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DEPARTMENT OF ENERGY, MINES AND RESOURCES

PAPER 71-22

SEKWI MOUNTAIN MAP-AREA, YUKON TERRITORY AND DISTRICT OF MACKENZIE

S.L. Blusson

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1971

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S.L. Blusson

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ABSTRACT

The area is important in understanding the geology of the northern Cordillera because it combines high relief and good exposure with unusual stratigraphic complexity. The Proterozoic and lower Paleozoic record is extensive and nearly every carbonate and arenite formation exposed on Mackenzie Mountains exhibit facies changes. The area comprises three broad divisions, an area of flat-lying to gently dipping Proterozoic clastic rocks, a belt of folded and faulted lower Paleozoic carbonates and a large belt of lower Paleozoic shales.

Several mineral deposits, including a lead-zinc deposit and a tungsten-bearing skarn deposit are currently being examined and it appears possible that the area also has potential for the occurrence of copper deposits.

RÉSUMÉ

La région s'avère importante pour comprendre la géologie de la cordillère septentrionale. Elle possède un relief prononcé, de bons affleurements et une stratigraphie anormalement complexe. Le Protérozoïque et le Paléozoïque inférieur sont abondamment représentés, et dans presque chaque formation de roches carbonatées et arénacées affleurant dans les monts Mackenzie, on peut voir des modifications de faciès. La région comprend trois grandes divisions: une région de roches clastiques protérozoïques, dont les couches sont horizontales ou faiblement inclinées; une zone de roches carbonatées plissées et faillées du Paléozoïque inférieur; et une zone étendue de schistes argileux du Paléozoïque inférieur.

Plusieurs gîtes minéraux, parmi lesquels un gîte de plomb-zinc et un gîte de skarn contenant du tungstène sont actuellement à l'étude, et il est vraisemblable que la région puisse contenir des gîtes de cuivre.

SEKWI MOUNTAIN MAP-AREA, YUKON TERRITORY AND DISTRICT OF MACKENZIE

INTRODUCTION

This report is based on work undertaken in conjunction with Operation Selwyn, a helicopter-supported reconnaissance geology survey embracing numerous map-areas in eastern Yukon, southwest District of Mackenzie and north-central British Columbia during parts of 1966 and 1967 field seasons (see Blusson, 1967).

This is a key map-area in the northern Cordillera as it combines high relief and a particularly high degree of exposure, with unusual stratigraphic complexity. The Proterozoic and lower Paleozoic record is extensive and virtually every carbonate and arenite formation of the Mackenzie Mountains changes facies in this area. Numerous stratigraphic and structural problems remain as this study was primarily one of reconnaissance mapping. Aerial photographs, both vertical black and white and low level colour obliques, were invaluable in the mapping.

PHYSICAL FEATURES

The Sekwi Mountain map-area lies almost entirely east of the Yukon-Northwest Territories divide in the central Mackenzie Mountains. A high subdued plateau separates the Selwyn Mountains in the extreme southwest corner of the area from the Backbone ranges in central and northeastern Sekwi Mountain map-area. The region is generally mountainous and fairly rugged with local relief as much as 5,200 feet. In general maximum elevations average between 7,000 and 8,000 feet and valley bottoms slightly below 4,000 feet, the approximate elevation of treeline.

Drainage is to the northwest on the Keele River and its branches which head in the uplands and Selwyn Mountains in the southwest. Keele River is readily navigable by sizable river boats as far as Sekwi canyon. The Canol Road is washed out in many places and now abandoned but provides an ideal route for horses or all-terrain vehicles. June Lake, one of the few lakes suitable for float-equipped fixed-wing aircraft provided a centrally located base.

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GLACIATION

As shown by the distribution of erratics, glacial striations and meltwater features, much of the map-area was glaciated at least once during the Quaternary. From about Intga River to the southwest, ice reached elevations of more than 6,500 feet and it appears that only the highest granitic peaks along the drainage divide were exposed. From the divide ice flowed to the north, northeast and east down the present drainage system decreasing to levels of approximately 3,500, 4,500 and 5,000 feet respectively on Twitya, Ekwi and Keele Rivers where these rivers pass beyond the map-area. Erratics of granitic rock, of a type forming stocks along the drainage divide have been found more than 20 miles north of the map-area (O. L. Hughes, pers. comm.).

