GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA

PAPER 78-23

ELEVEN STRATIGRAPHIC SECTIONS FROM THE LOWER CAMBRIAN OF THE MACKENZIE MOUNTAINS, NORTHWESTERN CANADA

W.H. FRITZ

Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

1979

GEOLOGICAL SURVEY
PAPER 78-23

ELEVEN STRATIGRAPHIC SECTIONS FROM THE LOWER CAMBRIAN OF THE MACKENZIE MOUNTAINS, NORTHWESTERN CANADA

W.H. FRITZ

1979

Available in Canada through

authorized bookstore agents
and other bookstores

or by mail from

Canadian Government Publishing Centre
Supply and Services Canada
Hull, Québec, Canada K1A 0S9

and from

Geological Survey of Canada
601 Booth Street
Ottawa, Canada K1A 0E8

A deposit copy of this publication is also available
for reference in public libraries across Canada M

Cat. No. M44-78/23 Canada: $4.00
ISBN – 0-660-10164-5 Other countries: $4.80

Price subject to change without notice

Critical reader

J.D. Aitken

Original manuscript submitted: 1978 - 6 - 30
Approved for publication: 1978 - 9 - 13

CONTENTS

Illustrations

Plates

ELEVEN STRATIGRAPHIC SECTIONS FROM THE LOWER CAMBRIAN OF THE MACKENZIE MOUNTAINS, NORTHWESTERN CANADA

Abstract

This is the last of three closely related papers describing Lower Cambrian strata in the Mackenzie Mountains. As in the previous papers, the strata are divided vertically into two grand cycles (clastic-carbonate pairs) and are separated laterally into inner detrital, middle carbonate, and outer detrital belts. Data from the present 11 sections are combined with those from 25 previously published sections to show the distribution of depositional facies.

The base of the first grand cycle is raised so that it now coincides with the base of a fine- to coarse-grained quartzite member within map unit 12. This position is believed to be close to the Cambrian-Precambrian boundary as it is presently mapped in western North America. The overlying half-cycle consists of carbonate that formed a platform during ***Nevadella*** *Zone time and shed coarse blocks onto an adjacent slope. An early but brief interruption of the platform-making process took place in the southeastern part of the area where deeper submergence led to the deposition of a thin member of outer detrital strata. Near the top of this half-cycle the presence of quartz sand in "floating clasts", interbeds, channels and cave deposits suggests intermittant bypassing of clastics across the platform. The position of a clastic wedge against the outer edge of the platform strengthens this suggestion.*

During the deposition of the lower half of the second grand cycle, a regional regression produced clastics that blanketed the area and terminated the platform-building process. Clastics overlying the platform are highly coloured whereas those in the transition zone between the outer platform and the slope have a sombre hue. The boundary between the ***Nevadella*** *Zone and the* ***Bonnia-Olenellus*** *Zone lies within this half-cycle. The upper half-cycle begins with a widespread, resistant limestone unit followed by an intra-cycle (half-subcycle) clastic unit that is also widespread. Physical correlation of the overlying carbonate and subordinate siltstone in the half-cycle is more difficult. The top of the upper grand cycle is diachronous and lies within the medial and upper part of* ***Bonnia-Olenellus*** *Zone. Overlying the second grand cycle are outer detrital black shale and platy limestone that were deposited throughout the rest of the Cambrian and later.*

The upper half of the first grand cycle is thicker in the southeastern part of the area than in the northwestern. This relationship is reversed for strata in the second grand cycle and in the remainder of the Lower Cambrian. Thicknesses in the Middle Cambrian are more variable than in the Lower Cambrian. This paper describes 238 stratigraphic units and identifies fossils from 284 localities.

Résumé

Dernier d'une série de trois rapports étroitement liés, celui-ci présente une description de strates du Cambrien inférieur des monts Mackenzie. Comme dans le cas des deux rapports précédents, les strates sont divisées verticalement en deux grands cycles sédimentaires (associations de roches clastiques et de carbonates); horizontalement, on distingue une zone détritique intérieure, une zone carbonatée médiane et une zone détritique extérieure. Les auteurs groupent les 11 sections de ce rapport avec les 25 qui ont déjà été étudiées, afin de montrer la distribution des faciès des sédiments.

On élève la base du premier cycle sédimentaire de manière à la faire coïncider avec celle d'une quartzite grenue à microgrenue qui forme l'un des termes de l'unité cartographique 12. On croit que cette position se rapproche de la frontière entre le Cambrien et le Précambrien, telle qu'elle apparaît actuellement sur les cartes de l'ouest de l'Amérique du Nord. La série susjacente du cycle sont les carbonates qui ont constitué une plate-forme pendant la période de la zone à ***Nevadella*** *et éparpillé des blocs grossiers sur une pente adjacente. Très tôt, cependant, le processus d'édification de la plate-forme a été brièvement interrompu dans la partie sud-est de la région, où l'élévation du niveau des eaux a fait se déposer de minces strates formant une zone détritique extérieure. Non loin du sommet de cette série, du sable quartzifère se présente dans des "lambeaux", des lits intercalaires, des canaux et des dépôts de fonds, ce qui laisse supposer que des roches clastiques auraient dévié à travers la plate-forme. Cette hypothèse est renforcée par la présence d'une couche clastique contre le bord extérieur de la plate-forme.*

Pendant la sédimentation de la série sous-jacente du deuxième cycle sédimentaire, il s'est produit une régression régionale qui a recouvert la zone de roches clastiques et mis un terme au processus d'édification de la plate-forme. Les roches clastiques surmontant la plate-forme sont très colorées, mais celles qui reposent dans la zone de transition entre la marge extérieure de la plate-forme et la pente ont une teinte sombre. C'est à l'intérieur de cette série sous-jacente que réside la frontière entre la zone à ***Nevadella*** *et la zone à* ***Bonnia-Olenellus****. La série susjacente commence par une unité de calcaire étendue et résistante, suivie d'une série secondaire également étendue qui se compose de roches détritiques. Il est plus malaisé d'établir une corrélation physique entre les carbonates et les siltstones sous-jacents. Le sommet du cycle supérieur est diachronique et repose à l'intérieur des parties médiane et supérieure de la zone à* ***Bonnia-Olenellus****. Le deuxième cycle est surmonté de roches détritiques formées de schiste argileux noir et de calcaire tabulaire, qui se sont déposées pendant tout le reste du Cambrien et par la suite.*

La série susjacente du premier grand cycle est plus épaisse dans la partie sud-est de la région que dans le nord-ouest, et le contraire se produit dans le deuxième cycle et dans le reste du Cambrien inférieur. Par ailleurs, les épaisseurs varient davantage dans le Cambrien moyen que dans le Cambrien inférieur. Le rapport décrit 238 unités stratigraphiques et identifie des fossiles provenant de 284 endroits.

ELEVEN STRATIGRAPHIC SECTIONS FROM THE LOWER CAMBRIAN OF THE MACKENZIE MOUNTAINS, NORTHWESTERN CANADA

INTRODUCTION

This is the third and last of a series of papers designed to illustrate 36 stratigraphic sections from the Mackenzie Mountains. The present data have been integrated with those from previous sections (Fritz, 1976b, 1978) in Figures 4 and 5 to summarize the distribution of depositional facies. Figure 4 provides the widest view of the facies, whereas Figure 5 gives additional data from the southeastern part of the area that were omitted from Figure 4 because of space limitations.

