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Maps and Charts

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SLAVE POINT DATUM PROJECT

PHASE III SUMMARY OF DATA

Raasch & Associates Ltd.

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FOREWORD

Following completion of the core studies presented in Volume II, it was decided to enlarge the scope of the project by extending the investigation lower stratigraphically, namely to or into the Hume Formation and its southerly and southeasterly correlatives. This was done by examining all cores (of the 37 wells selected) falling within this extended interval, plus investigation of such electric logs and sample data as were available in the files of the Institute of Sedimentary and Petroleum Geology. This was supplemented by formation tops published in the series of Schedules of Wells by the Department of Indian Affairs and Northern Development, Northern Development, Northern Economic Branch.

We wish at this time to express our appreciation to Mr. L. E. Workman who assisted in the well log studies and in the plotting of the strip logs. In the case of the Institute of Sedimentary and Petroleum Geology, so many individuals of that bureau assisted us in so many ways, that it is not possible to list them all here. We wish to thank Drs. A. E. H. Pedder and Helen Belyea for

their constructive interest and contributions, and the staffs of the Core Laboratory and Well Log Library, without the use of which this project would not have been possible.

SUMMARY OF INTERPRETATIONS

In Volume I, in which we deal with the surface outcrop studies, we prepared (pp. 36-39) a "Summary of Interpretations", which we stated were tentative pending subsurface studies.

Slave Point-Beavertail Relations

Our initial decision to defer final conclusions until the subsurface studies were made was subsequently justified, especially with respect to the Slave Point interval and its correlatives in the Middle Mackenzie Valley. The paleontologic studies of the cores clearly indicate that the Cyrtina panda Zone of the Beavertail/Upper Ramparts ("Carcajou Rock") formations plus the equivalent reefoid facies, the Kee Scarp, are not correlative with the Lower Slave Point as originally postulated, but are older. They are absent in the Great Slave Lake Region and southward.

The Lower (and Middle?) Slave Point are correlative with the Ponticeras Zone of the Middle Mackenzie Valley Beavertail, which includes

beds bearing the frequently cited brachiopod, Leiorhynchus hippocastanea.

No beds of Upper Slave Point equivalency have been definitely identified from the Middle Mackenzie Region, although they may be present locally as a condensed zone within the upper part of the Beavertail.

Willowlake Arch

It is not within the scope of this project(which is a linear rather than areal study) to make an adequate interpretation of successive paleogeographies or isopach intervals. Nevertheless, there is one feature that is so strong and so important that it is evident in spite of the limited coverage.

This feature we propose to call the Willowlake Arch (after the lake and river of that name). Over this arch most or all the beds of the target interval have been removed during post-Slave Point/pre-Canol time (probably between our intervals DFR4 and DFR5).

Over the area of the Arch (see Cross-section A and Imperial Triad Willow Lake B-20 log and summary) the Canol Shale rests either directly on the Hume (DLM10/11) or on a small remnant of Hare

Indian Shale (DLM12). Thus units DFR4 down through DLM13 and most or all of DLM12 are missing (a total of 6 to 7 units in all).

Farther north along the Mackenzie, in the Norman Wells-Fort Good Hope area most of the missing interval reappears. Beavertail(DLM15 to DFR1) zones north and south of the arch along this N-S axis are not only correlative but are in the same lithofacies. This strongly suggests that the beds were deposited in the intervening area and subsequently removed.

The Tathlina High therefore was not operative within the span of the present target-interval, being a feature related to pre-Hume time (pre-DLM8). By Givetian to Early Frasnian time, the positive feature had shifted north to the Willowlake NE-SW axis. The basin north of the Willowlake Arch might logically be called the Norman Wells Basin.

Givetian Interval

Within the Givetian portion of the target interval (i. e. the post-Hume portion of Depositional Sequence A) our linear study demonstrates a very high degree of facies variation and interfingering. Givetian lithostratigraphic relations are so complex that the consideration of all available subsurface information within the region would still leave a picture that is very incomplete. Stated

more positively, here is a region in which surely many stratigraphic anomalies of economic potential remain to be discovered.

