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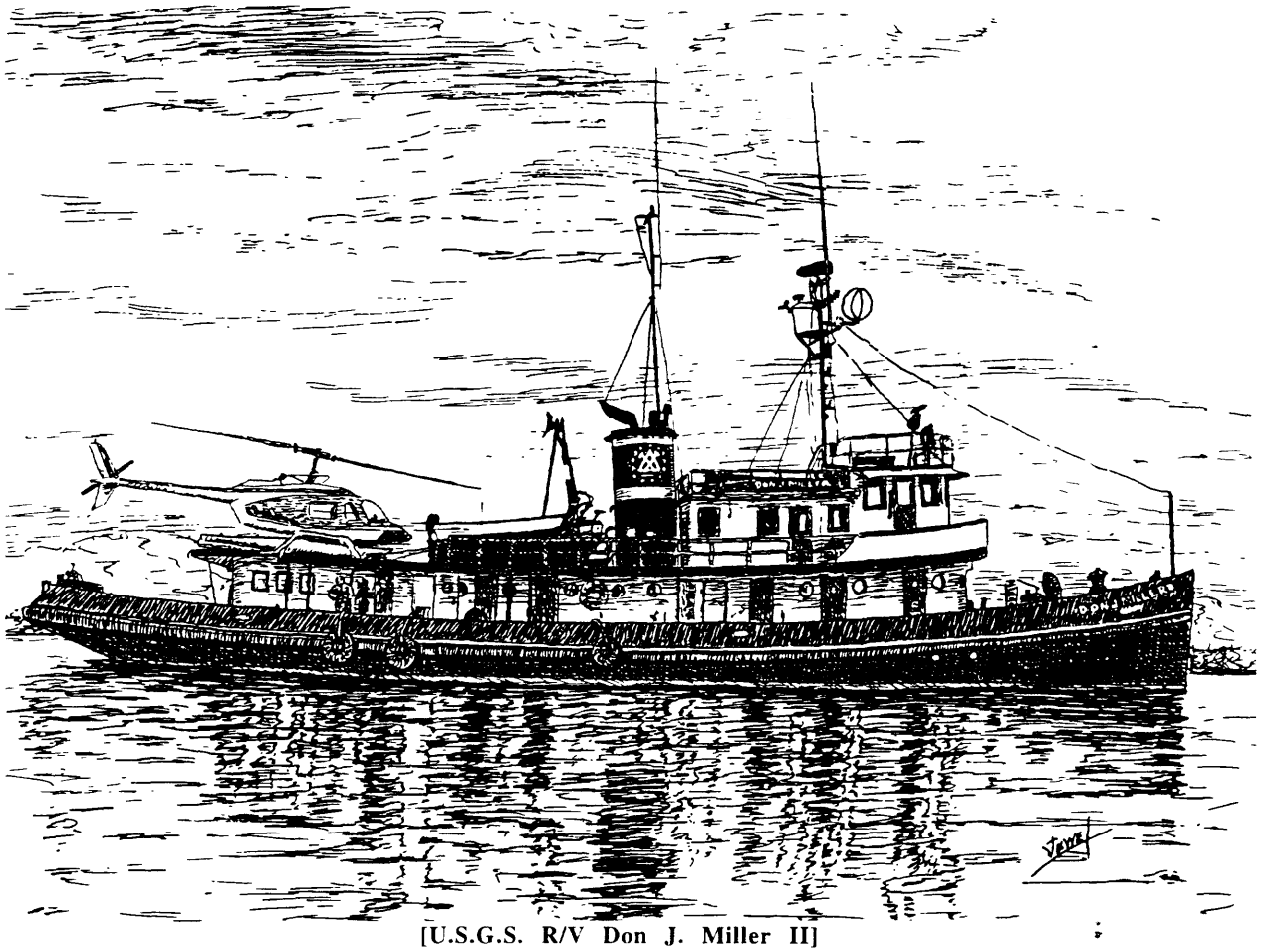

[U.S.G.S. R/V Don J. Miller II]

RECONNAISSANCE GEOLOGIC MAP OF THE PETERSBURG C-4 QUADRANGLE, SOUTHEASTERN ALASKA

Open-File Report 97-156-J

By David A. Brew

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Reconnaissance Geologic Map of the Petersburg C-4 Quadrangle, Southeastern Alaska

