RECONNAISSANCE BEDROCK GEOLOGIC MAP OF THE CHUGACH MOUNTAINS NEAR ANCHORAGE, ALASKA

Scale 1:250,000

Sandra H. B. Clark

Figure 2.--Geologic Map

Dotted where concealed, approximately located

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Probable thrust fault

Short lines on upper plate, dotted where concealed

Strike and dip of parallel cleavage and

please return to

MISCELLANEOUS FIELD STUDIES MAP MF - 350

Quartz diorite. --Unmetamorphosed plutonic rocks (Jq) crop out in two small areas of less than I square mile near the mouth of the Knik River. These rocks may be related to a more extensive plutonic belt exposed northeast of the Knik River (Landes, 1927; S. H. B. Clark, unpub. data). The rocks are predominantly gray, medium-grained, hornblende-biotite-quartz diorite. Locally, they contain chlorite, epidote, white mica, and prehnite as alteration products and in veinlets but generally are relatively fresh, little-altered, hypidiomorphic granular rocks that lack metamorphic foliation. Slightly the contact diorite (Fabrice (Fabrice) and the contact diorite (Fabrice) and the contac chloritized biotite from the quartz diorite (K-Ar locality B, fig. 2) was dated at 161 ± 5 m.y. (oral commun., M. A. Lanphere and Arthur Grantz, U.S. Geological Survey, 1971).

Felsic to intermediate hypabyssal rocks.—Swarms of Tertiary(?) dikes, sills, and other small intrusive bodies are present in three general areas: (1) the area around Crow Pass, which includes the Girdwood gold mining district (Park, 1933), (2) a large area from near Eagle Lake to the vicinity of Mount Magnificent, and (3) the ridges south of Eklutna Lake. Small intrusive bodies are present in areas other than those described but are sparse. All of the units of metamorphic rocks are cut by the felsic to intermediate hypabyssal bodies. The intrusive bodies are generally a few tens of feet wide and a few thousand feet long. They are shown on more detailed maps by Park (1933) and by Clark and Bartsch (1971a. b). Most of the dike rocks, except for those very near the range front, are light colored, fine grained, and altered and

are composed predominantly of plagioclase, quartz, chlorite, sericite, and sometimes calcite. Mafic minerals are generally absent or completely replaced. Near the range front, dike rocks are dacite porphyry containing hornblende, quartz, and

Kenai Formation .-- The continental Kenai Formation (Tk), consisting predominantly of sandstone, siltstone, and clay-Kenai Formation. -- The continental Kenai Formation (TK), consisting predominantly of sandstone, sittstone, and clay-stone, is exposed in only a few small areas near Eagle River. The lithology of this sequence has been described in detail by Kelly (1963), Barnes and Cobb (1959), Barnes (1962a, 1962b), Barnes and Payne (1956), and Barnes and Sokol (1959) and will not be considered in this report. Fossil plants from the Kenai Formation near Eagle River (fossil locality 8, fig. 2) have been described by Wolfe (1966) and Wolfe and others (1966) who assigned them to the lower(?) Seldovian stage of probable late Oligocene age (Wahrhaftig and others, 1969; J. A. Wolfe, written commun., 1970).

Surficial deposits. -- The undifferentiated surficial deposits (Qs) include a variety of glacial, lacustrine, and alluvial deposits and have been mapped and described by Miller and Dobrovolny (1959) and by Schmoll and others (1971). Most of the contact between bedrock and surficial deposits shown on figure 2 is from unpublished maps by H. R. Schmoll and Ernest Dobrovolny of the U.S. Geological Survey. Comprehensive discussions of the surficial deposits of the Greater Anchorage Borough are in preparation by Dobrovolny and Schmoll and need not be considered further here.