GENERAL GEOLOGY

The map-area is broadly divisible into three regions of differing lithology and structure. From east to west these are: in the northeast corner an area of flat-lying to gently dipping Proterozoic, chiefly clastic strata, an arcuate belt of folded and faulted lower Paleozoic, mostly carbonate rocks, and a much larger western belt of shale, much of which is equivalent in age to carbonates farther east. In general, structure is dominated by faults, accompanied by mostly upright, open folds. Fault blocks are mainly homoclinal successions repeated by faults with gentle to steep dips or moderately upright synclinal sections. In the shale terrain to the west folds are more tightly compressed, generally with near vertical limbs and locally with parasitic minor folds from 5 to 10 feet across showing incipient axial-plane fracture cleavage. Small granitic stocks of probable late Cretaceous age intrude folded Upper Proterozoic to Mississippian argillaceous rocks near the westward limit of carbonates.

Table of Formations

Period or Epoch	Formation or Group	Map-unit	Lithology	Thickness (feet)
Pleistocene and Recent		32	Unconsolidated glacial and alluvial deposits	
Cretaceous (?)		31	Quartz monzonite, and granodiorite, commonly megacrystic	
		Intrusive contact		
Cretaceous		30	Shale, argillite, sandstone quartz-pebble and cobble conglomerate, dark grey and black; carbonized plant debris	3,155 (+)

Period or Epoch	Formation or Group	Map-unit	Lithology	Thickness (feet)
			Fault contact	
Carboniferous or Permian		29	Dolomite, cherty, buff and orange weathering; sandy dolomite and quartzite; minor bioclastic limestone and dark shale	500 (+)
			Unconformity (?)	
Devonian and (?) Mississippian		28	Shale and argillite, dark grey to black	500 (+)
		27	Quartzite, grey to white, thick bedded; minor chert-pebble conglomerate with interbedded black shale	0-1,000(+)
		26	Shale, argillite, dark grey to black, brown siltstone and sandstone; minor chert-pebble conglomerate, quartzite and banded chert	3,500(+)
	Nahanni	25	Limestone, fine grained, light grey weathering	100-200
	Headless	24	Limestone, argillaceous, silty, buff-brown weathering, platy; minor banded orange-brown dolomite and light grey weathering crypto-grained limestone	2,800
	Landry	23	Limestone, crypto-grained, black, grey and brown, light grey weathering thin to thick bedded; minor bioclastic, reefoid medium grey limestone	1,700
Middle Devonian	Arnica	22	Dolomite, thin and thick bedded, dark grey to black; minor light grey dolomite and dark grey limestone	1,200

Period or Epoch	Formation or Group	Map-unit	Lithology	Thickness (feet)
Lower Devonian	Sombre	21	Dolomite, light and medium grey, well bedded, minor brownish grey weathering platy dolomite	2,000
Silurian and Devonian	Delorme	20	Dolomite and limestone, buff, grey, cinnamon; limestone breccia	1,800
	Whittaker	19	Dolomite, coarse grained black and medium to light grey weathering; thick bedded; nodules and bands of black chert	0-2,900
Upper Ordovician and Silurian	Road River		Black shaly limestone and calcareous shale; minor chert	0-1,000(+)
			Unconformity	
Middle Ordovician	Sunblood	18	Dolomite and limestone, platy flaggy, buff and grey weathering or mottled yellow rouge and grey; minor thick-bedded grey, black and white dolomite and blue-grey weathering limestone	0-1,500(+)
Lower Ordovician and Upper Cambrian		17	Dolomite and limestone, silty, intercalated wavy bands, nodular, platy, buff, orange and grey weathering; minor orange-weathering dolomite and grey to black crypto-grained limestone	0-2,000(+)
			Unconformity	

Period or Epoch	Formation or Group	Map-unit	Lithology	Thickness (feet)
Cambrian Middle		15	Calcareous shale and silty argillaceous limestone, dark grey recessive platy, dark and brown-grey weathering; minor crypto-grained limestone and bands of buff-weathering dolomite	0-1,000(+)
		Unconformity		
Lower	Sekwi	14	Dolomite, in part sandy and silty and dolomite-cemented sandstone, buff to orange weathering; limestone, silty dolomitic, commonly nodular, buff and grey weathering; minor variegated shale	100-3,800
		13	Sandstone, brown, fine grained, and argillaceous siltstone recessive weathering	500
		12	Orthoquartzite, light grey, white and pink, minor brown and green-brown siltstone and silty shale	0-3,200
		11	Dolomite, buff weathering, thick bedded, in part sandy; minor dolomite-cemented sandstone, dark weathering	0-500 (+)
Hadrynian and/or Lower Cambrian		10	Silty shale, phyllite and shale, dark grey-brown and green; minor siltstone and fine-grained quartzitic sandstone	3,500(+)
		9	Shale, argillite, siltstone, brown, dark grey, platy, minor quartz-pebble conglomerate and sandstone	2,370