Reefoid Facies Names

Reefoid masses developed within the following time-stratigraphic units:

ZONE	ROCK UNIT NAME
DFR2	Swan Hills
DFR1	Swan Hills
DLM15	Kee Scarp (sensu Stelck)
DLM14	Lower Ramparts; Presqu'ile
DLM13	Lower Ramparts (lower part)
DLM12	Upper Keg River

STRATIGRAPHIC NOMENCLATURE

HUME FORMATION

The Hume Formation lies at the base of the succession dealt with in the current core studies. It is used in the sense of its author (H. G. Bassett, 1961, p. 486). In our study we are primarily concerned with the upper surface of this formation and its equivalents as a platform "floor" or penicontemporaneous datum horizon against which variations in overlying time-rock units can be evaluated.

The Hume Formation consists of thin-bedded limestones and interbedded marlstones occurring in the Mackenzie Valley.

Here the formation may be divided into two time-rock units characterized by distinct faunas, of which the lower has been designated the Schuchertella adoceta Zone and the upper, the Atrypa arctica Zone. They correspond to our DLM9 and DLM10/11 zones respectively.

Southward, the Hume lithofacies grades to more solid limestones typically with corals rather than brachiopods and trilobites dominant. Pedder (1964, pp. 430-433) has shown this Nahanni lithofacies to be the exact time equivalent of the Hume which

adjoins it to the north.

The upper unit of the Hume and Nahanni formations (corresponding to our DLM10/11 Zone) continues eastward as the Lonely Bay Formation or Lower Member of the Pine Point Formation (see A. W. Norris, 1965) and southward and southeastward as the dark colomite of the Lower Keg River Formation.

The lower unit of the Hume and Nahanni formations (our DLM9 Zone) passes eastward to evaporites of the Upper Chinchaga Formation.

LOWER KEG RIVER FORMATION
see Hume Formation

NAHANNI FORMATION
see Hume Formation

LONELY BAY FORMATION
see Hume Formation

LOWER MEMBER PINE POINT FORMATION
see Hume Formation

UPPER CHINCHAGA FORMATION
see Hume Formation

HARE INDIAN FORMATION
see see Volume 1, page 4
The Hare Indian Formation passes southward into bank to reefoid carbonates of the Upper Keg River Formation, which as exposed in northeastern British Columbia, are lighter in color than the underlying Lower Keg River, and bear an early Stringocephalus

fauna (DLM12 Zone). Eastward from the Mackenzie Valley, the Horn River Shale north of Great Slave Lake is analogous in lithology and fauna with the Hare Indian F. whereas the richly fossiliferous M. Member of the Pine Point Formation south of the lake reflects a shallower, better aerated open marine environment peripheral to the Upper Keg banks and reefs.

HORN RIVER FORMATION
see Hare Indian

MIDDLE MEMBER, PINE POINT FORMATION
see Hare Indian

UPPER KEG RIVER FORMATION
see Hare Indian

LOWER RAMPARTS FORMATION
see Vol. 1, p. 5, under "Fort Good Hope Formation".
In volume 3, we have substituted the established name Lower Ramparts for the time and rock unit we designated "Fort Good Hope Formation" in Volume 1. This was done in the realization that the industry was readily familiar with the former term, which applies to a late Givetian bank to reef lithofacies characterized by the upper two zones of the Stringocephalus Fauna, the DLM13 S. asteius Zone and the DLM14 S. aleskanus Zone.

The higher of these, the S. aleskanus Zone, also occurs in the Presqu'ile/Sulphur Point Formation of the Great Slave region, where the position of the DLM13 zone may be occupied by the shales

of the Buffalo River Member of the Pine Point Formation (see A. W. Norris, 1965). In the mountains north of Peace River, in northeastern British Columbia, carbonates similar to the Lower Ramparts carbonates and in similar litho- and faunifacies directly overlie the Upper Keg River carbonates, from which they are separated with difficulty. Southeastward, south of the Great Slave region, the massive carbonates pass to the evaporites of the Muskeg Formation (see Law, 1955).

PRESQU"ILE FORMATION
see Lower Ramparts Formation

SULPHUR POINT FORMATION
see Lower Ramparts Formation

UPPER MEMBER, PINE POINT FORMATION
see Lower Ramparts Formation

BUFFALO RIVER MEMBER
see Lower Ramparts Formation

MUSKEG FORMATION
see Lower Ramparts Formation

WATT MOUNTAIN FORMATION

The Watt Mountain Formation, both in terms of the original description, oil industry usage, and our own observations, is a complex of varied lithologies. It might be said that the "formation" is in fact a zone rather than a rock unit. This zone combines lithologic characteristics resulting from emergence and subaerial weathering followed by a reworking of the available regolith into the subsequent transgressive deposits.