Two major faults, herein named the Knik fault and the Eagle River thrust fault (fig. 2), divide the area into three Two major faults, herein named the Knik fault and the Eagle River thrust fault (fig. 2), divide the area into three tectonic blocks, each of which has a distinctive style of deformation. For part of its length, the Knik fault zone may be in approximately the same area as a younger buried fault zone (Karlstrom, 1964, p. 21; Plafker, 1969) along the east side of the Cook Inlet-Sustina Lowland (fig. 1). However, near Chugiak, the trace of the Knik fault is exposed in the mountains (fig. 2), and it is marked by the ultramafic complex near Eklutna. The continuation of the Knik fault north of the Knik River is several miles south of, but approximately parallel to, the range front. The existence of the Knik fault is inferred from the juxtaposition of two lithologically distinctive terranes. Southeast of the fault are the luxes(2) and Creates are depressed to the Valdez(?) Group and the Upper Jurassic and(or) Cretaceous Jurassic(?) and Cretaceous deep-water marine deposits of the Valdez(?) Group and the Upper Jurassic and(or) Cretaceous McHugh Complex of coarse clastic and submarine volcanic rocks. To the northwest of the fault zone are Permian to Jurassic(?) greenschist facies rocks of the undifferentiated unit, an ophiolitic assemblage, and Jurassic plutonic rocks. The Knik fault has little or no topographic expression in most places, and no evidence of recent activity has been seen. Much of the fault is a complex zone along which the two terranes are juxtaposed and is only approximately located on figure 2.

The Eagle River thrust fault juxtaposes the McHugh Complex and underlying Valdez(?) Group rocks. The existence of The Eagle River thrust fault juxtaposes the McHugh Complex and underlying Valdez(?) Group rocks. The existence of the Eagle River thrust fault is inferred primarily because rocks of the Valdez(?) Group, including uppermost Cretaceous rocks, are overlain by the older or possibly coeval rocks of the McHugh Complex. Although bedding is locally overturned, both units are mostly upright. In most places, the contact is slightly or sharply discordant with bedding and(or) structures in the overlying and underlying units. In the vicinity of the Eagle River thrust fault, outcrops of rock types characteristic of the McHugh Complex commonly alternate with outcrops of rock types characteristic of the Valdez(?) Group. The absence of a sharply defined change indicates that the Eagle River thrust fault is actually a complex zone of imbricate faulting. An increase in intensity of deformation in the Valdez(?) Group as one approaches the fault can be seen in most areas, but this increase has not been recognized in the McHugh Complex. Where not cut by high-angle faults, most of the fault is a low- to moderate-angle structure that dips west, northwest, or north in the south part of the map area of the fault is a low- to moderate-angle structure that dips west, northwest, or north in the south part of the map area between Mount Gordon Lyon and Pioneer Peak, and in the areas near Eklutna Glacier and the head of Eagle River. Most of perween Mount Gordon Lyon and rioneer reak, and in the areas near Eklutna Glacier and the head of Eagle River. Most of the part of the fault surface southeast of Mount Magnificent and Eklutna Lake dips to the southeast or is nearly vertical. Variations in the dip of the fault surface could represent original irregularities on the fault surface, later deformation, or both. The Eagle River thrust fault is itself cut by high-angle faults in many areas. In areas where the contact between the Valdez(?) Group and the McHugh Complex is a high-angle structure, the fault at the contact may be younger or may be a variation in the dip of the Eagle River thrust fault.

The deformation and style within each of the three tectonic blocks separated by the Knik fault zone and the Eagle River thrust fault differ significantly from the style in the adjacent blocks.

The deformation of the McHugh Complex is characterized by at least two generations of pervasive closely spaced shear

Discontinuity of outcrop and fine-grained, directionless fabrics in many of the rocks preclude thorough understanding of the structure in the block northwest of the Knik fault zone. Where structural features are visible, they are characterized by well-developed schistosity that is commonly deformed into tight small-scale folds. Orientations of schistosity and axial planes are variable, but northeast trends with moderate to steep dips seem to predominate

fractures. The older and most conspicuous shear fractures commonly have steep dips and trends of about north-northeast These are cut by younger, low-dipping shear fractures. No pattern has been seen in the attitudes of the younger shear fractures except their low dips. Numerous other shear fracture orientations are also present. Bedding is obscure or impossible to trace for more than a few feet in much of the unit. Most of the bedding and com-

positional layering that has been recognized is approximately parallel to the older, steeply dipping shear fractures. The younger shear fractures are generally sharply discordant to bedding, resulting in fragmented detached remnants of beds. Some recognizable bedding has low dips that are discordant with the general trends of the early shear fractures. Because of the strong shearing and lack of recognizable bedding in most places, folds are only locally recognizable. The importance of folding cannot be evaluated in this unit; folds exist but are much less conspicuous than the pervasive shearing In some areas in the metavolcanic sequences of the McHugh Complex, lenticular to very irregularly shaped, detached