By

David A. Brew[1]

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[1]Research Geologist *emeritus*
USGS, MS 904
Menlo Park, California 94025

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INTRODUCTION

This map and its accompanying information were prepared specifically as part of the State of Alaska Division of Geological and Geophysical Surveys and the U.S. Department of Interior Bureau of Land Management Alaska Minerals Section (Juneau, Alaska) mineral-resource studies of part of the Petersburg, Alaska 1:250,000-scale quadrangle. These studies are a direct follow-up to the U.S. Geological Survey studies in the area in the 1980's, which are cited below.

The geologic information presented here has been released previously in generalized form (Brew and others, 1984); the information is based on reconnaissance field mapping and thus does not have the density of field-station control, samples, or field observations that are expected in most U.S. Geological Survey 1:63,360-scale geologic maps. This map is one of a series that share the same format and general information (Brew, 1997a-m; Brew and Koch, 1997). There are both a combined description and a combined correlation of the map units for this whole series of maps (Brew and Grybeck, 1997).

The available information on known mineral deposits in the whole Petersburg/Wrangell area was released previously (Grybeck and others, 1984) and Brew and others (1989, 1991). Bedrock, stream-sediment, and other geochemical data were released and interpreted by Karl and others (1985), Karl and Koch (1990), Cathrall and others (1983a-w), and Tripp and Cathrall (1984). Aeromagnetic and aeroradioactivity surveys information was released by the U.S. Geological Survey (1978, 1979) and Bouguer gravity information by Barnes and others (1989). Remotely-sensed features were described by LeCompte (1981). Burrell and others (1982) released a preliminary bibliography of Petersburg and Port Alexander quadrangles-related items.

Assessments of the undiscovered mineral resources for the whole Petersburg/Wrangell area are also available (Brew and others, 1989, 1991; Brew and Drinkwater, 1991). Some of the mineral-resource-assessment tract information in neighboring areas was revised by Brew and others (1996). Brew (1993) presented a generalized view of metallogenic belts that includes this area.

Detailed information on the Late Cretaceous plutonic rocks in the Petersburg 1:250,000-scale quadrangle is found in Burrell (1984abc); major-element chemical and other data for the area were reported by Douglass and others (1989), and relatively young volcanic features were described by Brew and others (1984) and by Brew (1990). McClelland and Gehrels (1990) reinterpreted some of the geology in and around the Duncan Canal area of this quadrangle.

The index map on the over-size sheet shows the major geological elements of the Petersburg-Wrangell area. They are, from west to east, (1) the Alexander belt, consisting of generally unmetamorphosed Lower Paleozoic through Upper Triassic rocks intruded by scattered mid-Cretaceous plutons, (2) the Gravina belt, consisting of unmetamorphosed to highly metamorphosed, variably deformed Upper Jurassic(?) through mid-Cretaceous flysch and volcanic rocks intruded by both mid- and Upper Cretaceous plutons, and (3) the Mainland belt, consisting of metamorphic rocks intruded by Upper Cretaceous, lower Tertiary, and mid-Tertiary plutons. Younger than almost all parts of all of these belts, and extending from the Alexander belt across the Gravina and onto the mainland belt, is the lower to middle Tertiary Kuiu-Etolin belt that consists largely of varied volcanic rocks, associated plutons, and minor sedimentary rocks. The Alexander belt corresponds more or less to the Alexander terrane of Berg and others (1978), the Gravina belt is a refined interpretation of their Gravina belt. This quadrangle includes rocks of the (1) Duncan Canal-Zarembo Island-Screen Islands sub-belt of the Gravina belt, (2) Gravina belt itself, and (3) Kuiu-Etolin belt (see Correlation of Map Units diagram on the oversize sheet).

DESCRIPTION OF MAP UNITS

[Note: All formational and descriptive map-unit names in the text of the following descriptions are set off with quotation marks to make them easier to identify.]

Qs SURFICIAL DEPOSITS (Holocene and(or) Pleistocene)--Includes alluvium, colluvium, tidal mudflat deposits, and some glaciofluvial deposits. The distribution of most large areas of surficial deposits are shown, but the deposits have not been studied in detail in the field and many small areas are not shown.