Period or Epoch	Formation or Group	Map-unit	Lithology	Thickness (feet)
Hadrynian		8	Sandy dolomite, dolomitic limestone breccia, rusty brown weathering, slaty argillite	1,120
			Local ? unconformity	
	Rapitan Group	7	Upper Rapitan: Shale and sandstone, green, brown and grey minor laminae of buff-orange dolomitic limestone	2,800
			Angular unconformity	
		6	Middle Rapitan: Mudstone, conglomeratic, orange-brown weathering	2,700(+)
			Angular unconformity	
		5	Lower Rapitan: Mudstone, maroon; minor green	0-600
			Angular unconformity	
		4	Limestone, light grey massive; minor orange-weathering dolomite	1,500-2,000(?)
		3	Limestone, dark grey to black, platy; middle member: limestone, light grey, thin bedded	1,400(+)
Helikian		2	Dolomite, buff, orange and grey weathering, in part stromatolitic; minor green, brown and purple shale	1,500(+)
		1	Argillite, shale, siltstone; tan, green, purple; orange-weathering dolomite; minor fine-grained quartzite	270(+)

DESCRIPTION OF MAP-UNITS

Proterozoic

Map-unit 1

Strata of map-unit 1, the oldest rocks recognized, are restricted entirely to the hanging-wall of a major thrust fault in the extreme northeast corner of the map-area. Approximately 300 feet of thin-bedded varicoloured, predominantly fine-grained clastic rocks are there exposed; these presumably form the top of a much thicker largely quartzite sequence described in the adjoining Wrigley Lake map-area (see Gabrielse et al., 1965, map-unit 2). Unit 1 includes green and brown, mud-cracked silty shale; tan-buff, green and purple banded argillite; finely laminated and crossbedded silty argillite and siltstone; very fine grained cream orange and red weathering, in part stromatolitic, dolomite, and rare pale green fine-grained quartzite.

Map-unit 2

On the long ridge west of Keele River in northeastern Sekwi map-area unit 2 is 1,500 feet thick and consists mostly of buff, pale orange and light grey weathering thin-bedded fine-grained dolomite. Alternating thin beds and bands of bright orange-weathering dolomite and dark purple shale form a distinctive member near the middle of the section. The uppermost beds consist of more than 100 feet of vuggy, reefoid, craggy weathering, light grey dolomite overlain by at least 100 feet of bright orange-weathering stromatolitic dolomite with minor purple and green argillite. Map-unit 2 appears to be limited upward by faults in this area and is much thicker to the southeast and northwest where stromatolitic orange-weathering dolomite is more prevalent.

Map-unit 3

Map-unit 3 is at least 1,400 feet thick and consists of dark grey to black, platy and flaggy limestone. The base of a 300-foot-thick member of light grey weathering, generally thin-bedded limestone lies about 300 feet above the base of the formation. The light grey member includes some interbedded dark platy limestone, and at the top several 1- to 2-foot-thick beds of light grey rough weathering, fine-grained, limestone breccia.

Map-unit 4

Map-unit 4 outcrops in the northeast corner of the map-area where at least 1,500 -2,000 feet of strata are preserved beneath a major unconformity at the base of the Rapitan Group. The lithology of this unit is not well known and it may in part include rocks of map-units 2 and 3. The main lithology is poorly bedded, commonly craggy, orange and buff-grey weathering light grey limestone.

Map-units 5, 6, and 7, Rapitan Group

In Sekwi Mountain map-area the Rapitan Group is divisible into three distinct formations mapped as units 5, 6 and 7, all of which are bounded by unconformities. These rocks have been well described by Upitis (1966) in the area between Keele and Ekwi Rivers where the thickness of the group as a whole totals more than 6,100 feet.

The lowest division, and perhaps most distinctive unit in the entire region (unit 5), consists of very dark purple hematitic mudstone. The distinct colour combined with sharpness of contacts above and below, both of which are angular unconformities, make this an especially easy unit to outline, even on aerial photographs. Locally present in the mudstone are isolated pebbles and cobbles of limestone, green mudstone, greenstone, sandstone and chert in part faceted as if of glacial origin. Thicknesses vary abruptly, due to erosion, from a maximum of 600 feet to 0. Iron-formation, present in other parts of the Mackenzie Mountains where more of this unit is preserved, was not found.