In some areas in the metavolcanic sequences of the McHugh Complex, lenticular to very irregularly shaped, detached remnants of the more resistant layers are surrounded by a pervasively sheared argillitic matrix, resulting in a melange-like appearance. On larger scale maps, the metaclastic sequences of the complex have locally been differentiated from the metavolcanic sequences. The two sequences thus differentiated can be traced for short distances only, are generally significantly different even on adjacent ridges, and have patterns that can be best interpreted as fault-bounded blocks. The chaotic patterns and the inference that metaclastic and metavolcanic parts of the complex formed in different environments of deposition suggest that the two contrasting groups of rooks for both texts. ments of deposition suggest that the two contrasting groups of rocks may have been tectonically juxtaposed and mixed.

In some areas the metaclastic sequence of the McHugh Complex has layers that can be visually followed for several miles across steep cliff faces. In these areas, the intensity of shearing and amount of mixing is apparently less than in the areas previously described, and the melange-like characteristics are not apparent.

Deformation of the Valdez(?) Group is characterized by tight, similar folds with well-developed slaty cleavage approximately parallel to axial planes and by numerous high- and low-angle faults. Small-scale features of the folds suggest that folding and cleavage formation were initiated before the sediments were completely lithified. Folds trend generally north-northeast and have axial surfaces that dip steeply to either the northwest or the southeast. Very tight folds and local overturning are commonly seen in road cuts at low elevations. On many ridges at higher elevations, folds seem to be larger and more open, possibly because they are higher in the structures. In areas of more intense deformation, the rocks are phyllitic and the s-surfaces (cleavage or schistosity) that developed during the initial folding are commonly deformed into folds with steeply dipping axes.

The early history of Southern Alaska commenced with the development of an andesitic arc on ocean crust (Richter and Jones, 1970; Jones and others, 1970). These rocks, which collapsed against and were added to the continent probably in Early Triassic time (Richter and Jones, 1970; MacKevett, 1971) occur mainly in the Alaskan Range and the Wrangell Mountains Reed and Lanphere (1970) described a plutonic episode in the southern Alaska Range and the Talkeetna Mountains that began in Early Jurassic time (about 180 m.y. ago) and continued for about 25 m.y. According to plate tectonic theory, the in Early Jurassic time (about 180 m.y. ago) and continued for about 25 m.y. according to plate tectoric checky, the parallelism of the Jurassic plutonic belt to the north with the Jurassic(?) and Cretaceous terrane probably deposited on oceanic crust to the south suggests a possible relation between the Jurassic plutonism and consumption of oceanic crust at the plate boundary. A Late Triassic or Early Jurassic age of blueschists near Seldovia based on K-Ar ages of co-existing minerals (R. B. Forbes and M. A. Lanphere, oral commun., 1971) indicates that subduction along a continental margin may indeed have been operative and related to the Jurassic magmatism.

The terrane north and west of the Knik fault zone is considered to be a part of the northern belt that was deformed, intruded, and added to the continent prior to the deposition of the McHugh Complex and the Valdez(?) Group. The association of tectonically emplaced ultramafic rocks with gabbroic rocks, metabasalts, and metachert northwest of the fault zone is typical of ophilitic assemblages that are thought to represent oceanic crust. A general arrangement of rock types from ultramafic rocks on the southeast to gabbros and finally metavolcanics and metachert to the northwest indicates that the upper part of the sequence is to the northwest. Fossiliferous Permian marbles occur very near to the northwest contact of the ultramafic complex (fossil locality 1, fig. 2). The ultramafic complex and associated rocks near Eklutna could be a part of the Late Paleozoic oceanic crust that is exposed in the Alaska Range (Richter and Jones, 1970; Clark and others, 1972). The 161 m.y. age of plutonic rocks near the Knik River suggests that these plutonic rocks were emplaced during the Early Jurassic plutonic episode described by Reed and Lanphere (1970). The greenschist facies metamorphism in the undifferentiated unit might have occurred at about the same time as the Jurassic plutonism and the metamorphism of the The terrane north and west of the Knik fault zone is considered to be a part of the northern belt that was deformed, ferentiated unit might have occurred at about the same time as the Jurassic plutonism and the metamorphism of the

The metaclastic part of the McHugh Complex was probably derived from a rapidly eroding magmatic arc on the continental crust of the northern belt. The metaclastic rocks are juxtaposed with metavolcanic sequences that formed in relatively quiet oceanic waters. The tholeitic nature of the basalts, associated radiolarian metacherts, and the presence of small podies of ultramafic rock in the sequence suggest that these rocks represent ocean floor material.