KUIU-ETOLIN BELT

Belt informally named by Brew and others (1979), redefined by Brew and Morrell (1983), and the age revised by Brew and others (1985).

EXTRUSIVE AND INTRUSIVE VOLCANIC ROCKS OF KUIU-ETOLIN VOLCANIC-PLUTONIC BELT (Quaternary and Tertiary)--Diverse volcanic rocks exposed in a broad area extending from northeastern Kuiu southeastward through Kupreanof and Zarembo Islands. Divided into:

Qb Extrusive Basaltic Rocks and Underlying Sediments (Holocene and(or) Pleistocene)--
Fresh, locally polygonally jointed, dark greenish gray, dense, very fine-grained to aphanitic magnetite-bearing olivine basalt and minor pyroxene basalt. Individual flows are as much as 10 m thick and are columnar jointed; most flows are less than 1 m thick. Underlain locally by aa flows, mafic volcanic breccia in layers up to 0.5 m thick, and by locally derived, poorly sorted, well-bedded brown- to gray-weathering conglomerate, pebbly sandstone, sandstone and minor siltstone deposited in fluvial or beach environment. Quarry on peninsula in Kah Sheets Bay in the southern part of this quadrangle exposes polymictic glacial till that is mapped with this unit in small lens under dense aphanitic basalt; whole unit is interpreted to be Pleistocene or younger. Three whole-rock K-Ar ages on basalts from a few miles south of Kah Sheets Bay gave ages of 0.272±0.085, 0.262±087, and 4.04±6.95 Ma (M. A. Lanphere, U.S. Geological Survey, written communs., 1972). Exposed elsewhere along south shore of Kupreanof Island from Kah Sheets Bay to Douglas Bay and from west of Totem Bay to beyond Point Barrie and at Indian Point and on High Castle Island in Duncan Canal. Equivalent rocks may be included with "Basalt and Other Mafic Extrusive Rocks" (QTb), particularly along Rocky Pass and near the mouth of Irish Creek.

Extrusive and Intrusive Volcanics and Volcaniclastic Rocks (Quaternary(?) and Tertiary)--
Complicated intrusive and extrusive volcanic pile best exposed on southwestern Kupreanof Island and on Zarembo Island; may include rocks that should be assigned to "Extrusive Basaltic Rocks and Underlying Sediments" (Qb) but which cannot be distinguished in the field from older basalts. Originally considered to be the southeastern, and more varied extension of "Admiralty Island Volcanics" named by Loney (1964) and assigned a late Eocene to Oligocene age on Admiralty Island. That age revised to Eocene to Miocene(?) by Lathram and others (1965); K-Ar dating (G. Plafker, U.S. Geological Survey, oral commun., 1982) of volcanic rocks there indicates a Miocene age. However, the "Admiralty Volcanics" are now considered to be a different but possibly time-equivalent unit. Time- and litho-stratigraphic relations are uncertain, but dominant rhyolites and basalts appear to have erupted at undetermined times and in no obvious or simple sequence from Paleocene (as indicated by the age of the locally underlying "Kootznahoo Formation") to Holocene (as inferred from the possible inclusion of Quaternary volcanic rocks in the unit). The unit may include rocks erupted throughout the Tertiary and Quaternary, but there is likely a significant Oligocene break. Stratigraphically complicated with major lithologic types occurring repeatedly throughout the section. Some suggestion that "Altered Dellenite, etc." (QTf), and "Gabbro and Microgabbro" (Tmgb) exposed elsewhere in the Petersburg-Wrangell area occur only low in the section. "Siliceous Volcaniclastic Rocks" (QTc) occur in and around "Rhyolite, Rhyodacite, etc." (QTr); see also Muffler (1967). Divided into:

QTr Rhyolite, Rhyodacite, and Related Siliceous Extrusive and Intrusive Rocks--

In general, aphanitic to finely crystalline; generally quartz and feldspar porphyritic; C.I. less than 1. Locally layered, spherulitic, and(or) miarolitic; light gray where fresh; buff, white, green lavendar, maroon, or pink where altered; generally rusty weathering. Pyrite and zeolites common. Many exposures are complicated mixtures of discontinuous mm-scale flow layered, brecciated, spherulitic, and phenocrystic rocks. Varied stratigraphy includes lava flows, obsidian flows, lahars, welded and nonwelded ash, tuff, and lapilli; all cut locally by porphyritic rhyolite and rhyodacite dikes. Vents and domes are indicated by extreme alteration, brecciation, attitudes of layering, and dikes; isolated massive structureless rhyolite bodies suggest plugs; columnar-jointed cliff exposures in excess of 100 m thick are interpreted as cooling units. Exposed in southwestern part of quadrangle on southern Kupreanof Island.

QTa Andesite and Other Intermediate Extrusive Rocks--

Dark gray where fresh, green to maroon where altered, blocky weathering, pyroxene and feldspar porphyritic, massive to vesicular and amygdaloidal flows 10-50 cm thick. Apparently intercalated with basalts in southern Rocky Pass area between Kuiu and Kupreanof Islands; occurs in the southwestern part of this quadrangle, especially near exposures of "Rhyolite, Rhyodacite, etc." (QTr) near Kah Sheets Lake.

QTb Basalt and Other Mafic Extrusive Rocks--

Dark gray where fresh, rusty weathering, platy, blocky, or columnar jointed flows 50 cm to several meters thick. Commonly vesicular and amygdaloidal. Amygdule fillings include calcite, epidote, chalcedony, chlorite, and zeolites, in order of decreasing abundance. Platy flows are pyroxene microporphyritic; massive flows may contain magnetite, pyroxene, and olivine. Intercalated mafic tuff and flow breccia of uneven thickness, less than 1 meter thick. Section of gently east-dipping flows greater than 500 m thick extends from Port Camden on Kuiu Island, across Rocky Pass to western Kupreanof Island. Mafic dikes and small localized flows occur higher in the section.; Exposed near the southwesternmost edge of this quadrangle. Most extensive volcanic unit in the Kuiu-Etolin belt; may also underlie much of exposed extrusive volcanic section on Kuiu, Kupreanof, and Zarembo Islands.

INTRUSIVE GRANITIC AND OTHER ROCKS OF KUIU-ETOLIN VOLCANIC PLUTONIC BELT (Miocene and(or) Oligocene--K-Ar determinations of about 20-22 Ma obtained on rocks from the "Granite of Central and Northern Etolin Island" (Tmge) (M. A. Lanphere, U.S. Geological Survey, written communs., 1981, 1982). Descriptions of the rocks of this belt given by Hunt (1984). In this quadrangle there is one unit:

Tmqk Heterogeneous Granitic Rocks of Central Kupreanof and Northeastern Kuiu Islands--Biotite-hornblende granite, quartz syenite, quartz monzonite, and quartz monzodiorite. Poorly exposed, nonfoliated; hypidiomorphic, inequigranular to porphyritic. Fine- to medium-grained; C.I. 02 to 20. Miarolitic cavities common and locally abundant, as are fine-grained mafic inclusions. Feldspar mineralogy consists of microperthitic alkali feldspar which commonly rims plagioclase grains, common and locally pervasive micrographic intergrowths, and some potassic alteration of plagioclase. Mafic mineralogy consists of brown biotite (often partially replaced by chlorite), green-brown to blue-green hornblende (commonly associated with a pale-green fibrous secondary amphibole), and rare pale pyroxene. Accessory minerals include locally abundant sphene, magnetite, and rare allanite; epidote occurs as miarolitic cavity fillings. Includes minor amounts of pyroxene-rich, coarse- to medium-grained quartz monzodiorite (C.I. 25-35), and of medium-grained, subophitic, pyroxene-biotite diorite (C.I. 40-50) similar to "Diorites associated with the granitic rocks on northwestern Kuiu and Zarembo Islands" (Tmaz and Tmdk). Unit is exposed in a plug on Kah Sheets Creek in this quadrangle, on northwestern Kuiu Island southwest of Threemile Arm (where it also forms dikes which invade the adjacent country rocks), and as small plugs on Horseshoe and Monte Carlo Islands in Keku Strait. Various phases of these plutons have counterparts among all of the other coeval plutons in the quadrangle; they differ from various granitic units on Etolin Island in generally lower quartz and greater plagioclase content, finer grain size, and generally higher C.I.

