BRITISH COLUMBIA DEPARTMENT OF MINES Hon. W.K. Kiernan, Minister P.J. Mulcahy, Deputy Minister

PRELIMINARY GEOLOGICAL MAP

SOUTHERN QUEEN CHARLOTTE ISLANDS

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NOTES ON THE GEOLOGY OF THE SOUTHERN QUEEN CHARLOTTE ISLANDS

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The geology of the Queen Charlotte Islands south of the 53rd parallel is shown on the accompanying preliminary map which covers much of Moresby Island, most of Louise Island, and all of Lyell, Burnaby, and Kunghit Islands. The map base is prepared from the National Topographic Series Sheet, Moresby Island (103 B, 103 C, 102 O) at a scale of 1:250,000. The preliminary geological man is issued at twice that scale (1:125,000) or about 2 miles to the inch. The Moresby Island sheet should be referred to for topography and geographic names.

In these notes new stratigraphic names are not introduced, with one exception. An Upper Triassic sedimentary formation is named the Kunga formation, and the type section is roughly described. The terms "older" and "younger" are applied to volcanic rocks rather than to give them formational names at this time. Use of the name Vancouver group has been avoided because of the present uncertainty as to whether it should be applied to the entire succession or just the Triassic part.

Volcanic rocks predominate in the southern Queen Charlotte Islands although both plutonic and sedimentary rocks are important. The stratified succession begins and ends with great assemblages of volcanic rocks. Between these volcanic assemblages are two distinct sedimentary formations separated by an unconformity. The stratified succession is metamorphosed and cut by two types of plutonic rocks: the first forming syntectonic plutons and the second, smaller post-tectonic bodies.

STRATIFIED ROCKS

The oldest rocks are featureless greenstones at least 6,000 feet thick that are mapped as Older volcanic rocks. In the map-area they are best exposed and their relationship to the overlying rocks is most clearly seen on Kunghit Island, Kunga Island, and Kootenay Inlet. Probably 90 per cent of the unit is composed of altered basic volcanic rocks which have as their only evident textures amygdules and irregular fractures. Of the remainder of the unit most is similar rock showing vague pillow forms or fragmental textures. A small percentage is composed of obviously fragmental rocks, tuffaceous limestone, and limestone. The only fossils col-

lected were well down in the unit north of the map-area on Buck Channel. They consist of crinoid stems which might be either late Palaeozoic or Triassic.

The greenstones are overlain with apparent conformity by about 3,000 feet of limestones and argillites of the Kunga formation. The section on the eastern shore of Kunga Island is well exposed and relatively uncomplicated. From the base, the section comprises 550 feet of massive grey limestone, about 800 feet of thin-bedded black limestone, and about 1,900 feet of alternating thin-bedded black argillaceous limestone and limy argillite. Minor lenses of grey clastic limestone from 1 inch to 20 feet thick occur throughout the thin-bedded rocks. The top of the section is not exposed but there is reason to believe that nearly the whole section is represented. The massive grey limestone contains about 100 feet of greenstone that may be either a sill or a flow. At other localities intercalated volcanic rocks occur also at other horizons within the formation. Many of the volcanic rocks can be proven intrusive sills, and a few can be proven flows, but for some the origin is not readily apparent. From Kunghit Island to Skincuttle Inlet and southwestern Tasu Sound the country rock is largely of the Kunga formation, but it is cut by such a multiplicity of dykes and sills, and is commonly so bleached and altered to hornfels that it may be difficult to recognize. The amount of intrusive rock approaches 75 per cent of the exposure in some areas.

The Kunga formation is all or chiefly of Late Triassic age. Fossils of Karnian and Norian age are abundant but generally are not well preserved. The basal limestone contains a benthonic fauna, the thin-bedded rocks a pelagic fauna dominated by <u>Halobia</u>, and in some of the upper grey limestone interbeds a benthonic fauna occurs again. Some poorly preserved ammonites are believed to indicate a Sinemurian age so that the age of the formation possibly extends well into the Early Jurassic.

The Kunga formation was sharply folded and bevelled prior to the deposition of the overlying Maude formation of Early Jurassic age. The Maude formation consists primarily of grey shales and siltstones but near the base includes abundant grey to buff greywacke and much conglomerate. The thickness is at most 3,000 feet but varies considerably, and the Maude formation apparently was deposited on a surface of some relief. The underlying unconformity is best exposed on the small island north of Alder Island, commonly but incorrectly called Monument Rock. The outcrop on this island reveals about 250 feet of conglomeratic beds, at the base of which a few very large boulders (largest 60 by 30 feet) occur in finer conglomerate, and above the boulder zone cross-bedded buff greywacke sandstone and pebble conglomerate occur. Overlying these rocks is 350 feet of fine to coarse thick-bedded buff greywacke. At other localities and higher in the section grey shales are dominant, and these commonly are thinly bedded and banded. Limestone is relatively insignificant. Belemnites are common but other fossils rare. Collections indicate a Toarcian age (latest Early Jurassic) and hence the rocks in the map-area are correlatives of the Maude formation of Skidegate Inlet, to which they are lithologically similar.