The new stratigraphic sections are located on Figure 1 and shown on Figures 2 and 3. As in the previous papers, correlation is made by extending contacts of formations, half-cycles, half-subcycles, and zones from one section to the next closest section. Because the present and previous sections have been published to the same scale, all are now available for comparison in this manner. When comparing sections, it is suggested that Section 31 and 4 in the present paper be used rather than Section 4 in the previous paper. Section 31 and 4 is a composite in which new data (Section 31) have been added to the base of Section 4, and old but unpublished data (from Section 4 field notes) have been added above.

Most of the fossils represented by Geological Survey of Canada locality numbers to the right of the sections are stored in Ottawa. Identifications are listed by locality numbers in the appendix. These identifications are by the writer except for localities 88939 through 88944, which are by W.T. Dean. Identifications are not yet available for collections 94596 and 94597 in Section 35 and localities 95604-95606 in Section 33. Paleontological analysis of the micro-shelly fossils in these samples is being undertaken by S. Conway Morris. The 29 collections preceded by the letter "C" in Section 33 are also awaiting identification. These samples were processed at the Geological Survey of Canada's Institute of Sedimentary and Petroleum Geology, Calgary, by W.A.M. Jenkins. Microfossils in these samples are being identified by M. Vanguestaine, and the samples will ultimately be stored in Calgary.

During the field work supporting this and the previous two papers, emphasis was placed on studying strata between the base of the Sekwi Formation and the top of the Lower Cambrian. Information on older and younger strata was gathered during the short and often unpredictable amount of time remaining at any one section. In this paper 238 stratigraphic units are described and fossils from 284 localities are identified.

In the following text the strata are discussed in terms of grand cycles as described by Aitken (1966) and depositional belts as described by Palmer (1960) and by Robison (1960). The method of applying these terms to the Lower Cambrian of western North America (Fritz, 1975) and to the Lower Cambrian of the Mackenzie Mountains in particular (Fritz, 1976a, 1976b, 1978) has been illustrated.

PREVIOUS WORK AND ACKNOWLEDGMENTS

Publications on the Lower Cambrian of the Mackenzie Mountains have been cited in the first and second papers of this series (Fritz, 1976b, p. 1; 1978, p. 2). Since then Krause and Oldershaw (1978a, b) have published on the subject, and Krause has nearly completed a Ph.D. thesis on these strata at the University of Calgary.

In 1976 the measuring of three of the present sections (26, 27, 28) was facilitated through the courtesies offered by A.G. Harman, D. Yeager and others at the nearby Harman Management camp at Goz Lake. In the same year D. Tempelman-Kluit and G. Eisbacher kindly diverted a helicopter shuttling between their camps to move the writer to Sections 29, 30, and 32 through 35. Tempelman-Kluit provided a staging area for field operations, maintained a flight schedule, provided food and mail service, and maintained twice daily radio contact. During short intervals in 1976 and 1977 the writer was assisted by C. Lord and F.F. Krause from the Department of Indian and Northern Affairs camp at June Lake (between Sections 10 and 33). In 1977 H. Speelman, one of that Department's assistants and M.J. Bleth helped the writer with the upper part of Section 33, and J.D. Aitken aided with the lower part. Assistance on 10 of the present sections was provided by J. Harper, who had earlier assisted the writer with 15 of the previous sections.

GRAND CYCLES

Grand cycle A, lower half-cycle (A1)

In previous papers (Fritz, 1976a, p. 11; 1976b, p. 2; 1978, p. 2) the writer has tentatively placed the base of this grand cycle at the bottom of Blusson's (1971) map unit 12. After viewing the map unit in Sections 33 and 35, and after reflecting on the composition of this map unit elsewhere in the Mackenzie Mountains, the writer now favours raising the base to a position within map unit 12. This position in Sections 33 and 35 is at the bottom of stratigraphic units 5 and 4 respectively. Thus defined, the half-cycle is an upwardly fining clastic succession. Its lower part is the upper portion of map unit 12 consisting of clean, fine- to coarse-grained quartzite (Section 33, units 5-9; Section 35, unit 4) with only minor siltstone interbeds, some of which contain burrows (Pl. 5, fig. 5). The next component in the half-cycle is map unit 13, consisting of medium dark, very fine grained sandstone and siltstone (Pl. 6, fig. 2) with abundant burrows

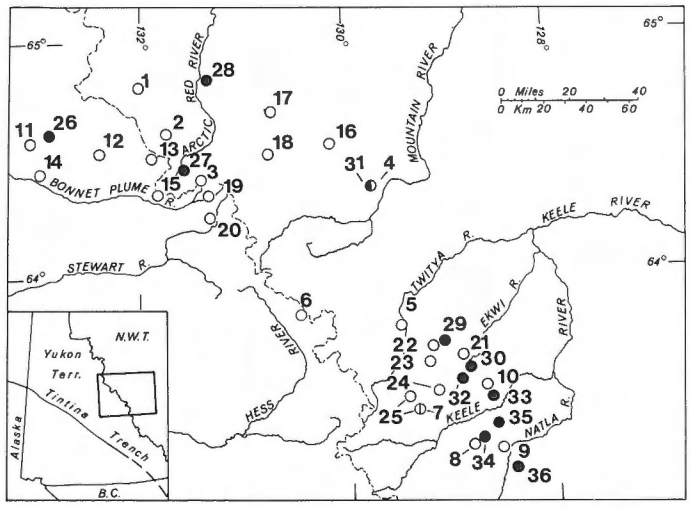


Figure 1. Index map. Solid circles locate sections described in this paper. Open circles locate sections described in previous papers (Fritz, 1976b, 1978).

(Pl. 3, fig. 1; Pl. 4, fig. 1, 2). The uppermost beds in the half-cycle belong to the lowermost Sekwi Formation. They are mainly composed of light brown to orange brown weathering, slightly limy siltstone. Some limestone is present in thin, wavy to nodular beds (Pl. 1, fig. 2); megafossils are rare. The top of the half-cycle is placed at the point where carbonate predominates over clastics.

Strata in the lower part of map unit 12 that are here excluded from the half-cycle consist of very fine grained quartzite in thin and medium beds and of interbedded siltstone. At Sections 33 and 35 carbonate interbeds are very sparse and some small burrows are present. At the base of map unit 12 at the sites of the two sections is a thin carbonate unit (Pl. 6, fig. 5) that the writer has labled map unit 11 on Figure 3. Blusson (1972) recognized this map unit a short distance to the east, but did not map its westward extension (thin tongue?) into the vicinity of Sections 33 and 35. Map unit 11 is reported (written communication on GSC localities 94596 and 94597, Conway Morris) to contain small shelly fossils.

Although the base of the half-cycle has been redefined in this paper, the newly designated position should be considered tentative until more work is done on strata that directly underlie the Sekwi Formation. It remains to be proven, for instance, whether map unit 13 is missing at the sites of Sections 16-18, 28, and 31 and 4 because of pre-Sekwi erosion in the northeast (Fritz, 1978, p. 2), or whether map unit 13 grades laterally into map unit 12 before reaching those sections. In either case, there is an abrupt change in the grain size of clastics at the contact between the Sekwi Formation and map unit 12 at the sections cited, with light coloured, fine to coarse grained quartzite in crossbeds below (Pl. 4, fig. 6) and very fine grained, planar laminated quartzite and siltstone above.

