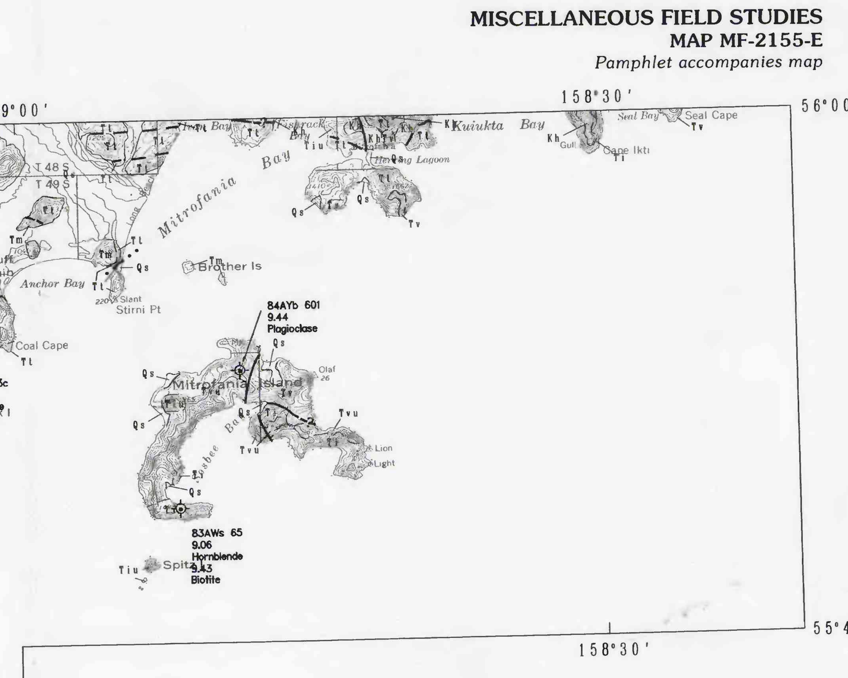
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-2155-E
Pamphlet accompanies map

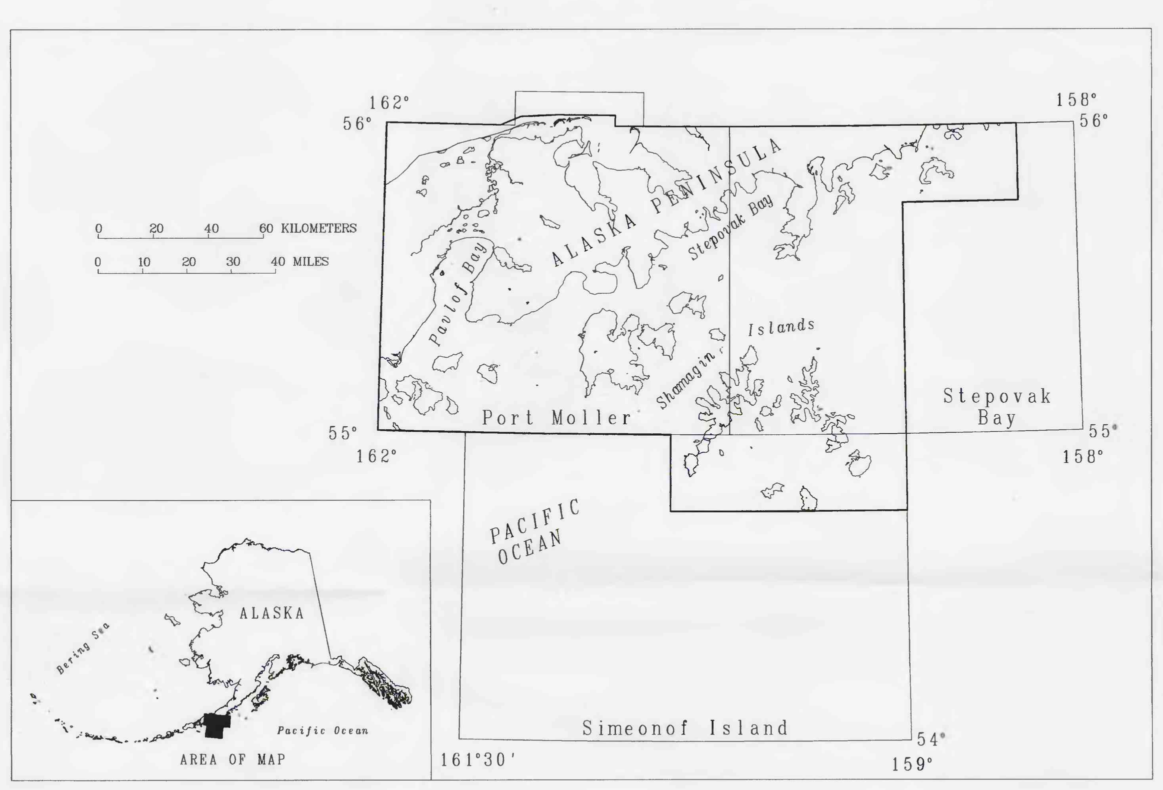
Base from U.S. Geological Survey
Port Moller, 1953 (revised 1988);
Simeonof Island, 1963; Stepovak Bay,
1963 (revised 1981)
Universal Transverse Mercator projection

