, many of which contain garnet and glaucophane. These bodies may be related to the chloritic schists, or they may be mafic intrusives of much younger age.

In the central part of the quadrangle, feldspathic, chloritic schists (Casadepaga Schist, Smith, 1910) form two belts which may join to the south. At least some of these rocks definitely are metavolcanic. Some are garnet-glaucophane-bearing bodies similar to those in the chloritic schists.

These belts of mafic rocks are clearly shown by aeromagnetic surveys flown by the State of Alaska in 1971, for they give linear magnetic highs with sharp peaks over garnet-glaucophane bodies.

Argillaceous Dolomitic Limestone

Above the York Slate with a transitional contact lies a highly deformed sequence of thin-bedded argillaceous limestones. These weather to bare slopes covered by yellowish soil which is very diagnostic of the rocks. For a description of the unit where first mapped in the York Mountains some 100 miles west, see Sainsbury (1969a).

Ordovician(?) Limestone and Marble

Carbonate rocks of Ordovician(?) age form thick thrust plates northwest of the Casadepaga River. Originally named the Sowik Limestone by Smith (1910), the rocks are correlated by lithology with Ordovician rocks in the York Mountains (Sainsbury, 1969a). None are dated by fossils, and most are intricately deformed and converted to marble or dolomite near thrusts.

Devonian(?) Limestone and Marble

Rocks of presumed Devonian age are confined to a single part of a thrust sheet between Venetia and Gassman Creeks near the west margin of the quadrangle. They consist of dark marble and limestone with discontinuous beds and broken fragments of black shale. Structures suggestive of fossils are found sparingly. Devonian marble may be present also in the thrust plate of carbonate rocks southeast of the Casadepaga River east of Big Four Creek.

Limestone, Marble, and Dolomite of Paleozoic Age

Carbonate rocks assigned an undifferentiated Paleozoic age are exposed in thrust plates at many places in the quadrangle. Most are highly deformed, schistose, and converted to marble in which bedding is largely obliterated. No fossils have been found in these rocks. Relict fossils have been found in dolomitized Paleozoic(?) carbonates, partly replaced by silica, in the headwaters of the Sherrette Creek, a tributary of the Kruzgamepa River, in the northwest part of the quadrangle. These exposures are the best illustration of the widespread silicification of thrust sheets of carbonate rocks, where silica has migrated from the siliceous York Slate during thrusting.

Where chloritic schists or slate have been tectonically mixed with Paleozoic carbonate rocks, very thick sequences of impure rocks were formed. Only the more continuous bodies are differentiated on the map.

Rocks of Unknown Age

As discussed in detail by Sainsbury, Hudson, Ewing, and Richards (1972a) the problem of the origin and age of the garnet-glaucophane bodies remains one of the most important unsolved problems of the geology of the Seward Peninsula. Two ages of intrusives seem to be represented (Sainsbury and others, 1970). The younger of these may be as young as Early to Middle Cretaceous in age, having been intruded during the early part of the thrusting.

Throughout the west part of the quadrangle, numerous highly deformed limestones were mapped. Where present in small exposures, beneath thrust plates, or in thin beds, these carbonate rocks cannot be assigned by age.

Surficial Deposits

The surficial deposits include glacial moraine, high-level terrace gravels along the lower Casadepaga and Niukluk Rivers, alluvium along major streams, a very extensive and thick blanket of high-level gravels west of the Solomon River, and thick silts and sands in the central part of the quadrangle.

The thick gravels west of the Solomon River are covered almost completely by tundra, but exposures along major streams show that they are at least 50 feet thick, and range from coarse cobble- to pebble-size gravel, the clasts of which are rounded by stream action. These could represent outwash gravels related to the glaciation that produced moraines in the Kruzgamepa River valley.

The thick silts and sands northwest of Golovnin Lagoon lap upward onto the low hills to the west, where they are well exposed in most stream valleys. Here they consist principally of well-sorted sands. Their origin is not settled, but they may be glacially derived.

Structure

The geologic structure is so complex that it will be merely touched upon here. As a consequence of overthrust faulting in the Collier thrust belt (Sainsbury, 1969b), a marked cleavage was imparted to the rocks, northwest-trending folds were developed and then deformed during continued thrusting, and rocks of diverse type were tectonically mixed. Following the thrusting, several distinct sets of normal faults were developed, chopping the thrust plates into linear outcrop patterns trending northwest.

Following the development of the faults trending northwest and northeast, the Kigluaik Mountains, in the northwest corner of the quadrangle, were uplifted to form a horst bounded on the north and south fronts by strong normal faults trending east-northeast.