Grand cycle A, upper half-cycle (A2)

Most of the strata in the Mackenzie Mountains belonging to this half-cycle are platform carbonates of the middle carbonate belt. New data can now be combined with those gathered earlier to record a brief but extensive penetration of the outer detrital environment into the middle carbonate belt in the southeastern part of the study area (Fig. 5). Here the penetration interrupts the half-cycle at 12 of the measuring sites, precedes the half cycle at 2 of the sites (Sections 8, 24), and completely displaces the half-cycle at 1 site (25 and 7). The effect of the penetration is weakly recorded as dark platy limestone at Section 36 (unit 3). The inner limit of the penetration is near Section 29 where large, light coloured limestone blocks have slid from the platform edge and come to rest on the upper slope (Pl. 3, figs. 3-5). Platy limestone originating on the slope is also found in slump deposits in this section (Pl. 3, fig. 2). A short distance basinwards, at Sections 22 and 23 (Fritz, 1978, Fig. 3), the proportion of platy limestone is much higher, and the slump deposits are composed mostly of broken limestone plates and only rare light coloured boulders. It is believed that the platy limestone at Section 23 (units 4, 5), Section 24 (unit 4), and also at Section 7 (Fritz, 1976b, Fig. 2, units 2, 4) represent periods of local "starvation", and that this was followed by local rapid filling by clastics (Section 23, units 6-9; Section 24, units 5-7; Section 7, unit 3).

The position of slope clastics in the mentioned sections next to the platform edge suggest their having been bypassed across it, but this proximity alone does not exclude other routes of transport, such as routes governed by longshore currents. Coeval strata in previously measured platform sections contain no obvious evidence of large scale bypassing, although there is an abundance of light coloured, crossbedded carbonate indicating water depths that were certainly shallow enough for optimum energy conditions. "Floating" fine to coarse quartz grains that may have been windblown and then waterlaid are common in these light carbonate rocks.

Section 36 contains new evidence that large scale bypassing took place over at least one portion of the platform during a late phase of half-cycle A2. Here (unit 7) an indication of emergence is present in the form of solution cavities and channels in a dolomite that contains little or no sign of sustained subaerial weathering. These channels and cavities are filled with clean fine grained quartzite (Pl. 7, fig. 2-4) and both quartzite and dolomite are overlain by a 27-foot thick sheet deposit of quartzite that is similar to that deposited in the dolomite below. Some quartz sand coeval to that in the sheet deposit at Section 36 was trapped on the platform, as is testified by the large amount of similar sand intermixed with dolomite in nearby Section 9 (Fritz, 1976b, Fig. 2, unit 6). The fine quartz sand at the locality mentioned and some others is interpreted as a small (coarser) fraction of the clastics that crossed the platform at intervals near the end of the half-cycle.

Grand cycle B, lower half-cycle (B1)

The clastic strata in this half-cycle are the product of a regional regression (Fritz, 1976b, p. 2) that terminated deposition of platform carbonate assigned to the previous half-cycle. The clastics are an oceanward extension of the inner detrital belt that briefly covered the platform and spilled into the basin to form large slope deposits, such as the 783-foot thick deposit at Section 7 (Fritz, 1976a, p. 14; 1976b, Fig. 2, units 5-11). In the transition zone between the clastics overlying the platform and coeval clastics on the adjacent slope there is a visible change in the strata. The succession overlying the platform is predominantly siltstone that weathers orange, green, and maroon and contains minor interbeds of orange dolomite, poorly sorted quartzite, and trilobite coquinas. The nearby slope succession is predominantly sombre brown weathering siltstone with minor, very fine to fine grained quartzite interbeds and with limestone mounds (with or without archaeocyathids) of widely ranging sizes. Strata in Section 27 are within the transition zone, as here the succession is unusually thick and the siltstone is approximately half sombre weathering and half maroon weathering. Nearby Section 13 is landward of the transition zone; it is thinner and is predominantly composed of highly coloured siltstone. Another nearby section, Section 19, is on the basinward edge of the transition zone, as it is composed predominantly of sombre weathering siltstone, and it contains some small limestone mounds with archaeocyathids. In Section 27 the boundary between the **Nevadella** Zone and the **Bonnia-Olenellus** Zone is within the interval from 35 feet (GSC loc. 93893) to 65 feet (GSC loc. 93894) above the base of the half-cycle.

The beginning of this half-cycle marks a broad difference in the rate of sedimentation between sections in the northwestern part of the study area as opposed to those in the southeastern part. Prior to the beginning of half-cycle B1, the deposition rate in the northwest was slower than that to the southeast, and after the beginning the reverse took place (Fig. 5).

Grand cycle B, upper half-cycle (B2)

At the base of this half-cycle is a limestone member that has been assigned to half-subcycle B2a (Fig. 2, 3). The limestone is resistant and contains limestone mounds with archaeocyathids at various horizons (Pl. 1, fig. 4). This member is overlain by a yellow to orange weathering siltstone member (half-subcycle B2b) that locally displays ripple marks and mudcracks (Pl. 1, fig. 5). The widespread distribution of both members has been recognized earlier (Fritz, 1978, p. 4),

and it is confirmed in the present paper (Fig. 4). At a typical section the two members plus half-cycle B1 form a striking succession of recessive orange and maroon weathering siltstone (B1), overlain by a medium light grey weathering limestone (B2a), which in turn is overlain by a recessive, yellow weathering siltstone (B2b).

Above half-subcycle B2b correlation is more difficult because of the lack of laterally persistent lithologic units, a variable thickness between half-subcycle B2b and the top of the Sekwi Formation, and paleontological data that are not yet fully studied. Half-subcycle B2d was found to be of some value for correlation, but it is less persistent than the mentioned half-subcycles and the lithology is similar to other siltstone beds in this part of the section.

Quartzite in considerable amounts (Pl. 2, fig. 3; Fig. 2, units 7, 9, 16, 18) is present in half-cycle B2 at Section 28, and is absent in most other sections. The thickest quartzite unit (unit 16) may correlate with unit 18 in Section 17 a short distance to the southeast. The relationship between the quartzite in Sekwi Formation units 16 and 18 in Section 8 and the quartzite in coeval but post-Sekwi basinal deposits to the south is unknown. Here, late Lower Cambrian quartzite with penecontemporaneous slump structures is present in Section 27 (unit 2). A thick but questionably dated basinal quartzite is also present at Sections 1 and 2 (Fritz, 1976b, Fig. 1). Exotic limestone boulders in this quartzite contain late Lower Cambrian fossils (Fritz, 1976b, p. 8) that provide a maximum age for this lithologic unit. Cecile (1978, p. 371) has also described this unit, but did not report any fossils.

The top of half-cycle B2 and of the Sekwi Formation is known to be diachronous (Fritz, 1976b, p. 2; 1978, p. 4) with an age ranging from the middle to the top of the **Bonnia-Olenellus** Zone. At many sections the contact between the Sekwi and the overlying dark shale and platy limestone is considered to be normal because of interfingering relationships and the continuation of Lower Cambrian faunas. At the sites of more shoreward sections however, there are large faunal gaps near or at the top of the Sekwi Formation, and the possibility that part of the half-cycle has been eroded cannot be dismissed. For instance, at the site of Section 36 the contact between inner detrital Sekwi strata (physically correlated with the Lower Cambrian) and the overlying dark shale and platy limestone with late Middle Cambrian fossils is probably sharp (exact horizon covered), and there is no record for most of the Middle Cambrian. The thickness of the Sekwi at Section 36 is, however, only slightly thinner than at nearby Sections 9, 33, and 35 which have "normal" upper contacts and Lower Cambrian fossils in the overlying strata. Section 31 and 4 is a second location where there is the possibility that erosion has cut down into half-cycle B2 and the Sekwi Formation. Here barren dolomite which correlates with the Lower Cambrian Sekwi Formation is overlain by dark shale and platy limestone containing Lower Ordovician fossils. However at Section 31 and 4, as at Section 36, there is no evidence of half-cycle B2 thinning relative to the adjacent sections. Present data, therefore, suggest that little or no erosion has taken place at the top of the half-cycle at the sites of most sections in the study area. Sections 11, 12, 14, and 26 in the northwestern part of the area are exceptions to this observation, as here half-cycle B2 and older half-cycles have been eroded at the edge of an uplifted region that extends only a short distance into the area (Fig. 4).