The Younger volcanic rocks overlie earlier units with variable relations. They occur in apparent conformity with both Maude and Kunga formations, in unconformity with the Kunga, or with intrusive relations to either. The Younger volcanic rocks are variable in type but are predominantly fragmental. The Three distinct facies exist which intergrade horizontally. most abundant facies is composed dominantly of andesitic pillow lavas, pillow breccias, and agglomerates containing aphanitic fragments. Very few flows are massive. Minor tuffs and limestones are intercalated. The facies is 7,000 to 10,000 feet thick and is present about Moore Channel and from Crescent Inlet to Kunghit Island. The second most important facies is largely agglomerate composed characteristically of andesitic porphyry fragments. It includes flows similar to the agglomerate fragments and considerable greywacke and conglomerate of direct volcanic derivation. This facies is mainly on the east coast, from Ramsay Island northward. Rocks of this facies on Graham Island and Skidegate Inlet have been called the Yakoun formation (MacKenzie, 1916). They are as much as 7,000 feet thick in the map-area and are of Bajocian to Callovian age (early Middle to early Late Jurassic). The third facies is not widely distributed but is about 5,000 feet thick south of Kootenay Inlet. It is composed of light grey weathering welded breccias and tuffs that have a pronounced foliation. These are ignimbrites, products of incandescent eruptions.

PLUTONIC ROCKS

Two groups of plutonic rocks intrude all the stratified rocks. On the map they are divided into compositional types, (a) acidic rocks and (b) intermediate or dioritic rocks. Most type <u>b</u> rocks are syntectonic plutons although some on the east coast may be post-tectonic, whereas all type <u>a</u> rocks are post-tectonic.

The largest intrusion in the Queen Charlotte Islands is the San Cristoval batholith which is named after the San Cristoval Range of the west coast of Moresby Island. The batholith is composed predominantly of foliated hornblende diorite or hornblende quartz diorite. Local phases, especially along the borders, are full of planar, basic inclusions and grade locally into migmatites. The southern body on Kunghit Island is similar to the San Cristoval batholith. The northern body on Kunghit Island and the body on the southeastern tip of Lyell Island are entirely migmatitic. All other plutons of type <u>b</u> are diorites, many of which are obviously post-tectonic and thus are related to the granites of type <u>a</u>.

Type <u>a</u> intrusions are all small bodies except the one on the west coast. They are unfoliated, may be porphyritic or miarolitic, and any inclusions are normally equidimensional. Many bodies have hornfelsic wallrocks and clearly intrusive relations. In composition they range from granite porphyry, through quartz monzonite and monzonite, to syenite. Several of them of varying composition are aligned along the western side of a major wrench fault.

STRUCTURE

Faults are the most prominent structural features but folds are also important. The style of folding varies but in general the folds are not tightly compressed. Bedding generally dips at 45 degrees or less and only locally is steep or overturned. Great panels of volcanic rocks dip at 20 to 30 degrees. Sedimentary rocks may be crumpled into sharp minor folds but nevertheless maintain moderate average dips over wide areas. However, on the east coast of Louise Island all rocks are involved in compressed folds.

The over-all structure from Kunghit Island to Huxley Island is a broad arch or anticlinorium complicated by lateral distortions and minor folds. This arch is truncated by a major fault, and its possible continuation is an anticline extending from Sedgewick Bay to Crescent Inlet. North of Tasu Sound there are two distinct directions of folding: westerly on Kootenay Inlet and again north of the map-area between Inskip Channel and Skidegate Channel, and northwesterly on Peel Inlet and Louise Island. The relation between folds of these directions is not known, but at least three major periods of folding are known: (1) Farly Jurassic, (2) Late Jurassic and Early Cretaceous, and (3) Late Cretaceous. Faulting has been intense and probably of long duration--it probably was active during deposition of the Maude formation and is continuing today. Most big faults are northwesterly trending wrenches on which the Pacific side moved north. Minor faults have many orientations but many are nearly east-west. One major thrust is known-from Darwin Sound to Tasu Sound, where it has raised the Kunga formation westward over pillow lavas and agglomerates of the Younger volcanic rocks.

The main wrench fault trends from Louscoone Inlet through Burnaby Strait and most probably continues by Murchison Island to Louise Island. It is joined in Juan Perez Sound by a similar wrench from Lyell Island. Others occur from Werner Bay to Hutton Inlet and along Rose Inlet. All these wrench faults are probably related to the Denali fault whose trace follows the very steep continental slope along the west coast of the Queen Charlotte Islands. Contemporary major earthquakes are aligned both along the Denali fault and the fault from Louscoone Inlet to Louise Island. First motion studies of the major Queen Charlotte shock of August, 1949, with epicentre on the Denali fault, indicated a movement the same as that for the faults on the islands, namely, Pacific side northward.

SELECTED REFFRENCES

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