SCALE 1:250 000

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETERS

CONTOUR INTERVAL 100 AND 200 FEET
DOTTED LINE REPRESENTS 100-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929



INDEX MAP SHOWING LOCATION OF PORT MOLLER, STEPOVAK BAY, AND SIMEONOF ISLAND 1:250,000-SCALE QUADRANGLES, ALASKA PENINSULA

Geology mapped by L.M. Angeloni, 1983-85; J.E. Case, 1977-78, 1983-85; C.L. Conner, 1982; John Decker, 1985; R.L. Detterman, 1977-78, 1982-86; G.D. DuBois, 1985; B.M. Gamble, 1983-84; Stephanie Zurinski, 1986; Louis Marincovich, Jr., 1982, 1984; J.W. Miller, 1982-85; M.A. Pernokas, 1983; Nora Shew, 1982; F.R. Weber, 1983-85; F.H. Wilson, 1977-78, 1982-86; M.E. Yount, 1977-78, 1982-85

Edited by C.L. Ostergren; prepared by L.M. Ghequiere

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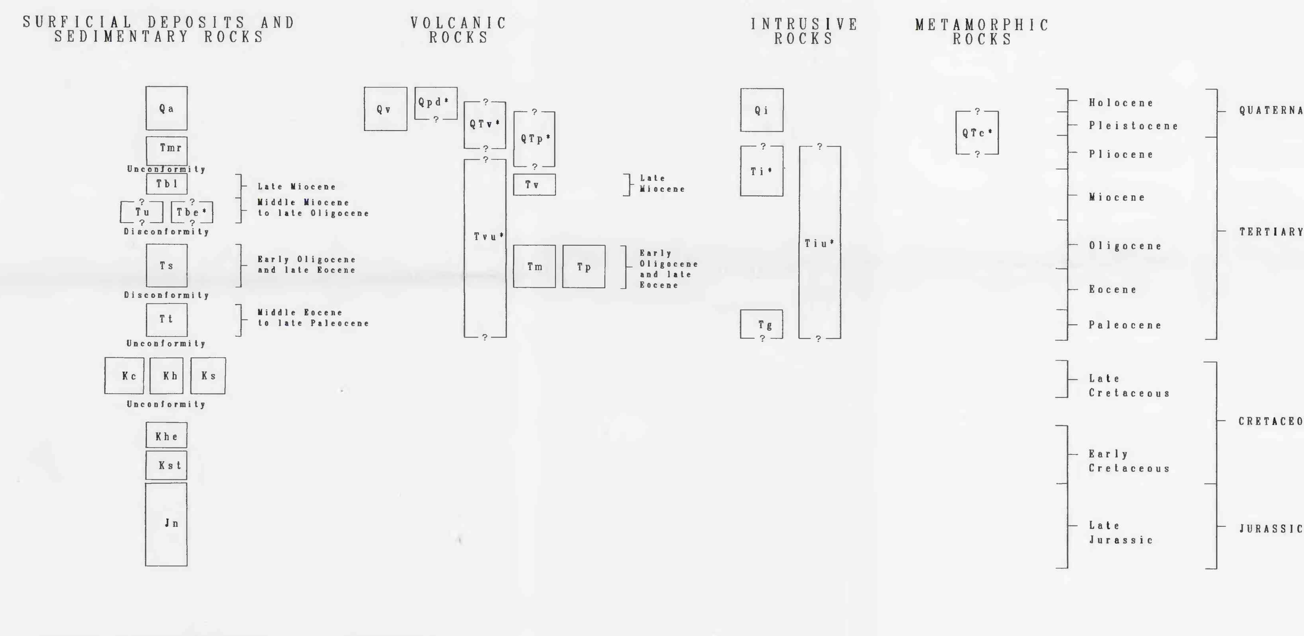
CORRELATION OF MAP UNITS