POST-SEKWI DARK SHALE AND PLATY LIMESTONE

The lower beds of this map unit typically underlie a saddle or col (Pl. 4, fig. 4; Pl. 6, fig. 6) with the more resistant carbonate of the Sekwi Formation outcropping on the down-section side, and platy limestone of this map unit underlying talus covered slopes on the up-section side (Pl. 2, fig. 4; Pl. 7, fig. 5). Outcrops (Pl. 7, fig. 6) are sparse and discontinuous, making it difficult to judge the proportion of the main rock types that were recorded as a ratio of black siltstone and shale to dark grey, finely crystalline limestone. Over much of the section this ratio could only be guessed from float by estimating the proportion of dark grey or dark brown weathering soil to plates of medium or dark grey weathering limestone. Needless to say, the float also compounded the problem of determining the presence or absence of tectonic deformation in the underlying strata. Despite limited exposures and a sparse distribution of sections extending into these younger strata, enough data are now available to at least draw attention to some of the ages and depositional rates near the contact with underlying half-cycle B2 or Sekwi Formation.

The widespread distribution of these late Lower Cambrian beds over the study area is attributed to a regional increase of water depth (Fritz, 1978, p. 4). This increase may have been uniform over the southeastern part of the area as is reflected by the uniform thickness of late Lower Cambrian dark strata there (Fig. 4). Thicker strata at Section 34 (postulated for Section 8 as well), seem to refute this observation, but here part of the dark strata was deposited earlier and at the expense of half-cycle B2.

Regionally uniform strata in this map unit overlie different lithologies of underlying half-cycle B2 (upper strata in the Sekwi Formation). In most sections in the southeastern part of the area the underlying lithology consists of thin bedded, wavy limestone believed to represent a shallow water, normal marine environment. At Sections 24 and 25 and 7 only a thin succession of wavy limestone separates the dark strata from an underlying medium and thick bedded dolomite that is thought to represent a restricted marine or possibly a supratidal environment. Similar dolomite in sections near the centre of the northeastern margin of the study area (Sections 17, 18, 31 and 4) is overlain by post-Lower Cambrian dark strata. Here it is uncertain whether dolomite deposition continued into the Middle Cambrian, or if dark Lower Cambrian strata were deposited and then removed by erosion.

In the northwestern part of the area, at Sections 1-3, 13, 15, 18, 27 and extending as far southeast as Section 5, a much greater thickness of Lower Cambrian strata is assigned to the present map unit. It is suggested that greater subsidence occurred there which, combined with the regional increase in water depth noted to the southeast, resulted in an increased rate of sedimentation. It has already been suggested that the trapping of clastics in this area permitted deposition of cleaner carbonate at Sections 25 and 7 and 24 (Fritz, 1976a, p. 21). Within the negative area a local carbonate buildup is present in Sections 19 and 20 (Fig. 4).

Thicknesses of Middle Cambrian strata in this map unit are variable, but more control is needed to outline areas of rapid or slow sedimentation. In these strata the most common fossils belong to the late Middle Cambrian while older Middle Cambrian fossils are rare. The Middle Cambrian at Sections 35 and 36 is of moderate thickness whereas it is known to be quite thin to the northwest at Sections 33 and 10. Still farther to the northwest it thickens again at Section 29, and much farther in that direction the Middle Cambrian may be quite thick at Section 28, but there it is as yet poorly documented with fossils. Basinward from Section 28 the Middle Cambrian thins at Section 27 whereas the Lower Cambrian of this map unit thickens. Field time was not available to locate the Cambrian-Ordovician boundary at the various sections, and therefore no data are provided on Upper Cambrian thicknesses.

REFERENCES

Aitken, J.D.
1966: Middle Cambrian to Middle Ordovician cyclic sedimentation, southern Rocky Mountains of Alberta; Bulletin of Canadian Petroleum Geology, v. 14, no. 4, p. 405-441.

Blusson, S.L.
1971: Sekwi Mountain map-area, Yukon Territory and District of Mackenzie; Geological Survey of Canada, Paper 71-22, 17 p.

1972: Sekwi Mountain, Northwest Territories-Yukon Territory; Geological Survey of Canada, Map 1333A.

Cecile, M.P.
1978: Report on Road River stratigraphy and the Misty Creek Embayment, Bonnet Plume (106B), and surrounding map areas, Northwest Territories; in Current Research, Part A, Geological Survey of Canada, Paper 78-1A, p. 371-377.

Fritz, W.H.
1975: Broad correlations of some Lower and Middle Cambrian strata in the North American Cordillera; in Report of Activities, Part A, Geological Survey of Canada, Paper 75-1A, p. 533-540.

1976a: Lower Cambrian stratigraphy, Mackenzie Mountains, northwestern Canada; Brigham Young University, Geological Studies, v. 23, pt. 2, p. 7-22.

1976b: Ten stratigraphic sections from the Lower Cambrian Sekwi Formation, Mackenzie Mountains, northwestern Canada; Geological Survey of Canada, Paper 76-22, 42 p.

Fritz, W.H. (cont'd.)
1978: Fifteen stratigraphic sections from the Lower Cambrian of the Mackenzie Mountains, northwestern Canada; Geological Survey of Canada, Paper 77-33, 19 p.

Krause, F.F. and Oldershaw, A.E.
1978a: Continental slope-rise deposits from Lower Cambrian Sekwi Formation, Mackenzie Mountains, Northwest Territories, Canada; American Association of Petroleum Geologists Bulletin, v. 62, p. 532.

1978b: Stratigraphic and paleoenvironmental analysis of the Sekwi Formation, Mackenzie Mountains, Northwest Territories; Depart. Indian Northern Affairs, Mineral Industries Rep., Northwest Terr., in press; Department of Indian and Northern Affairs Mineral Industry Report 1975, Northwest Territories, EGS 1978-5, Open File, July 30, 1978, p. 136-156.

Palmer, A.R.
1960: Some aspects of the early Upper Cambrian stratigraphy of White Pine County, Nevada and vicinity; in Intermountain Association of Petroleum Geologists, Guidebook to the Geology of east-central Nevada; Salt Lake City, Utah, p. 53-58.

Robison, R.A.
1960: Lower and Middle Cambrian stratigraphy of the eastern Great Basin; in Intermountain Association of Petroleum Geologists, Guidebook to the Geology of east-central Nevada; Salt Lake City, Utah, p. 43-52.

PLATES

PLATE 1

Figure 1. View looking southeast at Section 26. Base of Sekwi Formation is at "a" and top is at "b". GSC Photo 203167-V.

Figure 2. Pink to brick-red weathering limestone at base of Sekwi Formation, unit 1, Section 26. GSC Photo 203167-Y.

Figure 3. View looking northeast at Section 27. Base of map unit 13 is at "a", base of Sekwi Formation is at "b", base of unit 9 is at "c", base of unit 13 is at "d", and top of Sekwi Formation is at "e". GSC Photo 203167-S.

Figure 4. View looking north at large limestone mounds in unit 10, Sekwi Formation, Section 27. Mounds contain sparse archaeocyathids and grade laterally into medium and thin bedded limestone. Mound at "a" is approximately 15 feet high. GSC Photo 203167-I.