GRAVINA BELT

The term Gravina belt is used here to denote sedimentary and volcanic rocks of Late Jurassic and Early Cretaceous age, as well as the pre-Cenozoic granitic and other rocks that intrude them, in the east-central part of the Petersburg-Wrangell map area. As used here, the term also includes rocks of indeterminate Mesozoic age in a broad zone to the west of and adjoining the Jurassic and Cretaceous rocks. This zone is called the Duncan Canal-Zarembo Island-Screen Island sub-belt and it has within it blocks of Paleozoic and Mesozoic rocks unlike any elsewhere in the Gravina belt, but similar to some in the Alexander belt. The Gravina belt as used here more or less corresponds to the Gravina belt as defined by Berg and others (1978), but the map distribution does not correspond because of newer information and differing interpretations.

INTRUSIVE ROCKS OF ADMIRALTY-REVILLAGIGEDO PLUTONIC BELT AND ASSOCIATED MIGMATITE (Upper Cretaceous)--Belt informally named by Brew and Morrell (1983) and described by Burrell (1984abc); K-Ar determinations (M. A. Lanphere, U.S. Geological Survey, written communs., 1981, 1982) interpreted to be applicable to the whole suite, including the rocks in this quadrangle, are as follows:

Map unit	General location	Biotite age	Hornblende age
Ktif unit	Wrangell Is.	83.2 Ma	91.6 Ma
" "	Mitkof Is.	-	89.1 Ma
Ktef unit	Zarembo Is.	90.4 Ma	93.0 Ma

Somewhat similarly dated rocks occur in lithically correlative units to the east in the Bradfield Canal quadrangle (R. L. Elliott and R. D. Koch, oral commun., 1982; Koch and Berg, 1996). As mapped in this quadrangle, divided into:

Kqop Biotite-Epidote-Hornblende Quartz Monzodiorite--

Locally foliated; plagioclase-porphyritic with medium- and coarse-grained phenocrysts (to 12 mm), fine- to medium-grained groundmass (to 3 mm) and a C.I. range of 17 to 48. Weathers brownish-gray, gray and white where fresh. Body margins are commonly more mafic and have a very fine- to fine-grained groundmass. Also common are muscovite-biotite garnet-epidote aplite dikes of granitic and granodioritic composition. Mineralogy includes oscillatory zoned plagioclase with sericite alteration of the cores; interstitial quartz and K-feldspar; euhedral fine-grained hornblende; minor biotite; and primary (occasionally twinned and zoned) and secondary epidote. Unit is exposed on the Lindenberg Peninsula, in the northeastern part of this quadrangle on Kupreanof Island and on Woewodski Island, and on southwestern Mitkof, Woronofski and northern Zarembo Islands. Where mapped on northern Dry Island and eastern Mitkof Island, the compositions range from quartz monzodiorite to tonalite (Burrell, 1984ab).

Kdi Hornblende Diorite--

Hornblende diorite, quartz diorite, and minor tonalite; medium- to very-coarse-grained; C.I. 15 to 50; equigranular, except for local crowded plagioclase porphyry like the "Hornblende-Biotite Tonalite" (Ktop) mapped elsewhere in the general area (Brew and others, 1984). Weathers light to dark green; highly altered to epidote- and chlorite-rich rock. Crops out on and near Woewodski Island in this quadrangle. Differs from other Cretaceous granitic rocks in the high degree of alteration.

STEPHENS PASSAGE GROUP (Upper Cretaceous/Cenomanian to Upper Jurassic(?))--Name proposed by Lathram and others (1965) for the "...sequence of slate, graywacke, conglomerate, and augite-bearing volcanic flow breccia, Late Jurassic and Early Cretaceous in age, which forms a well-defined northwest-trending belt of rocks exposed along the eastern slopes and shores of Admiralty Island...". This sequence also occurs south and east of Admiralty Island (Souther and others, 1979) and extends southward into this area. Information presented by Brew and others (1984) showed that the Group is as young as Albian or Cenomanian in this area, i.e., late Early and early Late Cretaceous. The "Brother's Volcanics"/"Douglas Island Volcanics" unit probably intertongues with the "Seymour Canal Formation", probably near the top of the latter (Loney, 1964). Cohen and Lundberg (1993) reported on details of the "Seymour Canal Formation" north of this quadrangle. This group of rocks not mapped in this quadrangle, but its metamorphosed equivalents are:

METAMORPHOSED STEPHENS PASSAGE GROUP ROCKS (Upper Cretaceous)--In general, these units are associated with the Upper Cretaceous and Tertiary plutons (of the Kuiu-Etolin Belt) in the Gravina Belt. The rocks have been rather arbitrarily assigned a Late Cretaceous age and are described here or assigned a Tertiary age and described elsewhere as "Hornfelsed Seymour Canal Formation Rocks (Tsh)" based on the known or inferred age of the pluton(s) nearby. This results in a potentially misleading map pattern, however, because the metamorphic rocks adjacent to Tertiary plutons may have undergone Upper Cretaceous metamorphism as well and the units that are based on Tertiary metamorphic effects alone are poorly defined. The Cretaceous age assignment used here is also not entirely satisfactory from either a field mapping or petrographic study viewpoint. This is due to both the complexity of spatial overlapping metamorphic effects and the apparent lack of an unmetamorphosed protolithic unit for one of the metamorphic units mapped outside of this quadrangle. Three units mapped in this quadrangle, namely:

Ksg Greenstone and Greenschist--

Subgreenschist to greenschist facies rocks within the "Phyllite" (Ksp) on Lindenberg Peninsula, Kupreanof Island, in the northeastern corner of this quadrangle. Dominantly fine- to medium-grained, relict pyroxene-phenocryst-bearing epidote-albite-chlorite greenstone. Poorly foliated, weathers dark greenish gray, grayish-greenwhere fresh. Probably derived from intermediate composition volcanic breccias; forms poor rounded outcrops. Includes some greenschist and green phyllite, although most of the latter has been mapped with the "Phyllite" (Ksp). Age inferred from relation to that same unit.

Kss Schist and Hornfels--

Greenschist and albite-epidote to hornblende-hornfels facies metamorphic rocks derived from "Seymour Canal Formation" turbidites and related rocks (KJss). Original textures and structures generally preserved;. Dominantly fine- to medium-grained, grayish-brown and reddish-brown weathering. Locally foliated, commonly compositionally layered, chlorite-biotite-quartz-feldspar schist and semischist; minor phyllite. Some strongly hornfelsed rocks close to plutons; the clear-cut aureoles around Upper Cretaceous plutons are (garnet-andalusite-staurolite-) biotite-quartz-feldspar hornfels and schistose hornfels; some calc-silicate and intermediate composition layers and lenses locally. Age of metamorphism varies as described in headnote above; age of protolith is Late Jurassic to middle Cretaceous based on derivation of this unit from the Seymour Canal Formation.

Ksp Phyllite--

Subgreenschist and greenschist facies metamorphic rocks inferred to be derived from fine-grained sediments associated with the turbidites of the "Seymour Canal Formation" (KJss) mapped elsewhere in the Petersburg-Wrangell area. Original textures and structures generally obscure. Dominantly very-fine-grained, dark-gray weathering, carbonaceous chlorite-quartz-feldspar phyllite. Some interlayered graywacke and graywacke semischist; locally extensive layers and lenses of very-fine-grained, light to dark-green weathering chlorite-rich phyllite are interpreted to have been metamorphosed from fine-grained volcanic sediments such as tuffs or from highly transposed and tectonized coarser grained intermediate composition rocks. Age interpretation is the same as that given above for the "Schist and Hornfels" (Kss).

DUNCAN CANAL-ZAREMBO ISLAND-SCREEN ISLAND SUB-BELT OF THE GRAVINA BELT

See "Gravina belt" heading (above) for background information.