The thick Valdez(?) Group is a deep-water marine turbidity sequence that is thought to have been deposited largely on oceanic crust. The recognition of Late Cretaceous Inoceramus fossils in the Valdez(?) Group shows that the deep-water deposits are at least partly coeval with the Cretaceous continental shelf deposits of the Matanuska Formation. The Valdez(?) Group could be also partly coeval with deposition and tectonic mixing of rocks of the McHugh Complex, or alternatively the Valdez(?) Group could have formed entirely after the collapse of the depositional site of the McHugh Complex. In either case, it is thought that first the McHugh Complex and then the Valdez(?) Group was deformed and accreted to the continental plate as result of convergence of an oceanic plate with a continental plate that is now represented by the

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The area between Knik and Turnagain Arms east of Anchorage is underlain mostly by rocks that are part of an extensive arcuate belt of thick Mesozoic marine deposits that extend through the Chugach-Kenai-Kodiak Mountains. The two main units in this belt are the Jurassic(?) and Cretaceous Valdez(?) Group composed of flysch deposits and the McHugh Complex composed of oceanic metavolcanic sequences tectonically mixed with metaclastic rocks derived from a continental magmatic arc. Deformation of the McHugh Complex is characterized by pervasive, closely spaced shear fractures and is melange-like in some areas. Deformation of the Valdez(?) Group is characterized by tight folding that was initiated before the sediments were completely lithified. The folds have steeply dipping axial surfaces that are overturned to the northwest in some areas and to the southeast in other areas. The Jurassic and(or) Cretaceous McHugh Complex is separated from the Valdez(?) Group by the Eagle River thrust fault. The Valdez(?) Group was probably deposited primarily on oceanic crust that was collapsed against the continental margin in latest Cretaceous to early Tertiary time.

An arcuate belt of upper Paleozoic to lower Mesozoic rocks to the north and west had been deformed, accreted to the an arcuate best of upper rateogost to lower nessent focus to the north and series (?) and Cretaceous sediments. Rocks continental margin, and intruded by plutons prior to the deposition of the Jurassic(?) and Cretaceous sediments. Rocks of this continental terrane that underlie the Wrangell and Talkeetna Mountains and the Alaska Range are locally exposed in the map area north and west of the Knik fault zone. Near the village of Eklutna, the junction between the two terranes is marked by an ophiolitic assemblage.

The U.S. Geological Survey has been conducting studies of bedrock in the Chugach Mountains near Anchorage since 1969 The U.S. Geological Survey has been conducting studies of bedrock in the Unugach mountains near Anchorage since 1909 to determine the geologic history of a part of the extensive belt of Mesozoic eugeosynclinal rocks that underlie the arcuate mountain ranges bordering the Gulf of Alaska (fig. 1). Reconnaissance mapping of bedrock in the area between Turnagain Arm and Knik Arm (fig. 2) is nearing completion, and related laboratory studies and analyses of field data are underway. The mapping has recently been extended into adjacent areas. Although the studies in progress are of importance underway. to interpretations in the Anchorage area, a reconnaissance map and preliminary interpretations are being made available at the present time to facilitate studies now underway by other agencies.

The most comprehensive early geologic reports on bedrock geology of the area were by Capps (1916, 1940) and Park (1933). More recently, chromite-bearing ultramafic rocks near the village of Eklutna were mapped and described by Rose (1966). Rose also summarized work from several earlier studies of the Eklutna area. Reconnaissance geologic maps of the Anchorage B-7 and B-6 quadrangles at a scale of 1:63,360 were released on open file by Clark and Bartsch (1971a, 1971b).

The surficial geology of the Anchorage area was mapped and described by Miller and Dobrovolny (1959). Since 1965, this work has been extended to include all the Anchorage Borough, and the surficial geology of the Eagle River-Birchwood area has been released on open file (Schmoll and others, 1971).