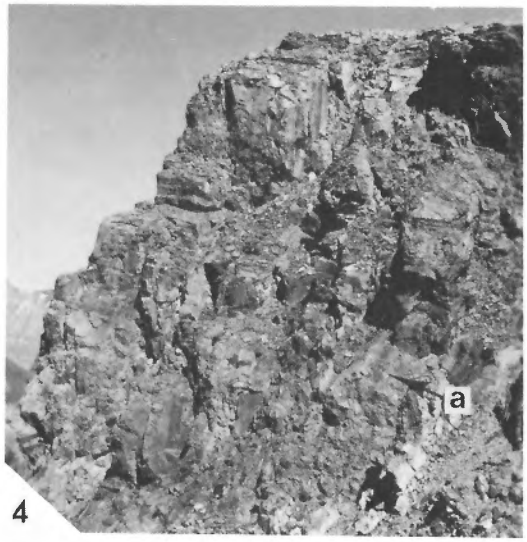
Figure 5. Ripple marks and mudcracks in unit 14, Sekwi Formation, Section 27. GSC Photo 203167-M.

Figure 6. View looking south at second segment in Section 27. Top of Sekwi Formation is at "a", unit 2 of post-Sekwi dark shale and platy limestone map unit is at "b", and top of dark shale and platy limestone is at "c". GSC Photo 203343-H.


b
a
1


2


e
d
c
b
a
3


a
4


5

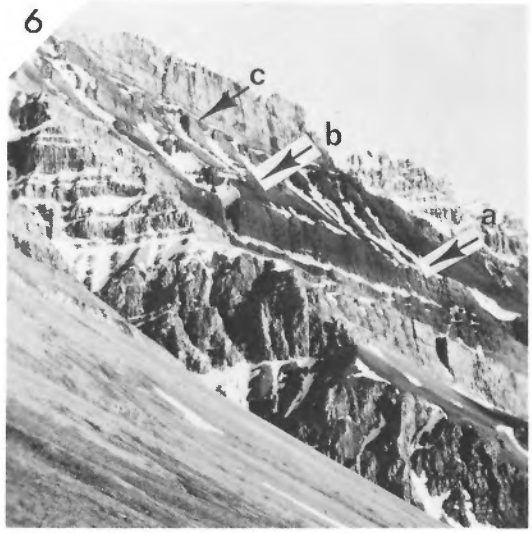

6
c
b
a

PLATE 2

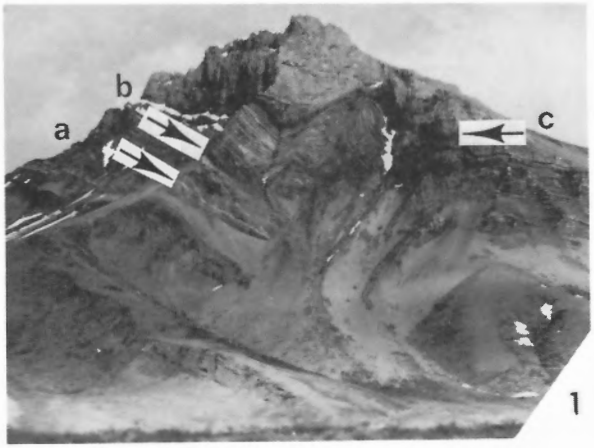
Figure 1. View looking northeast at post-Sekwi dark shale and platy limestone in third and fourth segments of Section 27. Basal 2.5 feet of orange weathering limestone in third segment (basal beds in unit 6) is at "a", and top of third segment is at "b". Top of post-Sekwi dark shale and platy limestone is at point "c"; this point is located near top of fourth segment of measured section. GSC Photo 203343-E.

Figure 2. View looking southwest at Section 28. Base of Sekwi Formation is approximately located at "a", and top of unit 16 in Sekwi Formation is at "b". GSC Photo 203167-U.

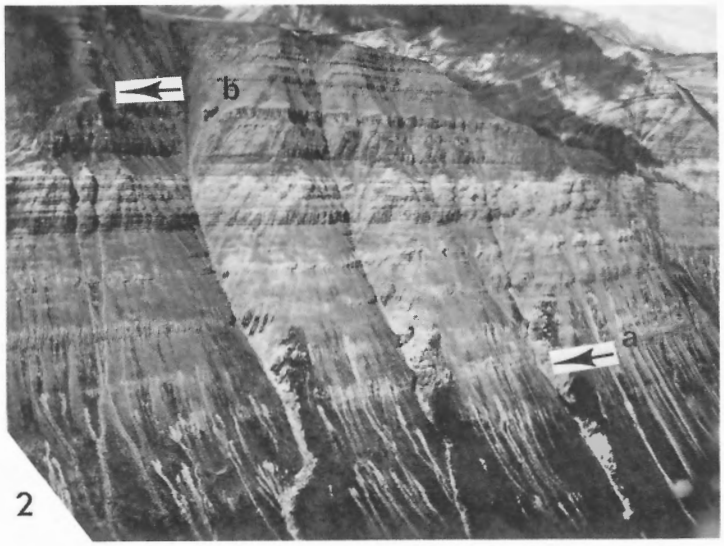
Figure 3. Quartzite in unit 16, Sekwi Formation, Section 28. Base of unit is in foreground and top of unit is at "a" in this figure and at "b" in figure 2. Base of quartzite in the lower part of unit 18 is at "b" in present figure. Highest point on skyline "c" is a short distance below top of Sekwi Formation. GSC Photo 203343-O.

Figure 4. View looking south at upper segment of Section 28. Top of Sekwi Formation is at "a". Upper segment of measured section starts at top of Sekwi short distance to left of picture, continues south along crest of ridge, and ends beyond point "b" on skyline. GSC Photo 203343-U.

Figure 5. View looking northwest at Section 29 where lower and upper segments were measured. Photograph taken from measuring site for middle segment (strata equivalent to middle segment in present view are faulted). Base of unit 6 is at "a", base of unit 11 is at "b", and top of Sekwi Formation is at "c". Composite of GSC Photos 203343-R and 203343-V.



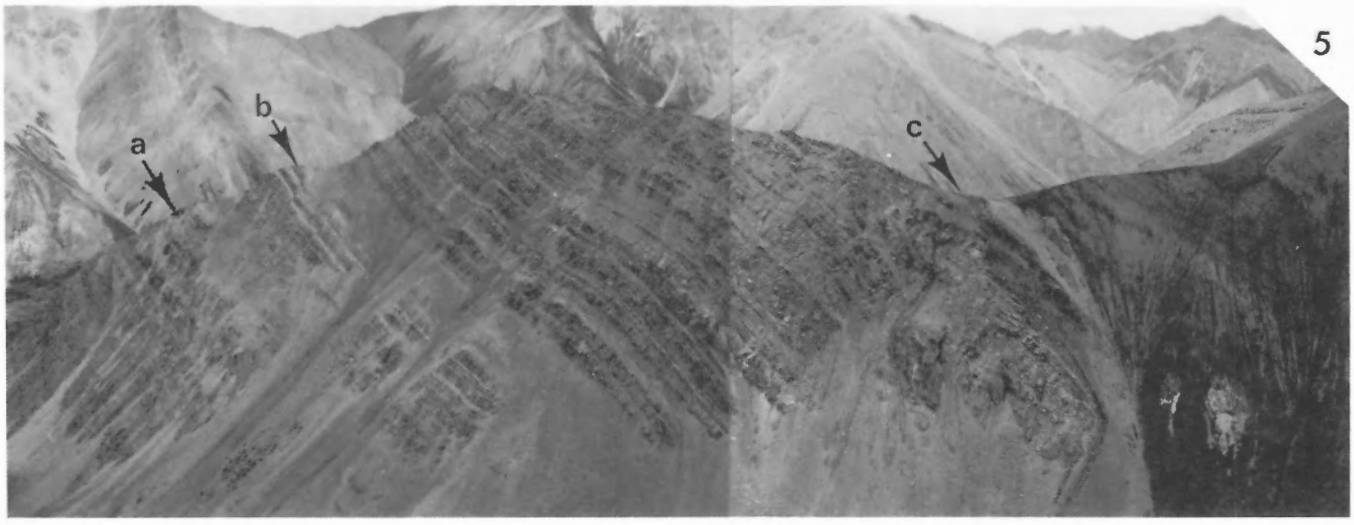
1



2

3

4



5

PLATE 3

Figure 1. Burrows preserved on lower surface of thin sandstone bed, float from upper part of map unit 13. Locality is short distance southwest of middle segment of Section 29. GSC Photo 203167-P.