* See DESCRIPTION OF MAP UNITS for exact unit ages

DESCRIPTION OF MAP UNITS

[Geology by Frederic H. Wilson, Robert L. Detterman, and Ellen E. Harris. Stratigraphic nomenclature and age assignment from Detterman and others, in press]

SURFICIAL DEPOSITS AND SEDIMENTARY ROCKS

Qs **Surficial deposits (Holocene and Pleistocene)**--Unconsolidated, poorly to well-sorted, poorly to moderately well stratified sand, gravel, and silt. Also includes alluvial, colluvial, glacial, marine, lacustrine, and eolian deposits. Locally includes reworked volcanic-ash and debris-flow deposits

Tmr **Milky River Formation (Pliocene)**--Volcanogenic nonmarine sedimentary rocks and interlayered flows and sills. Upper part of unit contains numerous porphyritic andesitic lava flows, lahar deposits, and tuff beds interlayered with sedimentary rocks. Lower part consists almost entirely of coarse-grained, highly crossbedded and channeled, fluvial volcanic sandstone and cobble-boulder conglomerate that has clasts composed mainly of volcanogenic debris

Tbl **Bear Lake Formation (late Miocene)**--Inner neritic marine and nonmarine (Wisehart, 1971; Nilsen, 1984) sandstone, conglomerate, siltstone, and shale. Sandstone is moderately well sorted and grains are moderately well rounded. Conglomerate horizons are made up of well-rounded clasts, of which about 40 to 55 percent are quartz and chert, 20 to 30 percent are volcanic fragments, 10 to 15 percent are granitic clasts, and remainder is lithic sedimentary clasts. Unit is abundantly fossiliferous

Tu **Unga Formation (middle Miocene to late Oligocene)**--Volcaniclastic sedimentary and volcanic rocks overlying coal-bearing siltstone and shale. Volcanic rocks are dominant in upper part, whereas carbonaceous shale and coal are confined to lower part. Sandstone and conglomerate are composed of poorly sorted volcanic debris and are poorly consolidated. Many conglomerate beds are lahar deposits

Tbe **Belkofski Formation (middle and early Miocene? and late Oligocene?)**--Mainly tuffaceous, volcaniclastic sandstone, siltstone, and conglomerate and interbeds of tuff and volcanic breccia (McLean, 1979). Rocks are dominantly red, pink, and purple and very well indurated. Potassium-argon (K-Ar) age determination on clast from volcanic rubble-flow tentatively mapped as Belkofski Formation on Dolgoi Island is 11.79±0.41 Ma (sample 83APk 50a, table 2, pamphlet); if mapping is correct, then some of the Belkofski is of Miocene age

Ts **Stepovak Formation (early Oligocene and late Eocene)**--Upper part is olive-gray and yellowish-brown sandstone rich in unaltered volcanic debris and was deposited in a nearshore, shallow-water, shelf environment. Lower part is dark-brown laminated siltstone and shale deposited as a deep-water turbidite and commonly shows graded bedding and rip-up clasts in sandstone interbeds. Megafauna distributed throughout upper part is characteristic of water depths no greater than 30 to 50 m (Louie Marincovich, Jr., written commun., 1983-1986)

Tt **Tolstoi Formation (middle Eocene to late Paleocene)**--Pale-yellowish-brown to gray-green interbedded sandstone, conglomerate, siltstone, and shale. Lithic clasts in conglomerates are dominantly granitic detritus and arkosic detritus that contains 20 to 30 percent volcanic clasts. Most volcanic clasts are not fresh appearing and, in association with the granitic and arkosic detritus, suggest a Mesozoic source rather than contemporaneous magmatic activity, in sharp contrast to most overlying units (Detterman and others, in press). In type area just east of Pavlof Bay, characteristic lithologies indicate shallow-marine sedimentation, which is succeeded northward by delta-plain and fluvial deposits, mainly of braided-stream type, that are typical for the major part of Tolstoi Formation

Kc **Chignik Formation (Late Cretaceous)**--Dominantly a light-olive-gray to olive-gray sandstone and interbedded olive-gray to olive-black siltstone and conglomerate of multicolored chert, white quartz, granitic rocks, and minor volcanic rocks. Unit is cyclic nearshore marine, tidal-flat, nonmarine flood-plain, and fluvial deposits (Fairchild, 1977; Detterman, 1978). Nonmarine parts may contain coal beds as much as 2 m thick. Marine fossils, mainly pelecypods, indicate a late Campanian to early Maestrichtian age (J.W. Miller, written commun., 1983-85)