Map-unit 6 consists of at least 2,700 feet of light green-grey and dark grey conglomeratic, silty and sandy mudstone that as a whole weathers brown to orange-brown. Clasts are much more abundant than in the lower unit and include pebbles, cobbles and boulders of carbonate, greenstone, sandstone, chert, mudstone, and, in places, metamorphic rocks. This unit rests unconformably on map-units 4 and 5, with a discordance of up to 10 degrees in places.

The uppermost division of the Rapitan Group (unit 7) is characterized by a uniform lithology, consisting mainly of dark green to brownish grey weathering, green to dark grey shale. Minor constituents are light grey limestone, very fine grained light green-grey to brown sandstone, and in the upper part, a few laminations and bands of buff or orange-brown weathering dolomitic limestone. Sandstone is mostly platy or thin bedded with shale partings and weathers typically orange-brown. The middle part of the unit is generally more sandy and orange weathering over a thickness of about 800 feet. Petrographic work by Upitis (1966) showed a high proportion of feldspar in the arenites which suggests a possible source in crystalline rocks to the east.

Map-unit 8

Map-unit 8 forms a distinctive resistant buff-orange weathering marker between the predominantly shale units 7 and 9 and in the northeastern part of the map-area. A thickness of 1,120 feet of strata was measured comprising orange-brown weathering locally calcareous slaty argillite in the lower part and interbedded orange-buff weathering, fragmental dolomitic limestone and sandy dolomite in the upper half. The limestone is characterized by pale blue-grey weathering, angular limestone fragments.

Map-unit 9

Constant thickness and uniform lithology, with smooth dark glossy talus slopes characterize this predominantly slate unit, which is restricted to the east flank of the Sayunei Range. A maximum thickness of 2,370 feet was measured, consisting of finely banded and laminated bluish and brownish grey slate, slaty argillite, in part silty and sandy, and minor laminated

brown siltstone. A thin pebble-conglomerate member is present near the middle part of the section and in general the unit coarsens upward, containing more silty and sandy bands in the upper part, grading conformably into overlying quartzites of unit 10.

Map-unit 10

Map-unit 10 is essentially a shale-siltstone sequence that includes rocks older than map-units 11 and 12 and westward shale-silt equivalents of these two units. East of June Lake unit 10 is divisible into a lower light brown to orange-weathering shale-siltstone member more than 600 feet thick, a middle cliff-forming member 600 feet thick of medium blue-grey weathering platy to thin-bedded dark limestone, with distinctive rouge weathering parting surfaces, and an upper sequence about 750 feet thick of dark grey, poorly laminated, in part calcareous shale, with minor quartzite and rare bands of orange-brown weathering silty or sandy dolomite. West of June Lake and north of O'Grady Lake where unit 10 still underlies unit 12, it consists of brown-weathering well-banded and laminated, mostly greenish and brownish green shale. Northwest of O'Grady Lake, quartzites of unit 12 have changed facies westward and the upper part of unit 10 contains much interbedded quartzite and shale. Near Canol Road camp Mile 222, this unit is mostly banded and laminated grey and brownish green-grey slate with good slaty cleavage. The lower part exposed in the bed of Keele River just east of camp 222 is pale green slate and phyllite, possibly correlative with the top of the Hadrynian grit unit (unit 1, Green et al., 1968). It appears that the degree of slaty cleavage increases with its depth in section of unit 10, and, to the west. Slate and slaty phyllite predominates in the lower part and shales in the upper part.

Map-unit 11

This map-unit forms prominent buff-coloured cliffs, where it underlies a thick quartzite sequence in a restricted area north and south of the big bend on Natla River. It consists of thick-bedded buff weathering dolomite, in part oolitic, which grades upward into dolomite-cemented sandstone. Where sandy it normally shows well-developed large scale crossbedding. A maximum thickness of 500 feet was measured just north of Natla River. Thinning and eventual disappearance to the north is apparently primary as the upper contact is conformable with overlying quartzites of unit 12.

Cambrian and/or Precambrian

Map-unit 12

North of Natla River, 3,200 feet of strata were measured consisting of thin beds of white or buff weathering, fine-grained quartzite, with minor brown siltstone. Several members of orangish weathering dolomite are present in the upper part overlain by a 150-foot bed of quartz-pebble conglomerate. Westward near the centre of the map-area these quartzites become finer grained and finally pass laterally into unit 10a. Some sand persists in the uppermost 200-400 feet of unit 10a as far west on Canol Road camp, Mile 222.