Northwestward in the region of the Middle Mackenzie Valley, the Watt Mountain horizon is represented by a black, sooty clay full of organic detritus. This is interpreted as an expression of relative still-stand, from condensed sedimentation through to a moderate degree of submarine erosion. Hiatal but not emergent conditions are postulated. The clay is here placed at the base of the Upper Ramparts (Carcajou Ridge) Formation or of its lithic equivalent, the Beavertail Formation.

BEAVERTAIL FORMATION
see Volume 1, page 7

In cores of wells in the Upper Mackenzie/Great Slave region, Beavertail and Upper Ramparts lithologies are intergrading. For this reason, all dark limestone of Zone DLM15 are there designated "Beavertail".

UPPER RAMPARTS FORMATION
see Volume 1, p. 6, under Carcajou Rock Formation.

As in the case of the "Fort Good Hope Formation" proposed, a substitute for the Lower Ramparts in Volume 1, so in the case of the "Carcajou Rock Formation", we revert, in Volume 3 to the name Upper Ramparts Formation. We decided on this more conserative course because 1) we dislike introducing new stratigraphic names informally without a published description and 2) we felt our clients might be better oriented to the old terms.

We wish to re-emphasize, however, that the term "Ramparts" is misleading since the "Lower" and the "Upper Ramparts" are quite separate stratigraphic entities.

KEE SCARP FORMATION
see Volume 1, p. 9

In the cores, the term Kee Scarp is reserved for lighter-colored relatively massive, stromatoporoidal bank or reef carbonates, equivalent to that portion of the Lower Ramparts and Beavertail that lies within the limits of the DLM15 Zone.

SLAVE POINT FORMATION
see Volume 1, page 10

In the case of the Slave Point Formation, it seems preferable to amend the interpretation of Volume 1 to the extent of linking the Middle with the Lower Slave Point as a unit, and to maintain the Upper Slave Point as a separate entity. This is based on faunal evidence from the cores which seems to indicate that Middle Slave Point is linked time-wise with the Lower Slave Point (the beds designated the "Wood Buffalo Member" of Volume 1).

The Upper Slave Point (the "Mellor Rapids Member" of Volume 1), is faunally distinct and bears a number of early Waterways fossils.

It may be immediately pre-Waterways or may be a time and facies equivalent of the Firebag and/or Peace Point Member of the Waterways Formation.

FORT VERMILLION FORMATION
see Volume 1, p, 10

In the outcrop area, the Fort Vermilion Evaporites rest on the Presqu'ile/Sulphur Point, but in the subsurface to the west, at some localities, beds with the Beavertail fauna and lithology intervene between Fort Vermilion above and Presqu'ile/Sulphur Point below.

SWAN HILLS MEMBER

This term is reserved for reefoid accumulations equivalent to the Lower to Middle Slave Point in a time-stratigraphic sense. Thus the Swan Hills is to the Lower and Middle Slave Point what the Kee Scarp is to the Beavertail/Upper Ramparts.

In some areas Upper Slave Point through to Middle Waterways deposits may also fall within this designation (see Fischbuch, 1968).

WATERWAYS FORMATION

Over nearly all of the area, the black Canol/Muskwa Shale rests directly on the Slave Point or older beds. In the surface areas of the Great Slave Region and Peace River Foothills (B. C.), a full thickness of Waterways strata intervenes, as is the case in the subsurface as far west as Hay River.

However, since the Waterways beds, except possibly the basal portion, are outside the scope of our study, there is no

need to discuss the formation in detail at this time.

CANOL FORMATION

see Volume 1, page 9

MUSKWA FORMATION

The name Muskwa (see Griffin, 1967, Vol. 1, pp. 803-826) is synonymous with Bassett's (1961) term Canol, except that it is used predominantly in the regions south of latitude 60° and in the Great Slave and Upper Mackenzie regions, whereas the term Canol is used for the same shale of similar age in the Middle Mackenzie Region.

DEPOSITIONAL SEQUENCES, UNCONFORMITIES, AND PALEOGEOGRAPHIES

Definition of Terms

The subject of stratigraphic boundaries was discussed in Volume 1 (page 3), and these were classified as Lithostratigraphic, Biostratigraphic, and Tectostratigraphic.

We are here, first of all concerned with the latter in their expression as major regional unconformities, involving widespread fall in sea level plus a degree of subaerial erosion. The succession of strata lying between a pair of such unconformities ("major discontinuities"), we term a major depositional cycle.