Kh **Hoodoo Formation (Late Cretaceous)**--Typically dark-gray to black, rhythmically and thin-bedded, splintery to pencil-fracturing siltstone and fine-grained sandstone. Becomes more sandy upwards, and at Hoodoo Mountain contains channel conglomerate that has clasts of plutonic and volcanic rocks, chert, and quartz. Sandstone beds range from 0.3 to 1 m thick, and siltstone and shale beds range from 1 to 2 m thick and have individual layers as thin as 1 cm (Detterman and others, 1981). Sparse megafauna indicates an age of late Campanian to early Maestrichtian (J.W. Miller, written commun., 1983-85). Depositional environment is characteristic of lower to upper slope of a submarine fan; structures imply submarine slumping and turbidity current flow

Ks **Shumagin Formation (Late Cretaceous)**--Interbedded graywacke, siltstone, mudstone, and shale. Sandstone is medium to very fine grained, highly indurated and medium light gray to medium dark gray (Moore, 1974). Sandstone units, mostly lithic graywacke, are graded and contain abundant shale and siltstone chips (Moore, 1974; Detterman and others, in press) Thin grayish-black mudstone layers are interbedded with sandstone, and in some areas mudstone forms dominant lithology. Thin-bedded siltstone, mudstone, and sandstone sequences are rhythmically bedded and have sharp upper and lower contacts that indicate turbidity-current deposition in deep-sea-fan and abyssal-plain environments. Thickness is at least 3,000 m (Burk, 1965). Fossil remains are uncommon, but existing collections indicate an early Maestrichtian and possibly Campanian age (J.W. Miller, written commun., 1983-88), equivalent in age to upper parts of Hoodoo and Chignik Formations

Khe **Herendeen Formation (Early Cretaceous)**--Primarily uniform calcarenaceous sandstone, which weathers a conspicuous light gray. Thin bedded, medium grained, and dusky yellow to pale yellowish brown on freshly broken surfaces. *Inoceramus* fragments form a major lithic component, but complete specimens have not been found in map area. Megafauna, including *Inoceramus* and ammonites, permits an age assignment of Hauterivian and Barremian (J.W. Miller, written commun., 1983-85; Detterman and others, in press)

Kst **Staniukovich Formation (Early Cretaceous)**--Light-olive gray siltstone containing two light-olive-brown sandstone intervals overlain by shaly olive gray siltstone that has numerous calcareous nodules and concretions. Upper unit erodes readily, is typically not well exposed, and contains few age-diagnostic fossils. Lower unit has an abundant megafauna, particularly the pelecypod *Buchia*, which indicates a Berriasian and Valanginian age (J.W. Miller, written commun., 1982-88; Detterman and others, in press)

Jn **Naknek Formation (Late Jurassic)**--Dominantly medium-gray, fine- to medium-grained arkosic sandstone and siltstone. Fresh biotite and hornblende are a minor but important component of the sandstone. Dark-gray siltstone of the Snug Harbor Siltstone Member (Detterman and others, in press) and light-gray arkosic sandstone containing magnetite laminae and thin beds of conglomerate of the Northeast Creek Sandstone Member (Detterman and others, in press) are present in Port Moller area and northwest of Sapsuk Lake. Abundant megafauna collections from formation indicate an age of Oxfordian to Tithonian (Detterman and Reed, 1980, p. B38; J.W. Miller, written commun., 1982-88)

VOLCANIC ROCKS

Qv **Volcanic rocks (Holocene and Pleistocene)**--Basalt, andesite, and dacite lava flows, volcanic breccia, and lahar- and debris-flow deposits that generally cap ridges or form volcanic edifices. Lava flows are porphyritic, typically glassy, gray to black, and commonly vesicular. Individual flows may be as much as 30 m thick and be laterally continuous over large areas. Potassium-argon ages are about 1.1 Ma and younger (DuBois and others, 1987; see table 2, pamphlet)

Qpd **Pyroclastic and debris-flow deposits (Holocene and late Pleistocene?)**--Dacite(?) and hornblende dacite(?) ash-flow tuff, block-and-ash-flow deposits, debris-flow deposits, and air-fall deposits in vicinity of Mount Dana. Interbedded with and overlies Quaternary glacial debris (unit Qs)

QTv **Volcanic rocks, undivided (Quaternary and Pliocene?)**--Andesite, dacite, and basalt lava flows, sills, and plugs. These extrusive and shallowly emplaced hypabyssal rocks typically cap ridges and include massive lava flows, agglomerate, and lahar deposits