Cambrian

Map-unit 13

Fine-grained clastic rocks of map-unit 13 form a thin, yet persistant recessive interval between quartzites of unit 12 and the Sekwi Formation throughout most of the map-area. Typically uniform brown weathering, this unit consists of dark grey to black platy argillite, slate, finely laminated siltstone and fine-grained quartzite, with a total thickness of about 500 feet. Olenellid trilobites found near the top (Handfield, 1968) indicates that at least the upper part of this unit is of early Cambrian age.

Map-unit 14 - Sekwi Formation

The Sekwi Formation has been described by Handfield (1968). At its type section just north of June Lake, the Sekwi Formation is 2,525 feet thick, at Cariboo Pass 3,234 feet and east of Natla River 1,676 feet. The unit is characterized by bright orange and yellow weathering dolomites, in part sandy, silty and calcareous, and mottled dolomitic limestone. Contacts of the Sekwi are readily defined by recessive brown siltstone and mudstone beneath (unit 11) and recessive dark weathering shaly limestone above (unit 15). The Sekwi is highly fossiliferous and contains numerous genera of lower Cambrian trilobites and archeocyatha. North and south of Canol Road and at the head of Keele River, the Sekwi Formation is divisible into an orangish weathering and upper grey weathering dolomite sequence. Farther westward the grey member disappears and the orange-weathering beds thin rapidly finally disappearing beneath Ordovician-Silurian dark shales just west of the map-area. Most of the thinning appears due to erosion at the base of a Late Ordovician unconformity. In the eastern part of the area the Sekwi Formation thins perceptibly northward beneath Cambro-Ordovician strata (unit 16) and is absent entirely in the Sayunei Range. Stratigraphic studies to the southeast suggest that the Sekwi Formation changes facies eastward into Lower Cambrian quartzites, correlative with at least the top of unit 12. In this area the Sekwi thins eastward to a feather edge above unit 12, due mainly to Middle Cambrian erosion and only the lower part can be shown to be transitional to sand.

Map-unit 15

Contrasting markedly with the Sekwi Formation in the eastern and central parts of the map-area is an unconformably overlying sequence of dark recessive impure limestone and calcareous shale (unit 15). In the southeast of the map-area these rocks total 900 feet in thickness and according to W.H. Fritz of the Geological Survey of Canada include both Albertella and Bolaspidella zones of Middle and Late Middle Cambrian age. There the unit is divisible into three members: a lower member approximately 150 feet thick of recessive, largely calcareous, black shale with a base of thin-bedded shaly very fine grained, dark blue-grey limestone; a middle member nearly 400 feet thick of flaggy and thin-bedded dark blue-grey to black very fine grained and crypto-grained limestone, and an upper member of thin-bedded light grey weathering, very fine to medium crystalline grey dolomite. To the southeast unit 15 overlies lower Cambrian quartzite (unit 12) and northwestward rests at different levels on the Sekwi Formation. Just north of June

Lake at the type section of the Sekwi Formation it appears that the basal Albertella-bearing beds of unit 15 are missing (W.H. Fritz, pers. comm.) suggesting a disconformity beneath the middle member. In this area the three fold division is not readily apparent as the unit becomes generally more shaly and recessive westward and northwestward.

Map-unit 16

Map-unit 16 is an indivisible sequence of dark recessive platy limestone and calcareous shale that includes Middle Cambrian rocks of unit 15 as well as facies of the predominantly carbonate units 17 to 25. Its age varies from Upper Middle Cambrian near June Lake to Middle Eifelian in the western part of the map-area. Where best exposed northwest of Caribou Pass basal beds are black, slightly calcareous shale, which become more calcareous upwards in section, with occasional 1- to 2-foot beds of massive bioclastic limestone, commonly containing orangish or brownish weathering selectively dolomitized clasts. Near the middle of the section the limestone beds make up 50 per cent of the unit. Some dark chert bands are present intercalated with shales and occasionally bluish black graptolitic unconformities are present in the section; below the mid-Franconian and below the Upper Ordovician. The latter unconformity appears to persist at least as far west as the Yukon-Northwest Territories border where graptolitic rocks of the Road River Formation directly overlie sub-Sekwi Formation slates of unit 10.

Map-unit 17

In the southeast corner, and near the eastern margin of the map-area unit 17 is divisible into two members totalling more than 1,100 feet: a lower member of predominantly light grey weathering thin-bedded dolomite with basal beds of fine- to medium-grained dolomite-cemented sandstone and an upper member more than 600 feet thick composed of platy to flaggy wavy banded and laminated silty limestones, weathering buff, pale orange and grey. To the west and northwest the lower division disappears and the basal sandstone, as much as 150 feet thick in the southeast, is recognizable only locally as basal more silty and sandy beds of the upper limestone member which thickens to more than 2,000 feet north of June Lake.