Part of the mapped area is included within an aeromagnetic study of the Cook Inlet basin by Grantz and others (1963).

Grateful acknowledgment is given to several persons who made valuable contributions to the geologic studies. They Graterul acknowledgment is given to several persons who made valuable contributions to the geologic studies. Iney include Susan R. Bartsch, Martha E. Yount, and Pamela S. Morse who participated in the geologic mapping; Henry R. Schmoll and Ernest Dobrovolny who shared information on bedrock geology and access and mapped most of the contacts between bedrock and surficial deposits; and David L. Jones who contributed ideas on interpretations of tectonics and environments, as well as paleontological studies. Critical review of this paper by George Plafker and David L. Jones have greatly benefited the report. Several people have examined parts of the map area with the author, and their observations and discussions are proposed to the ideas and interpretations presented in this paper. sions have contributed significantly to the ideas and interpretations presented in this paper.

The main mass of the Chugach-Kenai-Kodiak Mountains consists primarily of Jurassic(?) and Cretaceous bedded rocks with a narrow, discontinuously exposed fringe of older rocks along the northern flanks of these mountains. A thick sequence of clastic, marine continental shelf deposits of Cretaceous age overlies the older rocks in the Matanuska Valley area (Grantz, 1964) between the Chugach and the Talkeetna Mountains (fig. 1). A foothills belt south of the Kenai-Chugach Mountains is composed of Tertiary marine and non-marine deposits (Plafker, 1969, 1971). Another major tectonic element in the rocking! framework is the Cock Talker Syndrom Laylord and almost element in the rocking! element in the regional framework is the Cook Inlet-Susitna Lowland, an elongate almost north-south-trending depression that transects the arcuate trend of the older belts. Two major right-lateral, strike-slip faults, the Denali and Castle Mountain faults (fig. 1), also transect the sharply curved arcuate belts of rocks. Quaternary faulting is recorded along the Denali fault (Richter and Matson, 1971) and the projection of the Castle Mountain fault in the Cook Inlet-Susitna Lowlands (Grantz, 1965). Most of the Chugach-Kenai-Kodiak Mountains are within a seismically active area in which major tectonic deformation accompanied the 1944 Alaska earthquake (Plafker, 1969).

Undifferentiated metaplutonic, metasedimentary, and metavolcanic rocks.—Metaplutonic, metasedimentary, and metavolcanic rocks (JPu) crop out near the northwestern front of the Chugach Mountains in the northern post of the map area. The metaplutonic rocks range from quartz diorite to gabbro with metamorphic fabrics overprinting medium-grained granular or fine-grained granular or porphyritic fabrics. They are exposed mostly in an area of 3 to 4 square miles near the mouth of the Eklutna River, but small isolated outcrops of metaplutonic rocks extend as far south as Eagle River. The metasedimentary rocks are generally fine to medium grained and include marble, siliceous argillite, metachert, and metasandstone. Textures are predominantly granoblastic with lepidoblastic micaceous minerals. Marble, although not abundant, is characteristic of this unit and forms discontinuous layers a few feet to a few tens of feet thick that are absent in other units in the map area. The metavolcanic rocks are mostly strongly altered amygdaloidal basalts. Thicknesses of other units in the map area. The metavolcanic rocks are mostly strongly altered amygdaloidal basalts. Thicknesses of the metasedimentary and metavolcanic sequences are not known because of structural complexity and discontinuity of outcrops. The unit also includes schists and gneisses in which original textures are completely or nearly obliterated and

Metamorphic minerals in rocks of the unit include the typical greenschist facies minerals: albite, epidote group minerals, chlorite, white mica, and actinolite. Prehnite occurs commonly as a later mineral in veinlets that cut the

The only fossils that have been found in the undifferentiated unit (fossil locality 1, fig. 2) are poorly preserved Permian fusilinids that are probably of Leonardian age but may be as young as Guadalupian and that indicate deposition in relatively calm water (R. C. Douglass, U.S. Geological Survey, written commun., 1970). Douglass identified schwagerinid forms and Cancellina sp., a neoschwagerinid that has been recognized from the Permian Tethyan seaway.

