UNITED STATES DEPARTMENT OF THE INTERIOR

537

GEOLOGICAL SURVEY

PRELIMINARY GEOLOGIC MAP OF THE EASTERN SOLOMON AND SOUTHEASTERN BENDELEBEN QUADRANGLES, EASTERN SEWARD PENINSULA, ALASKA

By

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

EXPLANATION

Introduction

Parts of the area encompassed by the eastern Solomon and southeastern Bendeleben quadrangles were mapped in broad reconnaissance fashion by Mendenhall (1901) and Smith and Eakin (1911). The purpose of this report is to present the results of more recent mapping done at various times from 1968 to 1971. Additional mapping by Hopkins (1963) has been incorporated in the extreme northwestern part of the area as has data from Herreid (1965) near Omilak. Discussion of the economic geology will follow in a later report.

METAMORPHIC AND SEDIMENTARY ROCKS

p€mc

Metamorphic complex

Chiefly high-grade pelitic schist and gneiss with intercalated marble, calc-silicate gneiss and minor amphibolite. Pelitic schist and gneiss composed chiefly of quartz+plagioclase+biotite+muscovite+almandine±sillimanite±staurolite±K-feldspar±clinopyroxene±hornblende; cordierite and andalusite were found only near Omilak Mountain and north of Portage Roadhouse. Large outcrop areas of marble mapped separately as p€m. Calc-silicate gneiss is medium grained and composed of calcite+quartz+diopside±garnet±scapolite±plagioclase.

Unit is intruded by quartz monzonite (Kqm) stocks and dikes of aplite, graphic granite, and alaskite as well as the Darby and Bendeleben plutons; pegmatite dikes are common in Bendeleben Mountains but not in Darby Mountains.

Metamorphic complex is assigned a Precambrian age based on correlation with similar rocks in the Kigluaik Mountains which have yielded Precambrian Rb/Sr ages (Sainsbury and others, 1970). May include rocks that are stratigraphically equivalent to parts, or all, of rocks mapped as quartz-mica schist (p€qms) and graphitic schist (p€gs).

Phase assemblages indicate most of this unit belongs to the middle and upper almandine amphibolite facies of regional metamorphism.

p€m

Marble

Chiefly white, medium to coarsely crystalline and composed of calcite±diopside±foresterite±phlogopite. Only larger marble areas mapped separately from p€mc.

Tentatively assigned a Precambrian age based on interbedded relationships with pelitic schist and calc-silicate gneiss of p€mc but may include rocks as young as mid-Paleozoic.

mi

Migmatitic zone

Lithologically similar to p€mc but with granitic dikes, stocks, and bosses of probable Cretaceous age too abundant and intimately associated with metamorphic rocks to map separately.

Cut by lamprophyre dike swarm (not shown on map) near Cape Darby.

p€qms

Quartz-mica schist, metavolcanic rocks

Chiefly quartz-mica schist with lesser amounts of metavolcanic rocks (greenschist), graphitic schist, and marble. Quartz-mica schist is composed chiefly of quartz+chlorite+muscovite±albite±chloritoid±garnet± calcite and has a well-developed lineation and foliation. Metavolcanic rocks are chiefly greenschist composed chiefly of albite+actinolite+ chlorite+epidote±quartz±calcite±garnet. Graphitic schist is black, sooty, fine-grained siliceous rock composed chiefly of quartz+muscovite+graphite. Marble ranges from massive and crystalline to schistose. Phase assemblages indicate greenschist facies of regional metamorphism, in particular the quartz+albite+muscovite+chlorite subfacies (Winkler, 1967). Near Kiwalik Mountain, however, presence of biotite, and locally, kyanite and staurolite, indicate a higher grade metamorphism, probably in the lower almandine amphibolite facies.

Tentatively assigned a Precambrian age based on correlation with similar rocks in the western Solomon quadrangle which have been assigned by Sainsbury and others (1972) to the Casapedega schist and "York Slate" of Precambrian age.

p€gs

Graphitic schist, metasiltstone

Chiefly gray-black, quartz-muscovite-graphite schist with minor schistose marble; in northern Darby Mountains chiefly gray-black metasiltstone, marble, and gray-green calcareous metagraywacke.

Tentatively assigned a Precambrian age based on correlation with similar rocks assigned to the "York Slate" in the western Solomon quadrangle (Sainsbury and others, 1972).

p€sm

Schistose marble

Thin-bedded, schistose marble with minor graphitic, chloritic, and calc-schists. Weathers to characteristic buff to orange colored soil. Composed chiefly of calcite+albite+muscovite. Well-developed lineation and foliation.

Tentatively assigned a Precambrian age based on correlation with lithologically similar rocks in the western Solomon quadrangle (Sainsbury and others, 1972).