Major Depositional Cycles

In our ensuing discussion we are concerned with one major depositional cycle and parts of two others. These, in ascending order, may be designated the Couvino-Givetian, the Giveto-Frasnian, and the Frasnian.

Couvino-Givetian (Depositional Sequence A)

The Couvino-Givetian has at its base the sub-Hume (=Nahanni=Lower Keg River=Lonely Bay=Elm Point, etc.) regional unconformity. Its sedimentary sequence includes the following rock units within the bounds of the report area:

Buffalo River
Fort Good Hope
Hare Indian
Horn River
Hume
Lonely Bay
Lower Keg River
Lower Ramparts
(continued next column)

Muskeg
Nahanni
Pine Point, Lower
Pine Point, Middle
Pine Point, Upper
Presqu'ile/Sulphur Point
Upper Chinchaga
Upper Keg River

The Couvino-Givetian Sequence includes seven faunal zones, from DLM8 through DLM14. Although faunal zones may be missing from the base of the unit because of onlap and from the top because of post-Givetian erosion, no faunal zones are missing within the sequence. It is this latter fact which establishes a sequence, that is, it includes no major sedimentational discontinuities.

Of great practical importance is the presence, within the Couvino-Givetian sequence, of a readily discriminable penicontemporaneous time-line commonly referred to as the Hume Platform, Nahanni Platform, Lower Keg Platform, etc., depending upon the local area to which reference is made. In biostratigraphic terms, this is the top of our DLM10/11, Atrypa arctica Zone. This biostratigraphic boundary is fortunately supported by the fact that it is an effective lithostratigraphic boundary as well (e. g. see core descriptions in volume 2).

In our core descriptions and cross-sections, we have carried the downward below the top of the Hume Formation and its equivalents, but not to the base of the sequence, as this was not our primary objective.

Giveto-Frasnian (Depositional Sequence B)

The initially stated primary concern was with the Giveto-Frasnian Sequence, in an attempt to establish a penicontemporaneous datum within it (the "Slave Point Datum") of a value equal to that of the Hume (etc.) platform datum in the Couvino-Givetian Sequence.

The "Giveto-Frasnian Sequence" involves some strata which are currently called Late Givetian and some which are unequivo ally

Early Frasnian. In fact, according to unpublished conodont evidence of T. T. Uyeno submitted to us by A. E. H. Pedder, even the lowest beds of the sequence are Frasnian in age (see our Vol. II, p. 83).

The Giveto-Frasnian has at its base the Watt Mountain Unfonformity. The Watt Mountain can be traced throughout the Great Slave and Upper Mackenzie regions northward and westward to a line where pre-Canol/Muskwa erosion has removed not only that formation but a substantial portion of the underlying rocks of the Couvino-Givetian Sequence as well. Because of varying conditions along the Watt Mountain contact, the formation changes in character from place to place. Most common is the development of a regolithic or mantle-rock breccia involving more or less in-situ fragments of Presqu'ile/Sulphur Point carbonates in a matrix of tacky grey-green clay. This is interpreted as in-situ weathering of the top portion of the Couvino-Givetian beds previous to the Giveto-Frasnian transgression. This transgression in some cases reworked a portion of this breccia and clay into a basal conglomerate. More rarely, where the regolithic breccia was not found, only the basal conglomerateis present. Closer to the Peace River High, the Gilwood Sand occurs in a similar position to that of the Watt Mountain to north and east. This may be inspected in outcrop in the B. C. Rockies at localities northwest of Mount Burden.

Northward all strata belonging to the Giveto-Frasnian Sequence dis-

appear over a pre-Canol/Muskwa structural high, which we shall call the Willow River Arch.

Farther north, in the Norman Wells Area, Giveto-Frasnian deposits reappear. Here the position analogous to that of the Watt Mountain unconformity is occupied by deposits much less conspicuous in character. Between the Beavertail or the time-equivalent Upper Ramparts beds above, and the Lower Ramparts carbonates of the underlying Couvino-Givetian Sequence, occur several inches of plastic, sooty, black clay, commonly with a high bioclastic carbonate content. At Powell Creek, this clay included worn fragments of stringocephalids similar to whole shells present in the underlying Lower Ramparts carbonate.

The black clay that separates the Couvino-Givetian and Giveto-Frasnian sequences in the Middle Mackenzie Region is interpreted as indicating a fall in sea level but not an emergence. This fall in the "profile of equilibrium" was adequate to greatly reduce where not totally arrest deposition. The clay, which genetically constitutes the initial deposit of the succeeding sequence, represents conditions ranging from drastically condensed sedimentation through still-stand to a moderate degree of submarine erosion. Emergence is not postulated.