The Permian age of the marble at the fossil locality does not preclude the possibility that rocks of other ages have been included in the unit. Although there is no indication that rocks older than Permian might be included, it is likely that younger rocks, possibly gneissic or altered phases of the quartz diorite (Jurassic) have been included in the undif-

The age of metamorphism is unknown. The greenschist facies event most likely occurred about the time that the nearby Jurassic plutonic rocks were emplaced. The later development of prehnite could be as young as Late Cretaceous or early Tertiary and could be related to deformation of the McHugh Complex and the Valdez(?) Group.

McHugh Complex .-- The McHugh Complex (KJm) (Clark, in press) is a widespread unit that is prominently exposed near the northwest front of the Chugach Mountains and characteristically forms very jagged ridges and peaks. The complex is composed predominantly of two lithologically distinct but chaotically juxtaposed rock sequences with irregular outcrop patterns: a metaclastic sequence and a metavolcanic sequence. The metaclastic sequence, which makes up most of the complex, terms: terns: a metaclastic sequence and a metavolcanic sequence. The metaclastic sequence, which makes up most of the complex, is composed predominantly of gray, gray-green and dark-green, weakly metamorphosed clastic rocks, including siltstone, graywacke, arkose, and conglomeratic sandstone. The metavolcanic sequence includes greenstones, mostly with basaltic composition and texture, that are commonly associated with radiolarian metachert, cherty argillite, and argillite. Pillow structures are locally preserved in the greenstone. Small amounts of ultramafic rock and marble occur locally in the complex as isolated discontinuous outcrops, probably blocks or lenses. These isolated outcrops are near outcrops of both the metaclastic and metavolcanic sequences, and relations are not known. the metaclastic and metavolcanic sequences, and relations are not known.

Because of structural complexities of the unit, only orders of magnitude of thickness can be estimated. Metaclasti equences appear to be several thousand feet thick. Apparent thicknesses of greenstones are generally several tens of feet, and intercalated cherty argillite and argillite sequences are a few tens to a few hundred feet thick. Bedded chert sequences are generally fifty feet thick or less.

The approximate maximum age of the complex is indicated by a K-Ar date of 146 ± 7 m.y. on hornblende from a granitic cobble in the conglomeratic sandstone (K-Ar locality A, fig. 2) collected by Arthur Grantz and M. A. Lanphere, U.S. Geological Survey, and dated by Lanphere (oral commun., Lanphere and Grantz, 1971). The minimum age of the unit is limited by the beginning of accumulation of the unmetamorphosed Tertiary nonmarine sedimentary rocks in the Cook Inlet region. The youngest of these sedimentary rocks exposed in the map area is Oligocene (Wolfe, 1966; Wolfe and others, 1960 Wahrhaftig and others, 1969). However, Paleocene continental sedimentary rocks occur in the west part of the Matanuska Valley a few miles north of the map area (Barnes, 1962a; Wolfe, 1966). On the basis of these data, the age of the McHugh Complex is tentatively considered to be Late Jurassic and(or) Cretaceous.

Prehnite-pumpellyite facies metamorphic assemblages occur throughout most of the McHugh Complex. The most common and easily identified mineral is prehnite, which occurs in both metasedimentary and metavolcanic rocks. Pumpellyite is locally well developed in metabasalts but is less common than prehnite. Laumontite occurs in conspicuous veinlets near the range front but is absent in most of the remainder of the complex. The distribution of prehnite-pumpellyite and laumontite-bearing rocks suggests that metamorphic grade might increase from zeolite facies near the west front of the range to prehnite-pumpellyite facies to the east.

Valdez(?) Group.—A thick unit (KJv) of metasandstone (mostly metagraywacke), metasiltstone, and argillite, which are locally calcareous, is exposed over a large part of the map area. Metaconglomeratic siltstone occurs locally but is not abundant. These rocks are part of a belt that extends more than 1,000 miles through the Chugach-Kenai-Kodiak Mountains and as far south as the Shumigan Islands and Sanak Island (Payne, 1955; Burk, 1965; Moore, 1971). The part of the belt in the map area (KJv, fig. 2) is tentatively correlated with the Valdez Group named by Schrader (1900) for exposures in the vicinity of Port Valdez, Prince William Sound. The rocks in the Port Valdez area have not been dated more closely than Jurassic or Cretaceous (Plafker and MacNeil, 1966). In the map area, the unit includes rocks of known Cretaceous age as well as rocks of probable Cretaceous or Jurassic age. Because of the uncertainty of the age of the rocks in the type locality, the correlation is considered tentative. type locality, the correlation is considered tentative.