Dld

Limestone and dolomite

Chiefly white, massive, crystalline limestone with fetid odor; weathers to form barren gray-colored hills. Interbedded with dark gray to black, thin-bedded dolomite and dolomitic limestone; locally brecciated and fossiliferous. East of Darby Mountains, unit contains some dark gray phyllite and thin fault slices of schistose marble (not mapped separately) which may be correlative with p€sm. Intruded by numerous altered diabase dikes and plugs east of Darby Mountains.

Assigned a Devonian age based on fossil collections containing Amphipora, Thamnopora, Syringopora, and Cladopora (W. A. Oliver, 1971, written communication).

Kc

Conglomerate

Poorly sorted, thick-bedded cobble- and boulder conglomerate; clasts chiefly limestone with subordinate greenstone (Pmv) and schist. Minor interbeds of graywacke and thin coal seams.

Assigned a Cretaceous age based on correlation with similar rocks in the Candle quadrangle (Patton, 1967).

mls

Marble, limestone, and schist

Undifferentiated schistose marble and schist of probable Precambrian age (p€sm) and limestone of probable Devonian age (Dld). Mapped only in extreme northern part of map area and very poorly exposed with a widespread forest and tundra cover. Scattered exposures of different rock types of different age suggest a faulted and structurally complex area.

VOLCANIC ROCKS

Pmv

Mafic volcanic rocks
srp - serpentinite

Strongly sheared altered mafic volcanic and hypabyssal rocks composed chiefly of chlorite±epidote±albite±actinolite±glaucophane±pumpellyite± pyrite±relic augite. Forms a more-or-less continuous outcrop belt along eastern edge of map area and dikes and small plugs intruding Dld and p€sm throughout map area. A small serpentinite body (srp) occurs associated with sheared diabase between Kwiniuk River and Clear Creek in the eastern Solomon quadrangle and locally in fault slivers near Elim.

Tentatively assigned a Permian age based on lithologic correlation with similar rocks on St. Lawrence Island and on the south flank of the Brooks Range (Patton, 1971).

Qlj Lost Jim flow
Qg Gosling volcanics
QTi Imuruk volcanics
QTb Undifferentiated basalt

Chiefly tholeiitic and alkali olivine basalt with lesser amounts of nephelinitic basalt; some intercalated gravel. Relatively flat-lying but with local dips as much as 40°. Queried where completely concealed by overburden and presence is suggested only by aeromagnetic surveys (State of Alaska, Div. of Geological Survey, Aeromagnetic Survey, Bendeleben A-1, A-2, and B-1).

Areas mapped as Lost Jim flow, Gosling volcanics, and Imuruk volcanics in extreme northwest part of map are taken from Hopkins (1963). Imuruk volcanics in Koyuk River valley may include some Gosling volcanics. Most areas mapped as QTb have a near-complete cover of silt and tundra.

The Imuruk volcanics are considered by Hopkins and others (1971) to range in age from Late Tertiary to Middle Pleistocene and the overlying Gosling volcanics and Lost Jim flow to be Quaternary in age (Hopkins, 1963).

INTRUSIVE ROCKS

Kmgn

Granite gneiss of Kiwalik Mountain pluton

Fine-grained biotite-muscovite granite gneiss with well-developed foliation. Has sharp contacts with surrounding quartz-mica schist unit (p€qms) and may be intrusive into it. Absolute age unknown but well-developed metamorphic fabric suggests an age older than nearby unmetamorphosed Cretaceous plutons.

Kkms

Monzonite and syenite of Kachauik pluton

Leucocratic to mesocratic, porphyritic and trachytoid, coarse-grained monzonite and syenite. Cut by aplite, quartz latite porphyry (Kql), lamprophyre, and alkaline dikes (Kad). Tentatively assigned a mid-Cretaceous (Albian-Cenomanian) age based on a K-Ar age of 97.5±3 m.y. (M. A. Lanphere, written communication).

Kkhd

Hybrid diorite of Kachauik pluton

Chiefly mesocratic to melanocratic, coarse-grained hybrid diorite characterized by abundant biotite. May be a border phase of the monzonite and syenite of Kachauik pluton (Kkms).

Kkgm

Gneissic monzonite of Kachauik pluton

Leucocratic to mesocratic, medium-grained, gneissic to trachytoid monzonite. Cut by alkaline dikes (Kad). May be a border phase of monzonite and syenite of Kachauik pluton (Kkms).

Kdns

Nepheline syenite of Dry Canyon pluton

Leucocratic, porphyritic to trachytoid, medium-grained nepheline syenite (foyaite). Cut by blue-gray pulaskite dikes. Tentatively assigned a mid-Cretaceous age based on K-Ar age of 105±3 m.y. (M. A. Lanphere, written communication). Includes some monzonite and syenite similar to that in Kachauik pluton.