Trilobites found in the platy limestones, according to W.H. Fritz of the Geological Survey of Canada, include Saukia and Ptychaspis-Prosaukia of late Upper Cambrian age, indicating a marked hiatus between this unit and the youngest underlying beds of late Middle Cambrian age (unit 15).

Northwest of June Lake unit 17 changes facies to dark recessive calcareous shales and shaly limestones of unit 16.

Map-unit 18 - Sunblood Formation

The Sunblood Formation is restricted to the eastern arc of the Backbone Ranges, mainly east of Natla River and June Lake. Where best exposed near the southeast corner of the map-area it consists of at least 1,500 feet of platy to flaggy nodular bedded limestones and dolomitic limestone commonly buff or yellowish weathering. Basal beds are typically interbedded fine- to medium-crystalline black dolomite and very coarsely crystalline

white dolomite. Within upper part is a distinctive sequence known informally as the "wine beds", characterized by orange, buff and yellow mottled wavy banded silty dolomite and limestones commonly with sandy laminations and intercalated orange-weathering dolomite bands and rarely thick beds of pure light blue-grey limestone. The Sunblood Formation comformably overlies platy silty limestones and dolomites of unit 17 and is unconformably overlain by the Whittaker Formation.

Map-unit 19 – Whittaker Formation

The Whittaker Formation, so extensive in other areas to the southeast (see Gabrielse et al.) is typically developed only in the eastern part of the map-area mainly east of June Lake and northwest of Canol Road. The characteristic thickly banded white and black, commonly chert-bearing dolomites change abruptly westward through black shaly limestone to black shales of the Road River Formation (map-unit 19).

In the south the Whittaker Formation becomes shaly westward from near 128°15'W. East of Natla River the upper part is almost entirely dark recessive weathering shaly limestone and the lower part, though still mostly light and dark dolomite, is thinner bedded and contains intervals of banded dark chert. West of Natla River near 128°50'W the Whittaker Formation is replaced entirely by black graphitic shales and shaly limestone of the partly coeval Road River Formation.

Map-unit 20 – Delorme Formation

As in adjacent areas to the south and east the Delorme Formation is characterized by striking, yellow and orange-weathering, thin-bedded impure carbonates, principally dolomite. Recessive intervals of shaly and calcareous platy strata are commonly present forming a coarse striped pattern within the unit, and locally in the west and south become dominant grading continuously to shales of the Road River Formation. The Delorme Formation, in particular the recessive shaly and limy members, contains an abundant fauna, including ostracods, graptolites, brachiopods, and fish plates of Late Silurian to Early Devonian age.

Map-units 21 and 22

The Sombre and Arnica Formations continue essentially unchanged from map-areas in the south (see Gabrielse et al., 1965) northwestward across the Sekwi Mountain map-area. Even the black middle band of the Sombre Formation, so characteristic in areas to the south, can be recognized as far north as Natla River. The two formations are everywhere conformable, and show little variation in thickness throughout the area, Lithologic variation is almost entirely restricted to the Arnica Formation, being essentially a change in relative proportions of thin-bedded black dolomite and platy to flaggy black shaly limestone. "Bear Rock" breccia, more characteristic of areas to the east, is rare.

Where most typically developed north and south of Natla River the Sombre Formation consists of 1,500 to 2,00 feet of regularly thin- to medium-bedded very light grey weathering fine-grained, commonly cherty, dolomite; the Arnica Formation consists of approximately 2,000 feet of dark grey to

black dolomite with occasional light grey beds. The base of the Sombre is gradational with the underlying Delorme Formation, the contact being drawn at the uppermost buff-yellow weathering bed. The Arnica Formation is abruptly overlain by well-bedded resistant limestone of the Landry Formation. Numerous fossil collections in the Arnica Formation all indicate a Middle Devonian Eifelian age. The Sombre Formation yielded no diagnostic fossils in numerable sections and traverses.

Map-unit 22c. In the northwest corner of the map-area, Silurian and Devonian carbonate formations cannot be readily distinguished and are mapped collectively as unit 22c. This unit consists primarily of at least 3,000 feet of uniformally light grey weathering massive, locally reefoid, thick-bedded dolomite, ranging in age from about Late Silurian to Givetian; including correlatives of Whittaker through Nahanni Formations (map-units 19 to 23). To the south this conspicuously cliff-forming carbonate thins rapidly by changing in its lower part to recessive, dark calcareous shales of unit 16. Where last seen west of Caribou Pass unit 22c is entirely of Middle Eifelian age, although it is not known whether this reflects a facies change in the upper part as well as a hiatus beneath the dark shales of unit 26.