Figure 2. Penecontemporaneous slump breccia in basal 43 feet of unit 4, Sekwi Formation, Section 29. Breccia is composed of thin bedded, platy limestone in orange brown siltstone matrix. GSC Photo 203343-C.

Figure 3. Large limestone block in siltstone matrix (siltstone mainly covered by white lichen), unit 4, Section 29. GSC Photo 203343-J.

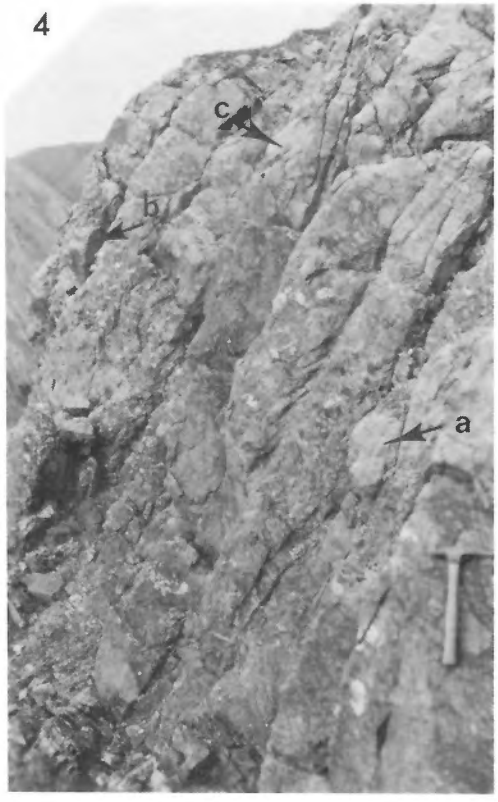
Figure 4. Archaeocyathid bearing limestone mounds ("a", "b", "c", etc.) mixed with platy limestone in siltstone matrix. Same stratigraphic horizon as in figure 2, but located short distance to north. GSC Photo 203167-N.

Figure 5. Large limestone block with siltstone matrix (lower left) penetrating into angular break, unit 4, Section 29. Distance between rocks in upper left of figure and lower right is approximately 30 feet. GSC Photo 203343-K.

1

3

2



5

PLATE 4

Figure 1. Burrows preserved on lower surface of thin to thick bedded quartzite, Section 30, 115 to 117 feet below top of map unit 13. GSC Photo 203343-D.

Figure 2. Burrows from same interval as those shown in figure 1. GSC Photo 203343-B.

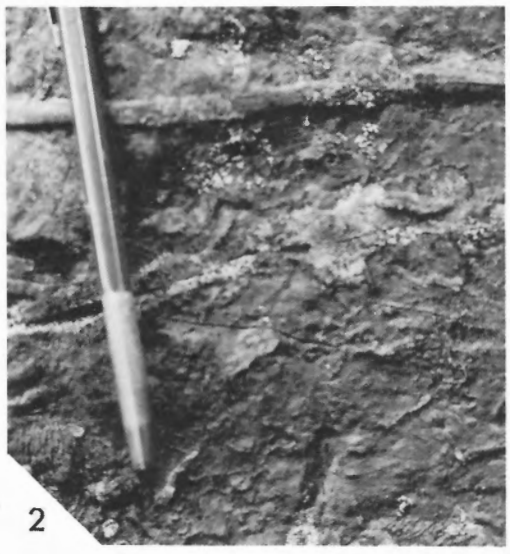
Figure 3. Boundary between **Fallotaspis** Zone and **Nevadella** Zone in Section 30. Medium bedded limestone immediately to left of hammer handle contains fossils belonging to **Nevadella** Zone (GSC locs. 94652, 94653). Similar limestone beds 1 foot to the right of hammer handle contain fossils belonging to the **Fallotaspis** Zone (GSC locs. 94650, 94651). Between limestone belonging to two zones is 1-foot bed of dark siltstone. GSC Photo 203343-F.

Figure 4. View looking northeast at post-Sekwi dark shale and platy limestone in Section 30. Penecontemporaneous breccia is present in beds located at "a" and "b". GSC fossil locality 94685 is at "c". GSC Photo 203343-A.

Figure 5. View looking west at composite Section 31 and 4. Contact between Sekwi Formation and map unit 12 is at "a". Top of unit 4 is at "b". GSC Photo 203343-S.

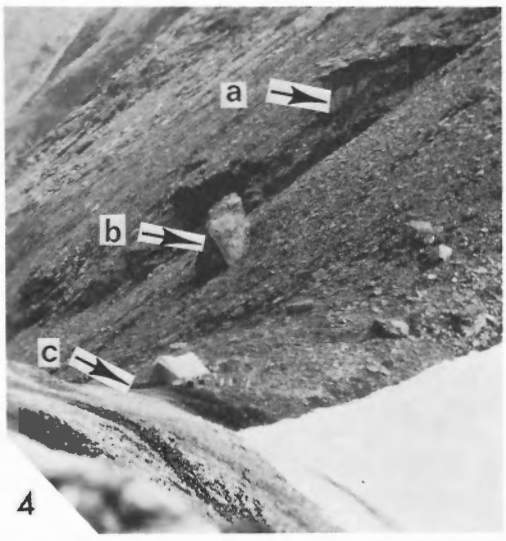
Figure 6. Set of crossbeds 1.25 feet thick, 5 feet below contact of Sekwi Formation and map unit 12, composite Section 31 and 4. Note overturned laminae in crossbeds near top of pencil in lower left. GSC Photo 203167-L.

1



2

3



4

5

6

PLATE 5

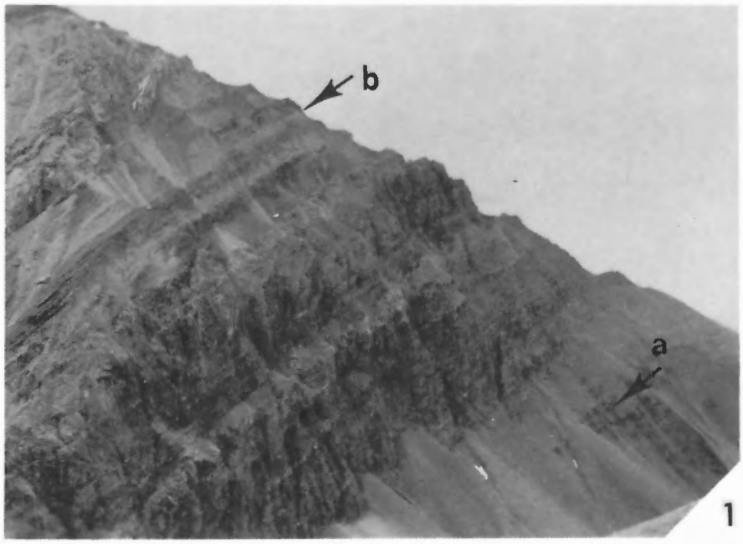
Figure 1. View looking southeast at lower segment of Section 32. Base of Sekwi Formation is at "a" and base of unit 10 is at "b". GSC Photo 203343-L.