In summary it can be stated in the broadest terms that the sub-Watt Mountain unconformity decreases in magnitude from south east to north west.

The sedimentary succession embraced by the Giveto-Frasnian Sequence includes the following rock units:

Beavertail
Carcajou Rock
Fort Vermilion
Gilwood
Horn Plateau
Kee Scarp
Lower-Middle Slave Pt.
Upper Ramparts
(continued next column)

Upper Slave Pt.
Waterways, Calmut
Waterways, Christina
Waterways, Firebag
Waterways, Mildred
Waterways, Moberly
Waterway, Peace Pt.
Watt Mountain

The Giveto-Frasnian Sequence includes five faunal zones, from DLM15 and DFR1 through DFR4. As in the case of the preceding sequence, the Couvino-Givetian (and of all sequences by definition) may lose zones from top or base, but not from within the sequence. Corresponding to Hume (et al) Platform datum horizon of the underlying sequence is the boundary between Lower Slave Point and Beavertail in the present sequence, which may be taken as the next higher datum.

In this case, in addition to faunal criteria, there is a lithologic contrast between the darker strata of the Beavertail and the light-colored Slave Point strata overlying. Where the Beavertail is missing and the Slave Point rests directly on the Watt Mountain conglomerate-breccia, the datum naturally becomes less precise, although the relief on the sub-Slave Point unconformity in these areas appears to have been modest.

Frasnian (Depositional Sequence C)

Depositional Sequence C corresponds to the bulk of the Frasnian, extending from the DFR5 through DFR12 zones to the close of the Frasnian. We are concerned here only with the basal part of this sequence, namely the Canol/Muskwa shale and the unconformity which separates it from the beds of Depositional Sequence B or from even older beds where the latter are missing.

The determination of the exact time-stratigraphic position of the Canol/Muskwa must rest with systematic studies of its conodonts. Where these have been recovered, they have proven in all cases to be Upper Devonian in age, although the containing strata may be resting on Middle Devonian or on much older rocks.

At Ottertail and Gas Keg ridges in the Mount Burden Area, B. C., the Canol/Muskwa Shale rests with apparent conformability upon Upper Waterways beds of DFR4 equivalency, and is overlain by strata which carry a DFR7 fauna. The Canol type loses it character to the southeast and is presumed to pass to shales of Cooking lake and/or lower Duvernay age.

Northwestward on the other hand, the magnitude of the hiatus increases so that it rests on the Hume Platform in the Liard Area, on pre-Hume strata in the Nahanni Area, and as low as Silurian in parts of central Yukon.

In many outcrops in the "Territories" the unconformity is readily evident in outcrop, notably at Kee Scarp and Powell Creek in the Norman Wells Area (see Volume 1, figs. 2, 3, and 10) and on Margery Creek in the Peel Plateau Area.

FAUNAL ZONES, TIME-ROCK UNITS AND DIASTEMS

Each of the eleven faunal zones involved in the current investigation coincides with a time-rock unit that has definite upper and lower limits. Each such unit underwent relatively rapid and continuous deposition; and each is bounded by diastems (non-deposition) or by thin bands of condensed (i. e. extremely slow) sedimentation. Faunal zones and their corresponding time-rock units are not, in other words, intergradational, but are integral. They constitute what Crickmay (1967, page 1) calls "indivisible aggregates".

In the case of our Depositional Sequences A and B, in the Middle Mackenzie Region, several inches of tacky black clay or black shale separate the carbonates comprising the time-rock units DLM13, DLM14, DLM15, DFR1, and DFR2. A sharp lithologic change marks the contacts between DLM12 and DLM13, and between DLM 10/11 and DLM12. These latter two contacts are those which bound the Hare Indian Formation in this region.

The time-line between DLM 10/11 and DLM12, extended southward,

becomes the boundary between Lower and Upper Keg River. Extended southeastward, it becomes the boundary between Lower Pine Point (Lonely Bay) and Middle Pine Point.

Still lower in the section, between Zones DLM9 and DLM10/11, a clastic, silty zone commonly intervenes, which in the Peace River Region passes to several feet of coarse sandstone.

Clastic breaks may also be seen in many of the cores in the area west of Great Slave Lake between Lower Slave Point (DFR1) and Beavertail (DLM15).