QTp **Pyroclastic deposits (Pleistocene? and Pliocene)**--Dacite(?) welded ash-flow tuff, block-and-ash-flow deposits, and air-fall deposits in area southeast of Left Head of Port Moller. Pale-green, propylitically altered, pyroclastic rocks form base of southernmost of unnamed Quaternary volcanic centers (Yount and others, 1985; Wilson, 1989a) northwest of Clark Bay. Unit has very limited distribution but has a thickness of at least 500 m. Age is poorly controlled; unit is capped by Pliocene(?) and Quaternary volcanic lava flows and may overlie the Tolstoi Formation

Tvu **Volcanic rocks, undivided (Tertiary)**--Andesite, dacite, and basalt lava flows, tuff, lahar deposits, and volcanic breccia. May be hydrothermally altered or hornfelsed. Also includes shallowly emplaced hypabyssal andesite and basalt sills and plugs

Tv **Volcanic rocks (late Miocene)**--Andesite, basalt, and dacite lava flows, sills, and plugs. Extrusive rocks typically cap ridges and include massive flows, agglomerate, and lahar deposits. Minor propylitic alteration is characteristic, except near San Diego Bay where sericitic and argillic alteration is pervasive. Hypabyssal rocks are of similar composition and were very shallowly emplaced. Potassium-argon ages range from 10.40±0.49 to 6.07±0.23 Ma. (DuBois and others, 1987; see table 2, pamphlet)

Tm **Meshik Volcanics (early Oligocene and late Eocene)**--Well exposed in mountains north of Ivanof Bay and consists of basalt and andesite lava flows, coarse volcanic rubble, lahar deposits, tuff, and minor volcanogenic sedimentary rocks. Volcanogenic sedimentary rocks are temporally and lithologically equivalent to the Stepovak Formation

Tp **Popof volcanic rocks (early Oligocene and late Eocene)**--Lava flows, lahar deposits, debris flows, ash-flow tuff, and tuff on Popof, Unga, Korovin, and Andronica Islands. Lithologically and temporally equivalent to the Meshik Volcanics, but unit crops out spatially separate from the Meshik Volcanics and is indicative of local volcanic sources; hence, its separate informal designation. Gradationally interfingers with the Stepovak Formation

INTRUSIVE ROCKS

Qi **Younger intrusive rocks, undivided (Holocene and Pleistocene)**--Hypabyssal dacite plugs and domes at Quaternary volcanic centers, particularly Trader Mountain and Mount Dana. Porphyritic dacite at Trader Mountain has a K-Ar age of 0.98±0.05 Ma (see table 2, pamphlet)

Ti **Older intrusive rocks, undivided (Pliocene and late Miocene)**--Medium- to coarse-grained, equigranular granodiorite to quartz diorite plutons and stocks containing hornblende, biotite, and pyroxene. Typically display well-developed hornfels zones and sporadic hydrothermal alteration in surrounding country rocks. Potassium-argon ages range from 9.43±0.26 to 3.21±0.14 Ma (see table 2, pamphlet)

Tiu **Intrusive rocks, undivided (Tertiary)**--Small intrusive bodies of quartz diorite or diorite, which are typically hypabyssal and contain phenocrysts of pyroxene or hornblende in a fine-grained groundmass

Tg **Granitic rocks (Paleocene)**--Medium-grained biotite granodiorite and quartz monzonite plutons that have hypidiomorphic granular textures and local development of potassium feldspar phenocrysts as much as 1 cm long. Crop out on Nagai, Big and Little Koniuji, Simeonof, Chernabura and Bird Islands. Potassium-argon ages (Burk 1965; Moore, 1974; Kienle and Turner, 1976) range from 65.6±3.3 to 57.9±1.8 Ma (recalculated using constants of Steiger and Jager, 1977)

METAMORPHIC ROCKS

QTc **Contact-metamorphosed rocks (early Quaternary or late Tertiary)**--Contact metamorphosed and hydrothermally altered rocks in mountains east of Mount Dana. Rocks probably consist of the Hoodoo Formation (Kh), undivided Tertiary volcanic rocks (Tiu), and Chignik Formation (Kc). Unit is well indurated, very fine grained, and intensely fractured; sulfide mineralization is common, and resultant iron staining is ubiquitous on weathered surfaces

Contact--Dashed where approximately located

Fault--Dashed where approximately located; dotted where concealed; queried where uncertain

Thrust or high-angle reverse fault--Dashed where approximately located; dotted where concealed; queried where uncertain. Sawteeth on upper plate

Volcanic crater

See pamphlet for references cited.

SAMPLE LOCALITY MAP AND ANALYTICAL DATA FOR POTASSIUM-ARGON AGES IN THE PORT MOLLER, STEPOVAK BAY, AND SIMEONOF ISLAND QUADRANGLES, ALASKA PENINSULA

By
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1994

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