Figure 2. Limestone in irregular nodules (left of clip on pencil). Process governing shape of nodules (solution?, slight movement of soft sediment?) unknown. Sekwi Formation, 211 feet above base of unit 6, Section 32. GSC Photo 203343.

Figure 3. Irregular nodules of finely crystalline to dense limestone (dark) in matrix or fill of light coloured, more coarsely crystalline carbonate (solution cavity filling?). Sekwi Formation, 7 feet above base of unit 5, Section 32. GSC Photo 203167-R.

Figure 4. View looking northeast at upper segment of Section 32. Base of unit 10 is at "a"; base of unit 15 is at "b". Measured route is on crest of ridge. GSC Photo 203167-T.

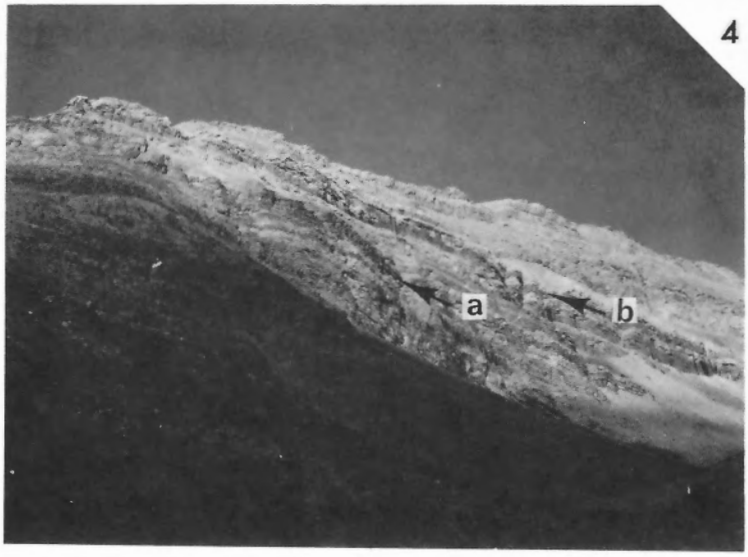
Figure 5. Burrows in local float from map unit 12 in Section 33. Fossils are from stratigraphic unit 7, 413 to 415 feet below top. GSC Photo 203167-Z.



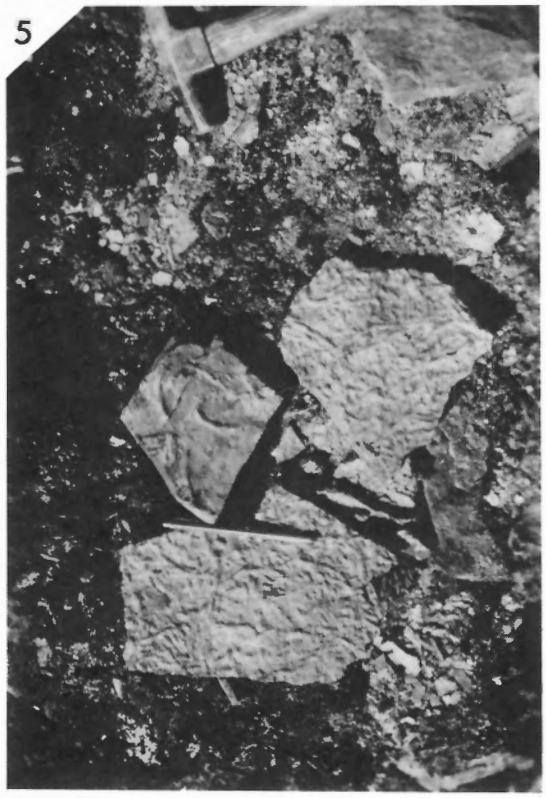
1

2

3



4



5

PLATE 6

Figure 1. View looking north from Section 33 towards Section 10. Base of Sekwi Formation in Section 10 is at "a" and top is at "b". GSC Photo 203343-T.

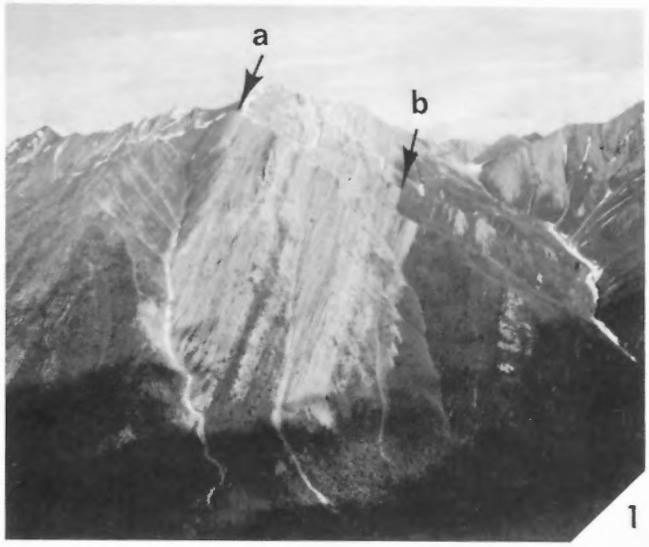
Figure 2. View looking west at lower segment of Section 34. Camera is located over stratigraphic unit 2 in map unit 12. Quartzite belonging to stratigraphic unit 3 is in the near-foreground at "a". Dark siltstone beyond quartzite belongs to map unit 13 and is in contact with Sekwi Formation at point "b". End of lower segment of Section 34 is behind high point on ridge ("c"). GSC Photo 203343-I.

Figure 3. View looking west at third segment of Section 34 (view short distance to north and overlapping view in figure 2). Segment was measured from point "a" over ridge "b" and terminated on west slope. Strata in second segment (strata between points "c" and "a") were measured on more accessible slope short distance to the north on ridge shown in this view. GSC Photo 203343-X.

Figure 4. View looking west at fourth segment in Section 34. Base of segment (base of unit 7) is at "a". Top of segment is over ridge crest on west slope. GSC Photo 203343-M.

Figure 5. Thin bedded, wavy, algal limestone in map unit 11, Section 35. GSC Photo 203343-N.

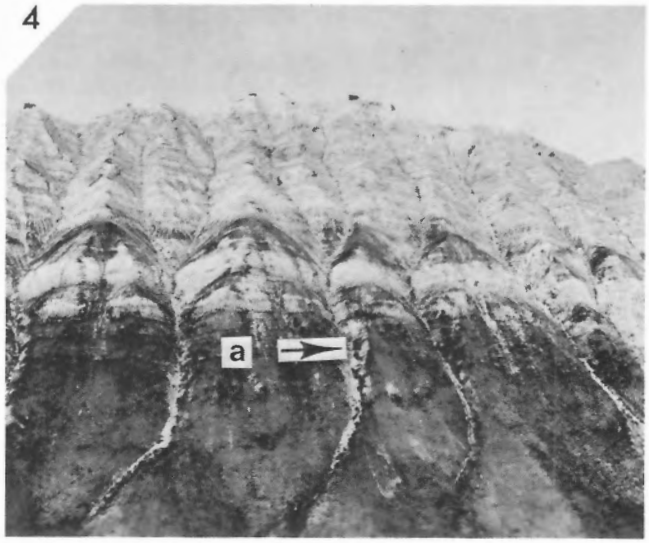
Figure 6. View looking south at Section 35. Top of map unit 12 is at "a", top of map unit 13 is at "b", top of Sekwi Formation is at "c", and top of measured section (top of unit 6) is at "d". GSC fossil locality 94598 is at "e". GSC Photo 203167-J.