From the fore-going, it can be seen that diastems between time-rock units of a sequence, and unconformities between major depositional cycles differ not so much in kind as in degree.

What produces the intra-sequential diastems remains conjectural, but the effect is a significant change in paleogeography from one time-rock interval to the next. In terms of petroliferous accumulations, this involves a shift in carbonate bank edges, reef alignments, etc. Therefore, ideally, a paleogeographic map should be made for each time-stratigraphic interval.

The isopach maps published by James Law (Bulletin of Canadian Petr. Geol., vol. 19, no. 2; June, 1971) approach this degree of

precision. For example, 1) his "Lower Hume, Headless, Willow Lake, and Upper Chinchaga" interval equals our DLM9; 2) his "Upper Hume, Lonely Bay and lower Nahanni formations, and Lower Keg River Member" interval equals our DLM10/11; 3) his "Upper Nahanni, middle Pine Point, lower Horn River and Hare Indian formations, and Upper Keg River Reef Member" interval equals our DLM12 except that we would not extend the term Nahanni this high; 4) his "Upper Hare Indian Formation, Middle Horn River Formation, and Buffalo River Member" equal our DLM13. 5) his "Lower Kee Scarp, Sulphur Point and Presqu'ile formations" equal our DLM14, with the following exceptions:

a) his "Lower Kee Scarp" (equals our "Lower Ramparts") we extend downward to include our Zone DLM 13; 6) his "upper Kee Scarp, Slave Point, Horn Plateau and upper Horn River formations" correspond to our DLM15 plus DFR1 zones, with the following exceptions: a)we have no evidence that the Horn River Formation extends that high; b) his "upper Kee Scarp" is our "Kee Scarp, sensu Stelck".

We follow Pedder's (1964) paleontologic evidence in considering the Nahanni Formation as equivalent to the Hume Formation and comprising Zones DLM9 and DLM10/11. We do not use the name as Law does for strata as young as DLM12. We prefer to use Kee Scarp in its original sense, rather than in the revised sense of Bassett (1961); we feel that Bassett's substitution of Kee Scarp for Ramparts is no more than a replacement of one unsatisfactory term by another even more unsatisfactory.

Law's faunal list for his "lower Kee Scarp" (op. cit., p. 461) is highly misleading. Stringocephalus sapiens is an Upper Keg River, DLM12 species. Stringocephalus chasmognathus and Rensselandia laevis are DLM13 species, that is, our Lower Ramparts (part) equals his "lower Kee Scarp" (part). Reticulariopsis (Warrenella) timetea is the same fossil as our Warrenella occidentalis; it is a key fossil of the DLM15 Zone of the Beavertail.

Despite some of the reservations and disagreements mentioned above, we felt that Law's paper supports the possibility of applying integral time-rock units in isopach and paleogeography studies.

GUIDE FOSSILS & TIME ZONES

Diagnostic Guide Fossils:

appearing on Core Summaries and Cross-sections*

1. Agoniatites sp. undet. GONIATITE Hare Ind. 17b.
2. Atrypa arctica Warren BRACH. Keg R., Lonely Bay, Nahanni, 3, 4b, 5, 7b.
3. Atrypa perfimbriata Crickmay BRACH. Horn R., U. Keg R., Hare Ind. 4a, 6, 18.
4. Atrypa n. sp. SLAVE POINT BRACH. Slave Pt. 7a.
5. Bekena homolibra McGill OSTRACOD U. Ramparts, 16.
6. Buchiola retrostriata von Buch PELECYPOD Hare Ind. 17.
7. Cyrtina panda Meek BRACH. Kee, Bv. 6a, 7.
8. Cyrtina aff. panda Meek BRACH. Bv., U. Ramparts, 7b, 16.

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*Numbers following the fossil names refer to well numbers as used in our study. Among rock unit names Beavertail is abbreviated "Bv", Kee Scarp as "Kee".