Map-unit 23 - Landry Formation

The Landry Formation is distinguished by a very light grey, almost white, weathering colour, uniform regular bedding and consistent composition of brown, medium grey or black crypto-grained limestone. Beds are 1 to 2 feet thick or rarely, where slightly bioclastic, up to 10 feet thick, with a crude internal parting. South of Natla River near the east margin of the map-area, the Landry Formation is at least 3,000 feet thick. Farther southeast where it intertongues with dark recessive sooty, platy limestone of unit 23b, it is extremely bioclastic especially crinoidal, massive and reefoid. Throughout much of the northern part of the area the Landry Formation consists of two thin tongues of bioclastic limestone separated by mainly buff-brown weathering, platy, recessive, impure limestone. The Landry Formation is conformable with the Arnica Formation or locally disconformable where reefoid and is overlain conformably by the Headless Formation.

Map-unit 24 - Headless Formation

Light brown and buff weathering, generally flaggy, silty limestones of the Headless Formation are highly fossiliferous throughout the map-area where they occupy a recessive zone beneath resistant, light grey limestone of the Nahanni Formation. In part, the Headless Formation is mottled buff and grey weathering, locally thin bedded, commonly with resistant ribs of grey weathering massive limestone and recessive intervals of light brown calcareous shale. The Headless Formation is dated on the basis of fossils as Early Givetian age.

Map-unit 25 - Nahanni Formation

Usage of the term Nahanni Formation follows that of Douglas et al. (1963) and Gabrielse et al. (1965) in the Mackenzie Mountains to the southeast. The most distinctive feature of this formation is its uniform character

and consistent thickness of 200 to 300 feet over wide areas. It consists of massive light grey weathering, medium grey crypto-grained limestone in places divisible into three units; an upper and lower thick-bedded part and a middle, thinner bedded more recessive member.

Map-unit 26

Black shale of unit 26 forms much of the subdued topography of the northwest part of Sekwi Mountain map-area and commonly occupies the cores of synclines in the tightly folded areas to the east and north. Much of the shale weathers light tan-brown and silvery light grey, particularly in the west. In the southwest part of the map-area this unit includes much chert-pebble conglomerate and chert arenite, possibly correlative with map-unit 7. Northwest of Canol Road, where the stratigraphy of this unit is best known, a resistant massive siltstone member (26b) forms a prominent marker unit 600 feet thick. Shales above and below are essentially indistinguishable except that silvery blue weathering, jet-black shale seems to be restricted to the lower member.

Map-unit 27

The resistant quartzite-conglomerate sequence map-unit 27, forms conspicuous ridges and knolls in the dominantly dark shale terrain, northwest and west of Caribou Pass. Thicknesses vary from 0 to a maximum of over 1,000 feet. Medium-grained quartzite and sandstone are the predominant lithologies. The unit is characterized by very chaotic chert-pebble and cobble conglomerate, intercalated locally with black shale. The coarsest material is present at the base which rests unconformably on units of various ages that become younger to the southwest. West of Caribou Pass underlying shales are post-Givetian, whereas, northwest of Mile 208, only 8 miles to the southwest, cobble conglomerates rest on calcareous black shales of mid-Eifelian age. This unconformity accounts for the absence of map-units 26 (a, b and c) and much of map-unit 16 in the area west of Caribou Pass.

Map-unit 28

Black shales and argillites of map-unit 28, are restricted to the cores of synclines northwest of Canol Road camp, Mile 208, where they overlie resistant chert arenites and chert-pebble conglomerate of map-unit 27 conformably. A maximum thickness of 800 feet is evident near the west margin of the map-area, where the section underlies Carboniferous or Permian carbonates with apparent unconformity.

Map-unit 29

This unit is found at one small area at the western margin of the map-area where about 500 feet of strata are preserved. It is characterized by variable amounts of light grey to buff quartzite, dolomites, interbedded dark shale and minor chert. The lower beds are conformable with the underlying black shales and include thin beds of bioclastic limestone and cherty, banded mauve, grey and orangish dolomite. Carbonate members of this unit contain an abundant bryozoan fauna and brachiopods of Carboniferous or Permian age.