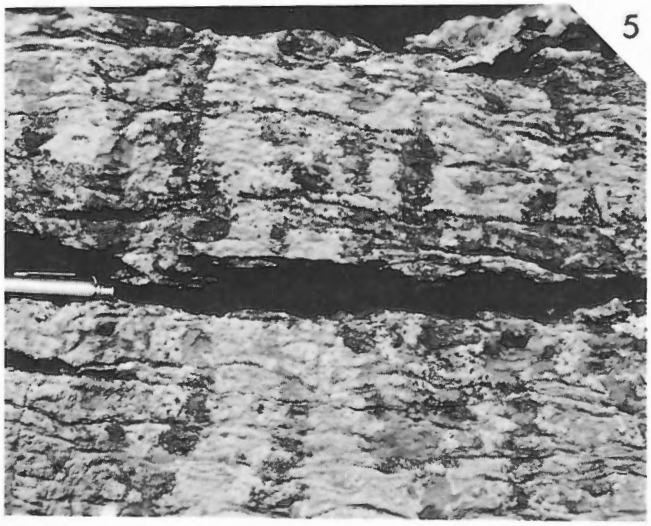
1

2

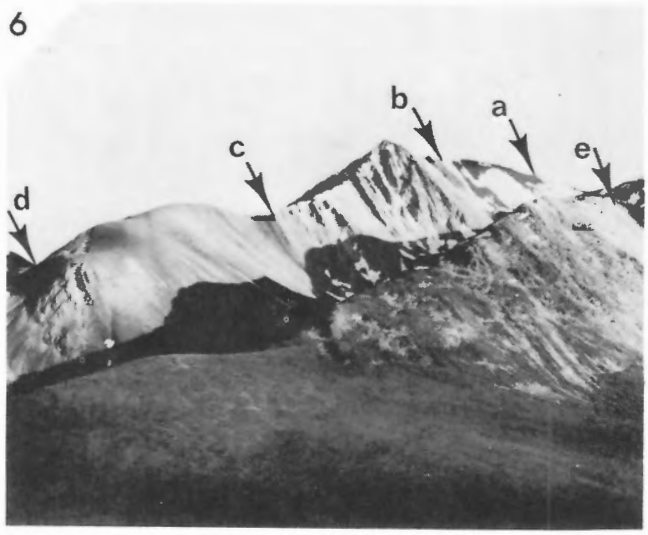
3



4



5



6

PLATE 7

Figure 1. View from Section 36 looking north at Sekwi Formation on adjacent ridge. Base of Sekwi is at "a" and top is at "b". GSC Photo 203343-G.

Figure 2. View looking northeast at unit 7, Sekwi Formation, Section 36. Contact at "a" separates 27 feet of thick bedded quartzite (above) from 14 feet of orange weathering dolomite (below). Isolated quartzite outcrops ("b", "c", "d", etc.) surrounded by orange dolomite mark sites of sandstone deposition in former caverns in dolomite. Assistant with 5-foot staff is standing on quartzite outcrop that occupies former channel cut 11 feet down into dolomite. GSC Photo 203167-A.

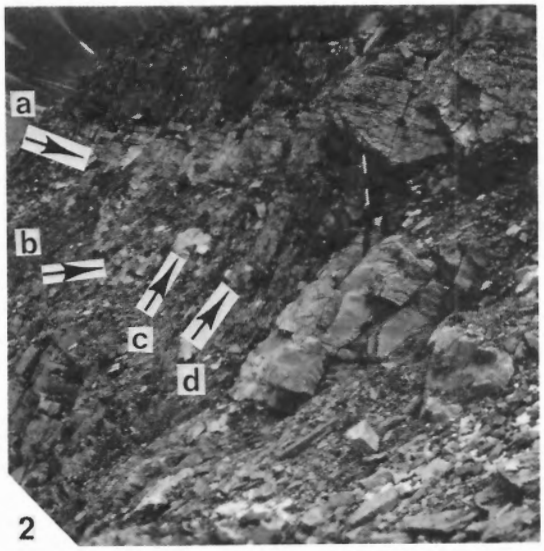
Figure 3. Quartzite bodies "b" and "c" located in figure 2. Pack in centre of present figure gives scale. GSC Photo 203167-W.

Figure 4. Quartzite body "d" located in figure 2. Rectangular quartzite exposure under hammer point may represent quartz sand fill in cavity formed by solution along joint in carbonate. GSC Photo 203343-Q.

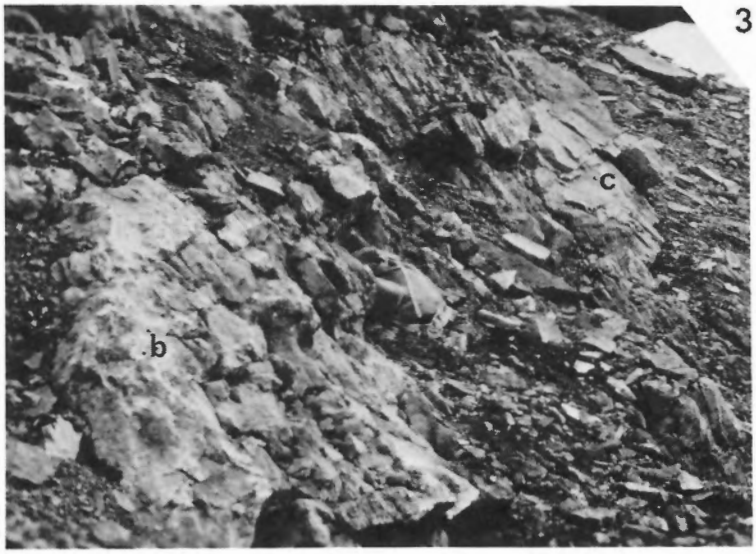
Figure 5. View looking south at post-Sekwi dark shale and platy limestone in upper segment of Section 36. Base of segment is at "a" and top (top of unit 1) is 224 feet above "b". GSC Photo 203167-Q.

Figure 6. Post-Sekwi dark shale and platy limestone at point "b" in figure 5. GSC fossil locality 94566 is at "a" in present figure. GSC Photo 203167-O.

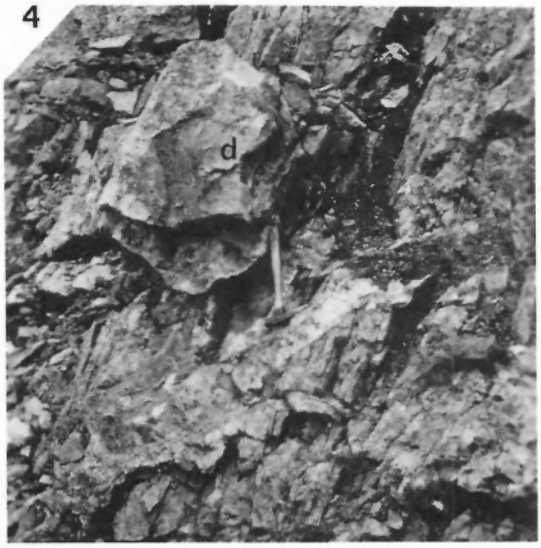
1



2



3



4

5

6