9. Dechenella neotesca Ormiston TRILOBITE Hume 18.

10. Dendrostella trigemme (Quenstedt) CORAL Nahanni, Hume 8a, 11, 17, 18, 19.

11. Devonoproductus aff. tertius Crickmay BRACH. Bv. 15.4.

12. Dialythophyllum? sp. CORAL Hume 11.

13. Emanuella meristoides (Meek) BRACH. Nahanni 8a.

14. Emanuella sublineata (Meek) BRACH. M. Pine Pt. Horn R. 3, 4, 4a, 11.

15. Geranocephalus inopinus BRACH. L. Ramparts 6.

16. Geranocephalus sp. BRACH. L. Ramparts 5.

17. Grypophyllum mackenziense (Pedder) CORAL Kee, U. Ramparts, Bv. 6a, 7, 7b, 15.4.

18. Hadrorhynchia intermissa Crickmay BRACH. Hare Ind. 8a.

19. Ladjia cf. caligatae (Crickmay) BRACH. Beavertail, U. Ramparts Kee #1, 6a, 14, 15.3, 15.4, 16, 19.

20. Ladjia landesi Crickmay BRACH. L. Slave Pt. #1, 1a, 2, 2b, 2c, 3, 4, 4a, 5, 7b, 7c, 8a.

21. Ladjia? vernilis (Crickmay) BRACH. L. Slave Pt. #1.

22. Ladjia? MACKENZIE BRACH. U. Ramparts 19.

23. Ladogiodes cf. sandersoni (Warren) BRACH. Bv. 7.

24. Leiorhynchus castanea (Meek) BRACH. M. Pine Pt., Hare Ind. Horn R. #1, 3, 5, 8a, 11, 17b.

25. Leiorhynchus hippocastanea Crickmay BRACH. U. Ramparts 16.

26. Leiorhynchus sp. X BRACH. M. Pine Pt., 3, 4.

27. Leperditia sp. undet. OSTRACOD L. Slave Pt. 4a.

28. Leperditia spp. OSTRACOD L. Slave Pt. 3.

29. Lingula spatulata Vanuxem BRACH. Horn River, 11.

30. Lingula sp. BRACH. M. Pine Pt. #1

31. Microplasma fongi Yoh CORAL Nahanni; Hume 7b, 8a, 9, 10.

32. Moravophyllum sp. nov. CORAL L. Ramparts 19.

33. Nervostrophia cf. tulliensis (Hall) BRACH. Bv. 7b, 15.4.

34. Ostracods, unspecified Slave Pt. 4,6.

35. Productella gulosi Crickmay BRACH. Bv. 7, 15.3.

36. Productella verecunda Crickmay BRACH. M. Pine Pt. 3,4.

37. Pterochaenia sp. H. I. PELECYPOD Hare Ind., 17a, 17b.

38. Pterochaenia? sp. PELECYPOD M. Pine Pt. #1.

39. Radiastraea verrilli (Meek) CORAL Hume 19.

40. Rensselandia? BRACH. L. Ramparts 14.

41. Rhombopora? sp. BRYOZOAN Bv. 7.

42. Rhyssochonetes aurora (Hall) BRACH. M. Pine Pt. 3,4.

43. Rhyssochonetes? sp. BRACH. M. Pine Pt. #1.

44. Schuchertella adoceta Crickmay BRACH. L. Nahanni 7

45. Sociophyllum glomerulatum (Crickmay) CORAL Nahanni, Hume 7b, 19.

46. Spinatrypa sp. POWELL CREEK BRACH. Kee, U. Ramparts 6a, 19.

47. Stringocephalus sapiens BRACH. U. Keg 6.

48. Stringocephalus sp. BRACH. U. Keg. R., L. Ramparts 2, 3, 4, 6, 7c, 14.

49. Styliolina sp. Bv. CRICOCONARID Kee, U. Ramparts 6a, 16.

50. Styliolina sp. H. I. CRICOCONARID M. Pine Pine Pt., Hare Ind. #1, 3, 4, 17a, 17b.

51. Taimyrophyllum sp. CORAL Hume 10

52. Temnophyllum richardsonense (Meek) CORAL L. Ramparts, 19

53. Temnophyllum (?) sp. nov. CORAL Kee, Bv. 6a, 7b, 15.1.

54. Tentaculites sp. H. I. CRICOCONARID Horn R., Hare Ind. 11, 17a.

55. Utaratuia acucipicta Crickmay CORAL Nahanni 7c.

56. Warrenella kirki (Merriam) BRACH. M. Pine Pt., Horn R. H. I., #1, 4a, 8a.

57. Warrenella occidentalis (Merriam) BRACH. Kee., Bv., 6a, 7, 7b, 15.4.

b) additional from Outcrop Sections*

58. Atrypa cf. scutiformis Stainbk. BRACH. L. Waterways; WR, GSL*
Recent examination indicates this is Atrypa independensis Webster of DFR2 and and Lower Cedar Valley (Iowa)

59. Atrypa hormophora Crickmay BRACH. L. Ramparts; PC

60. Aulacella? sp. KEE SCARP BRACH. Bv.; PC

61. Caunopora cf. ramosa Phillips CORAL Bv.; Well No. 8 (see also Crickmay, 1968, pp. 2-3)
This is a commensal intergrowth of a stromatoporoid and a syringoporoid coral.