METAMORPHOSED STEPHENS PASSAGE GROUP AND OTHER ROCKS (Upper(?) Mesozoic)--Currently interpreted to be mostly metamorphic equivalents of the Stephens Passage Group, but some may be derived from "Cannery Formation" (Muffler, 1967; Brew and others, 1984), some from a different facies of the "Stephens Passage Group", and some from a previously unrecognized facies of Triassic rocks. In this quadrangle includes:

Mzs Semischist and Phyllite Metamorphosed From Graywacke and Siltstone--

Low grade (probably sub-greenschist facies) metamorphic rocks; locally highly folded; generally poorly foliated but finer-grained phases have good cleavage. Brownish-gray where fresh, gray to brown where weathered. Relict textures and sedimentary structures indicate derivation from a graywacke and siltstone or mudstone turbidite sequence. Unit in other quadrangles encloses several large lenses of "Fossiliferous Limestone" (Dls) of Devonian age, but there is no direct indication of the age. Proximity to "Seymour Canal Formation" (KJss) outcrops in other quadrangles and compatibility of the protoliths with that formation suggest that this unit is a metamorphic and deformed equivalent of that formation. Unit contrasts with the "Phyllite and Slate Metamorphosed From Mudstone and Minor Graywacke" (Mzp) in the proportion of originally coarse-grained sediments, and in the general absence of volcanic(?) protolith phyllite in this unit, and the two units probably intertongue much more complexly than is shown on the map. Exposed in this quadrangle in Duncan Canal, and on Woewodski, Zarembo, and Etolin Islands.

Mzl Massive Limestone--

Limestone and minor shale. Weathers light to medium gray, light gray where fresh. Poorly bedded at 10-50 cm scale in a few places; most is fine- to medium-grained and much may be recrystallized. No fossils (including conodonts) found, so age assigned is Upper(?) Mesozoic based on association with the enclosing units. It is equally likely that these lenses are somehow related to the "Fossiliferous Limestone" (Dls) of Devonian age. Unit crops out in this quadrangle near Duncan Canal on Kupreanof Island and elsewhere at Mosman Inlet.

Mzv Greenschist And Greenstone Metamorphosed From Intermediate To Mafic Volcanic Rocks--

Greenschist, greenstone, phyllite, minor semischist. Weathers light to dark green, locally brownish. Derived from pillow breccia, agglomerate flows, and possible tuffs. Appears less deformed and less metamorphosed than other nearby rock units. Probably several thousand meters thick. Locally abundant relict pyroxene phenocrysts suggest a close link to the "Douglas Island Volcanics" (KJsv). Inferred upper Mesozoic age based on association with other units. Unit contrasts with the "Phyllite and Slate Metamorphosed From Mudstone and Minor Graywacke" (Mzp) mapped elsewhere in the Petersburg-Wrangell area in its apparent lesser metatuff and its higher proportion of rocks of volcanic origin. Exposed in this quadrangle along and near Duncan Canal and Woewodski Island and elsewhere on Zarembo Island and on Key Reef in Clarence Strait.

Mzc Quartzite Metamorphosed From Chert--

Quartzite and minor phyllite. White or light gray where fresh and weathered, fine-grained, "ribbon" appearance common with relict beds 0.5 to 3.0 cm thick with very thin phyllitic partings. Individual outcrops are highly folded, but some lenses must have been at least several 10's of m thick originally, others may have been only a few m thick. No direct evidence of age; no Radiolaria recovered from several samples collected for that purpose. Crops out in Little Duncan Bay and in central Kupreanof Island.

Mzr Schist and Semischist Metamorphosed From Felsic Volcanic Rocks--

Quartz-feldspar schist and semischist, minor phyllite and greenstone. Fine-grained; light grayish green where fresh, orangish-brown where weathered. Thickness unknown; relations to adjacent units uncertain. Age inferred from spatial association with other units. Exposed on Woewodski Island and nearby in Duncan Canal in this quadrangle.