Kwcm ξ, ξq

Monzonite and quartz monzonite of Windy Creek pluton

Leucocratic, massive, locally porphyritic to trachytoid, medium-grained monzonite and quartz monzonite; includes some nepheline syenite. Commonly fractured and hydrothermally altered (Miller and others, 1971). Tentatively assigned a mid-Cretaceous age based on lithologic similarity to dated rocks elsewhere on eastern Seward Peninsula (Miller, 1972).

Kdqm ξq

Quartz monzonite of Darby pluton

Leucocratic, massive, coarse-grained quartz monzonite. Cut by aplite and lamprophyre dikes. Tentatively assigned a Late Cretaceous age based on K-Ar ages of 81.4±3 m.y. and 92.1±2.8 m.y. (M. A. Lanphere, written commun., 1969; 1970).

Kkg $r\delta$, ξq

Granodiorite of Kachauik pluton

Leucocratic, massive to porphyritic, medium-grained granodiorite and quartz monzonite. Cut by aplite, quartz latite porphyry, alkaline, and lamprophyre dikes. Tentatively assigned a Late Cretaceous age based on K-Ar age of 86.1±3 m.y. (M. A. Lanphere, written commun., 1970).

Kql $r\delta$

Quartz latite porphyry

Leucocratic, porphyritic, medium-grained quartz latite porphyry. Correlated with granodiorite of Kachauik pluton on basis of lithology and proximity and therefore assumed to be Late Cretaceous in age. More dikes are present than are shown on the map.

Kbqm ξq, $r\delta$

Quartz monzonite of Bendeleben pluton

Leucocratic, fine- to medium-grained quartz monzonite and granodiorite. Cut by aplite and alaskite dikes. Assigned a Late Cretaceous age based on a K-Ar age of 79.8±2.4 m.y. (M. A. Lanphere, written commun., 1969).

Kklq ξ_g

Quartz monzonite of Kuzitrin Lake pluton

Leucocratic to mesocratic, medium- to coarse-grained, generally porphyritic quartz monzonite and granodiorite. Numerous inclusions and signs of contamination along the southern margin of the pluton. Tentatively assigned a Late Cretaceous age.

Kad

Alkaline dikes

Pulaskite, foyaite, and pseudoleucite porphyry dikes intrusive into granodiorite (Kkg) and monzonite and syenite (Kkms) of Kachauik pluton. Forms large dike swarm in the Kachauik pluton only a few of which are shown on the map. Absolute age unknown but assumed to be Late Cretaceous.

Kqm ξ_g

Quartz monzonite

Leucocratic, fine-grained quartz monzonite intrusive into metamorphic complex (p€mc) and migmatitic zone (mi); only larger bodies shown. Assumed to be Cretaceous in age.

Khi

Hypabyssal intrusive rocks

Chiefly quartz latite, latite, and quartz porphyry with numerous screens of metamorphic rocks. Considerable hydrothermal alteration. Assumed to be Cretaceous in age.

Ksd δ

Diorite of Spruce Creek pluton

Poorly exposed, altered, fine- to medium-grained diorite(?). Assumed to be Cretaceous in age.

UNCONSOLIDATED SEDIMENTARY DEPOSITS

(Mapped chiefly from aerial reconnaissance and photos)

Qm

Morainal deposits

Chiefly gravel and sand with well-developed morainal topography; only larger areas shown. Prominent lateral and terminal moraines shown by hachured line. Probably correlative with Nome River (Illinoian) and Salmon Lake (Wisconsin) glacial stages of Hopkins (1963).

Qo

Outwash deposits

Chiefly gravel, sand, and silt deposits; includes some flood-plain deposits. Topography characterized by numerous small lakes, ponds, and marshes.

Qca

Colluvium and alluvium

Chiefly colluvial and alluvial deposits of gravel, sand, talus, and silt, including windblown silt but includes some flood-plain and morainal deposits. Thick cover of tundra and forest.

Qs

Sand deposits

Chiefly windblown sand deposits south of Fish River delta.

Qfty

Qfto

Flood-plain and tidal flat deposits

Chiefly silt and fine sand deposits. Gravel in small streams draining upland areas. Topography of old deposits (Qfto) characterized by development of abundant small thaw lakes and ponds. Topography of young deposits (Qfty) characterized by bars, ox-bow lakes, meander scrolls, abandoned channels, and braided distributary streams.

Qf

Flood-plain deposits

Chiefly fine sand and silt. Topography characterized by bars, ox-bow lakes, meander scrolls, and abandoned channels.

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