Map-unit 30

The youngest stratified rocks in the area, map-unit 30, appears to be restricted to a fault bounded block northeast of June Lake between Keele River and Canol Road. A section 3,155 feet thick was measured from the lower fault contact to the axis of a tight syncline near the centre of the block. On the whole these rocks resemble map-unit 26 in the southwest corner of Sekwi Mountain map-area, but contain an abundance of carbonized plant debris and appear to be mainly nonmarine. The measured sequence consists predominantly of recessive black carbonaceous shales intercalated with thin beds of mostly dark very fine grained quartzite and siltstone, containing 20- to 100-foot-thick members of black shale, fine-grained light coloured quartzite and pebble conglomerate. Some banded black chert and procellanite is present in the lowermost beds.

The quartzite is typically composed of well-cemented very fine to fine-grained glassy quartz sand and is extremely homogeneous in composition and texture. The conglomerates contain angular fragments of dark chert and porcellanite as much as 3 inches across and well-rounded pebbles of very fine grained pure homogeneous glassy quartzite set in a slightly coarser pure quartzite matrix.

Material collected from both the lower and upper parts of the sequence was examined by D. C. McGregor of the Geological Survey of Canada who identified megafossil plant compressions and spores including Cicatricosisporites sp., ?Gleicheniidites sp., and septate fungal spores suggesting an Early Cretaceous or Late Cretaceous age.

The discovery of this downfaulted, folded block within the western part of the Mackenzie Mountains fold belt is significant as it shows that the limit of Cretaceous sedimentation extended much farther west than was previously suspected and confirms that major structures in the area are post-Early or Late Cretaceous.

Map-unit 31

Granitic stocks, map-unit 31, present only in the southwest corner of the map-area, are dominantly granodiorite and quartz-monzonite characterized by hornblende as the principal mafic mineral and locally by an abundance of potassium feldspar megacrysts. Generally the stocks lack foliation, have sharp well-defined contacts with few apophyses, are finer grained or in part porphyritic near contacts, and contact aureoles are narrow, commonly less than 1,000 feet wide. In southwesternmost Sekwi Mountain map-area, numerous small granitic stocks intrude clastic rocks, dominantly shales, of Proterozoic to Devono-Mississippian and possibly younger age. These stocks are part of a belt of granitic intrusions that fringe the Selwyn shale basin to the east and northeast and have been variously dated by potassium argon means as 96 million years, Itsi Range (Baadsgard et al.) and as 88 million years (O'Grady Stock, by the Geological Survey of Canada, 1969).

STRUCTURAL GEOLOGY

Structurally Sekwi Mountain map-area is divisible into four major elements dominated by an arcuate fault-fold belt more than 25 miles wide that extends diagonally across the map-area from southeast to northwest. This belt is outlined by steeply west dipping reverse faults near Caribou Pass on the west and Delthore Mountain on the east. Steep, longitudinal reverse faults, both west and east dipping, characterize this belt, with folding restricted chiefly to the younger less competent Devonian strata, which is mainly developed in the Godlin Lakes Synclinorium northwest of Canol Road. Within this arcuate belt folds change trend as much as 90 degrees in 90 miles from N30°E near the head of Natla River in the south to N60°W at the northwest corner of the map-area, and over the first half of this distance change in trend averages almost 2 degrees per mile.

The three other structural divisions include: an area of flat-lying strata northeast and east of the central fault belt, bounded near the northeast corner of the map-area by a major west-dipping thrust fault; and two areas in the west characterized by relatively open folding, but which differ in fold trend. North of Tsichu River folds trend northwest, whereas to the south they are mostly east-west.

As seen on the structural section A-B structures in the exposed stratigraphic succession record appreciable shortening of the area in the southwest-northwest direction confined mainly to the central fault-fold belt with stratigraphic throws on major faults of several thousand feet.

ECONOMIC GEOLOGY

Sekwi Mountain map-area, in particular the southwest corner, has been receiving increasing attention in recent years but as yet no mineral occurrences of economic interest have been discovered. Two promising deposits are presently being explored near the Canol Road in the adjoining map-area to the west. A lead-zinc deposit in banded and finely laminated argillite of unit 10 and a tungsten-bearing skarn deposit in banded argillite and limestone of lower Cambrian age (unit 14). Similar occurrences may be expected in the southwest corner of Sekwi Mountain map-area.

The Proterozoic section in the northwest part of the area is likewise potentially favourable for mineral discovery, particularly copper, as several of the units are continuous with those of the Redstone copper belt to the southeast and copper occurrences are known on strike to the northwest. The Rapitan Formation, which hosts extensive hematite deposits in the Snake River area to the northwest, is notably barren in this area.

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