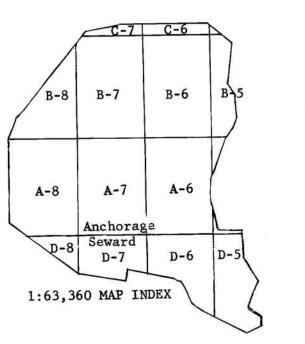
The Valdez(?) Group is a widespread flysch sequence that in some areas retains sedimentary features characteristic of turbidites. The unit commonly includes rhythmically alternating, thin-bedded, metasandstone-metasiltstone sequences, metagraywacke or metasiltstone beds a few feet thick, and thick (a few tens of feet to 100 or more feet), massive, graywacke layers. The thickness of the unit is unknown but is probably on the order of a few tens of thousands of feet.

Valdez(?) Group rocks are notably unfossiliferous. Although most of the rocks are so strongly deformed that the pre-Valdez(?) Group rocks are notably unfossiliferous. Although most of the rocks are so strongly deformed that the preservation of fossils is unlikely, fossils do occur in a few less intensely deformed areas. Prior to the current mapping, crushed specimens of Inoceramus had been found in the Crow Pass area (Park, 1933, p. 393-394), but these were too poorly preserved to be assigned an age more specific than Jurassic or Cretaceous (D. L. Jones, oral commun., 1969). Six new Inoceramus localities have now been found in three areas (fossil localities 2 to 7, fig. 2). David L. Jones, U.S. Geological Survey (written commun., 1970) reports that the fossils are similar to Inoceramus kusiroensis, of Late Cretaceous (Maestrichtian) age. Worm trails and burrows occur in the same areas as the Inoceramus fossils and at a few other localities. Unidentifiable fossil plant fragments have also been found; attempts to extract pollen from the material were unsuccessful (Richard A. Scott, U.S. Geological Survey, written commun., 1970).

In several areas the rocks are phyllitic, and sedimentary structures are almost completely obliterated. Metamorphic minerals in metasedimentary rocks of the Valdez(?) Group include chlorite, white mica, albite, and epidote. Prehnite is generally absent but occurs in the Valdez(?) near the contact with the McHugh Complex and in a locality near the Twenty-mile River. The mineral assemblages suggest probable lower greenschist facies metamorphism but do not limit possible temperature-pressure conditions of formation to this facies.

Ultramafic rocks. --Layered ultramafic rocks (MzPzu) are exposed in a linear belt about 9 miles long and as much as 2 miles wide near the front of the mountains southwest of Eklutna. A detailed map by Rose (1966) shows the distribution of rock types in the ultramafic complex. The predominant rock types, in order of decreasing abundance, are medium-to coarse-grained peridotite (wehrlite), dunite, clinopyroxenite and, locally, small amounts of gabbro. The ultramafic rocks are serpentinized primarily in sheared areas, most of which are near the contacts. Chromite layers are locally well developed in dunites and peridotites, and native copper occurs in the more pyroxene-rich phases (pyroxene-peridotites and pyroxenites). The ultramafic body is thought to be tectonically emplaced because of the absence of thermal effects in surrounding rocks and the occurrence of strongly sheared serpentinite zones near the contacts. A more complete description of the ultramafic rocks and a discussion of the economic geology are given by Rose (1966).

Gabbroic rocks.--Strongly altered gabbroic rocks (MzPzg) crop out in a zone as much as about 3,500 feet wide adjacent to the west contact of the ultramafic rocks in some areas (fig. 1). Rose (1966) described the gabbroic rocks and concluded that the ultramafic and gabbroic rocks were phases of the same complex because of the similarity of clinopyroxenes in both units. This hypothesis is strengthened by the observation that similar altered gabbroic rocks are interlayered with ultramafic rocks in a newly discovered ultramafic complex (S. H. B. Clark, unpub. data) in the Chugach-Kenai-Kodiak ultramafic belt (Rose, 1966) near the headwaters of Wolverine Creek in the Anchorage C-5 quadrangle.



Alaska: U.S. Geol. Survey Prof. Paper 398-A, p. Al-A29.