Mzp Phyllite and Slate Metamorphosed From Tuff, Mudstone and Minor Graywacke--

Chlorite phyllite, slate and semischist; minor conglomerate, limestone, and quartzite. Fine- to very fine-grained; highly folded, especially in northern Kupreanof Island. Some phyllite is light green where fresh and medium green where weathered and is inferred to have been derived from intermediate composition tuffaceous rocks; other phyllite is dark gray fresh and weathered and is inferred to have been derived from fine-grained clastic sediments; as are the dark gray fresh and weathered slates. Dark gray rocks are locally graphitic. Locally polymictic conglomerate layers less than 1 m thick occur only on northwestern Kupreanof Island . Thickness unknown, but probably great. One collection of conodonts from limestone layers in west-central Kupreanof Island indicates that the unit is at least in part Upper Triassic (B. R. Wardlaw and A. G. Harris, U.S. Geological Survey, written commun., 1983). Unit contrasts with the "Cannery Formation" (MDc) elsewhere in the Petersburg-Wrangell area because the unit contains less chert and is more deformed. It contrasts with the "Greenschist, Chert, Limestone, and Argillite" (Mzm) because this unit is of lower metamorphic grade and contains no limestone. Unit probably grades into the "Phyllite" (Ksp) to the east. Muffler (1967) mapped the exposures of this unit on northwestern Kupreanof Island as "Seymour Canal Formation" (KJss in this series of maps) on the basis of lithologic correlation with that unit on Admiralty Island to the north. Those rocks have been instead assigned to this unit because of difficulty in mapping them southward as a separate unit. Unit is exposed very widely as the most common unit in the northern part of the Duncan Canal-Zarembo Island-Screen Island sub-belt, especially in the northern part of this quadrangle.

Mzg Metamorphosed Gabbro--

Chlorite-amphibole-plagioclase rock interpreted to have been gabbro bodies, but could be highly metamorphosed mafic volcanic rocks. Dark grayish-green where fresh and weathered. Medium- to fine-grained; thickness uncertain. Some local suggestion of relict layering. No direct evidence of age. Crops out at Indian Point in Duncan Canal and on Woewodski Island in this quadrangle.

HYD GROUP(?) (Upper Triassic)--One unit mapped in this quadrangle, namely:

Trhv Felsic and Intermediate Volcanic Flows and Breccia, Limestone, and Argillite--
Dominantly very-fine to fine-grained, chlorite-quartz-muscovite-feldspar phyllite. Light to dark green where fresh, rusty and green where weathered; locally chertlike. Interpreted by Berg and Grybeck (1980) and Berg (1981) to be felsic metatuff. Also, thinly layered to laminated quartz-feldspar phyllite or semischist interpreted by the same workers to be metarhyolite. Associated with dark gray thin bedded carbonaceous mudstone, siltstone, and limestone. Thickness unknown, but probably at least several hundred meters. Age is Late Triassic-early Karnian; inferred from one collection of halobiid pelecypods from exposures on the west side of Duncan Canal (N.J. Silberling, U.S. Geological Survey, written commun., 1980). Host unit for massive sulfide deposits. Exposed along and near Duncan Canal, on the Castle Islands, and Woewodski Island in this quadrangle. The exposures on Rookery Island in Duncan Canal and on the northeast side of East Island in the Kashevarof Islands in the quadrangle to the south are well-bedded silty limestone of different and more uniform aspect.

DIs FOSSILIFEROUS LIMESTONE (Lower and Middle Devonian)--
Medium-bedded to massive, fine- to medium-grained;. Light to medium gray where fresh and weathered; locally fetid. Individual lenses up to several hundred m thick. Contains brachiopods, corals, crinoids, and (locally) fusulinids. Northwesternmost exposures (mapped by Muffler, 1967, as part of the "Gambier Bay Formation") contain corals or stromatoporoids of Middle Devonian or possibly Late Silurian age. Abundant old and new collections from the several fossiliferous lenses at and near the head of Duncan Canal contain Lower and Middle Devonian corals, brachiopods, and conodonts (Buddington and Chapin, 1929; A.G. Harris, U.S. Geological Survey, written communs., 1979, 1980, 1983; W.A. Oliver, Jr., U.S. Geological Survey, written commun., 1979; J.T. Dutro, Jr., U.S. Geological Survey, written communs., 1979, 1980) and the smaller lenses in Clarence Strait (Key Reef and Abraham Island) contain Lower(?) Devonian corals (W.A. Oliver, Jr., U.S. Geological Survey, written communs., 1978, 1983). Part of large exposure at Castle Islands in Duncan Canal was the host for a sulfide-barite deposit of significant size (Burchard, 1914); an alternative interpretation is that the block was of Triassic limestone (D.J. Grybeck, U.S. Geological Survey, written comm., 1997).

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