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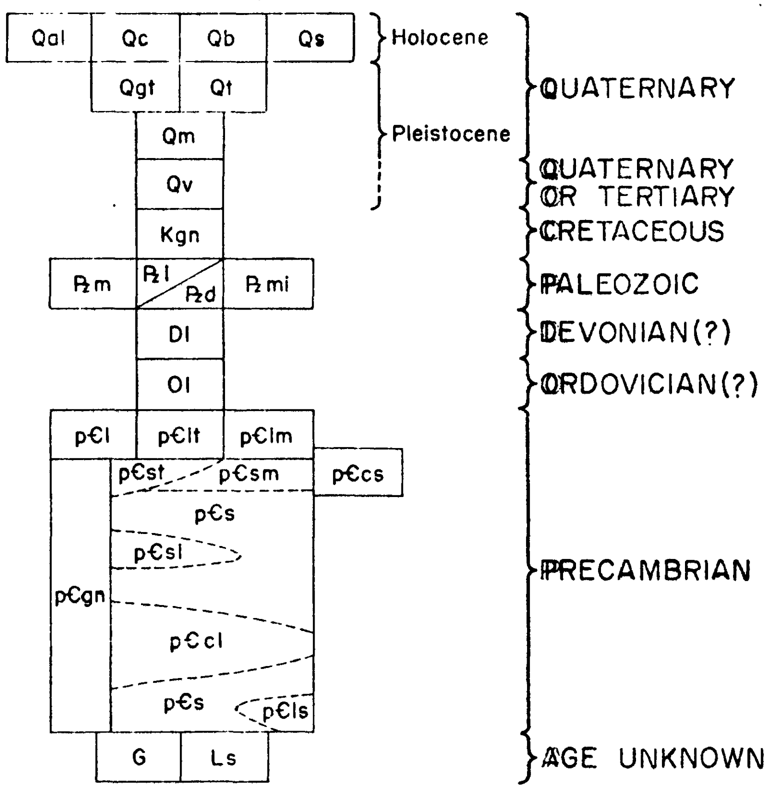
EXPLANATION

Correlation of map units



Description of map units

Qal	Alluvium
Qc	Surficial cover - principally tundra and soil, locally frost-riven regolith and colluvium partly covered by tundra
Qb	Beach deposits
Qs	Sand and silty sand, locally well washed. May be related to a former sea level higher than present
Qgt	Tundra-covered gravel
Qt	Terrace gravels along the Casadepaga and upper Niukluk Rivers
Qm	Morainal deposits and stream alluvium composed principally of reworked morainal deposits. Shown only where bedrock is completely mantled. Mostly covered by tundra (not shown on moraine)
Qv	Basaltic volcanic rocks, present only on Bear Creek
Kgn	Gneissic and cataclastic-textured coarse-grained porphyritic biotite granite
	LIMESTONE, MARBLE, AND DOLOMITE
Pzl	Limestone and marble with readily discernable bedding. Consists principally of medium-bedded gray to dark-gray limestone, weathering medium gray
Pzd	Dolomite
Pzm	Marble and schistose marble - local relict bedding and structures suggestive of fossils or chert nodules, local color variations reflect original lithologic differences
Pzmi	Tectonically mixed rocks consisting of Paleozoic carbonate rocks and chloritic schist or slate
Dl	Dark carbonaceous limestone with discontinuous beds and fragments of black shale
Ol	Medium- to thick-bedded gray to dark-gray limestone, in part converted to marble

ARGILLACEOUS DOLOMITIC LIMESTONE

p€l — Thin-bedded schistose argillaceous and dolomitic limestone; generally highly deformed, and containing numerous vitreous quartz veinlets. Weathers to thin slabs and fragments stained limonitic yellow

p€lt — Highly deformed equivalent of p€l - more schistose and more micaceous

p€lm — Marbleized equivalent of p€l

p€cs — CASADEPAGA SCHIST - Feldspathic, chloritic schist of igneous origin

YORK SLATE

p€s — Faintly- to moderately-foliated graphitic siltite, phyllite, and calcareous graywacke

p€st — Layered quartz gneiss, quartz-biotite semi-gneiss, and quartz schist; tectonic equivalent of p€s

p€sm — Biotite-quartz-graphite schist, graphitic siliceous calc-silicate rock, and andalusite-biotite schist; all are metamorphosed equivalents of p€s and p€st

p€sl — Medium- to dark-gray limestone and marble that weather medium gray where least deformed. Most common in upper part of p€s unit

p€cl — Chlorite-albite-epidote-amphibole schist, in part of volcanic origin, and less schistose, epidote-plagioclase-amphibole rock which may represent metamorphosed intrusive rocks of much younger age

p€ls — Schistose marble surrounded by chloritic schist; may represent limestone originally intercalated in a marine volcaniclastic sequence. Commonly contains chlorite and quartz grains

p€gn — Quartz-biotite-graphite-plagioclase-garnet paragneiss and semi-gneiss, locally containing sillimanite. Many small bodies of younger granitic rock are unmapped. Boundaries with p€sm and p€st are gradational, suggesting gneiss is a high-grade equivalent of the York Slate

UNITS OF UNKNOWN AGE

G — Gabbro, metagabbro, and metamorphosed dark igneous rocks - locally intrude thrust sheets of Paleozoic carbonate rocks, as well as chloritic schist; many are garnet-glaucophane rocks. In an earlier report (Sainsbury and others, 1970) these were referred to the Precambrian, but some may be as young as Early Cretaceous, and intruded in the early stages of the thrusting. Only the more conspicous bodies are shown

Ls — Schistose limestone and marble - isolated exposures which cannot be assigned but which probably belong to one of the known units

Placer gold mine

A B C

Contacts

A. Transitional across a few feet to hundreds of feet
B. Sharp contact well exposed
C. Open ends indicate that bed continues an unknown distance beyond exposure

All contacts dashed where inferred or approximately located, dotted where concealed

A B

Faults

A. Thrust fault; sawteeth on upper plate. Dashed where approximately located, dotted where concealed, queried where inferred or doubtful
B. High-angle fault. Dashed where approximately located, dotted where concealed, queried where doubtful

Anticline. Dashed where axis is approximately located