62. "Cyathophyllum" kobehense Stumm CORAL L. Ramparts; CRW

63. "Disphyllum" goldfussi (Geinitz) CORAL L. Ramparts; CRW

64. Eleutherokomma implana Norris BRACH. U. SLave Pt.; GSL

65. Ilmenia? sp. POWELL CR. BRACH. Bv.; PC

66. Hypothyridina cameroni Warren BRACH. U. Ramparts; GH

67. Ladjia sp. SLAVE PT. BRACH. U. Slave Pt.; GSL

68. Ponticeras tschernyschewi (Holzapfel) Bv.; CRW, PC

69. Rensselandia laevis (Meek) BRACH. L. Ramparts; GH

70. Stringocephalus aleskanus Crickmay BRACH. L. Ramparts; GH

71. Stringocephalus asteius Crickmay, BRACH. L. Ramparts; G

72. Stringocephalus axius Crickmay BRACH. L. Ramparts; WR

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*Locality abbreviations as follows;

WR=Wicked River; GSL=Great Slave Lake Area, South; PC=Powell Creek; CRW=Carcajou Rock; GH=Ramparts of the Mackenzie; PCW=Powell Creek West

73. Stringocephalus cf. fontanus Veevers BRACH. L. Ramparts; PCW

74. "Stringocephalus" giganteus (Sowerby) BRACH. L. Ramparts; CRW

75. Styliolina spica Hall CRICOCONARID U. Waterways, WR

From the above list it is apparent that, of hundreds of fossil species identified in the course of our current study, 75 have been selected as especially diagnostic for purposes of age determination and correlation. All of these appear on the cross-sections. The following species have previously been more fully discussed in Vol. I of our report: items 4, 11, 19, 20, 21, 22, 60, 65.

Diagnostic Fossils by Zone

Below the same species as above are listed according to zone, in ascending order. It is unfortunately outside the planned scope of this project to illustrate these diagnostic fossils. Therefore we have adopted the expedient of indicating where adequate illustrations may be found.

For example:

Leiorhynchus castanea (Meek 1868)

McLaren, 1962 indicates that, although the species was originally

named and illustrated by Meek in 1868 (under a differnet generic name; hence the parentheses), an adequate illustration is also available in a more readily accessible work by McLaren, 1962; namely in G. S. C. Bulletin 86, entitled "Middle and Early Upper Devonian Rhynchonelloid Brachiopods from Western Canada."

Those species which have not, to our knowledge, been described and illustrated by anyone but which are important for local correlation are variously designated; such as:

1) Agoniatites sp. undet. (species undetermined but the genus itself is time-diagnostic).
2) Lingula sp. (material inadequate or insufficient for species determination).
3) Devonoproductus aff. tertius Crickmay (resembles Crickmay's species but definitely a different species).
4) Nervostrophia cf. tulliensis (Hall) (resembles Hall's species, and may be the same).
5) Atrypa n. sp. SLAVE POINT. An important species, but not previously described; therefore we adopt the expedient of giving it an informal name (i. e. "SLAVE POINT").

All species from outcrop will be maintained in our collections, where they will remain readily accessible to our subscribers for confidential examination.

Zone DLM 8 through DLM 11-composite

Those zones comprise the Hume Formation as developed in east central Yukon. In the Middle Mackenzie region, Zone 8 is absent, and it has not been recorded in the otherwise time-equivalent Nahanni Formation, where Zone DLM9 is the earliest fauna recognized. Zone DLM10/11 occurs in the upper 200 feet (approx.) of the Hume and Nahanni, and extends eastward and southward as the Lonely Bay, Lower Pine Point, Lower Keg River, Elm Point, etc.

Although some species are restricted to single zones, others, notably some of the corals, range throughout the Hume/Nahanni but remain excellent indicators of these formations. Among them are:

Dendrostella trigemme (Quenstedt)

Microplasma fongi Yoh

Radiastraea verrilli (Meek)

Sociophyllum glomerulatum (Crickmay)

DLM9 Schuchertella adoceta Zone

Schuchertella adoceta Crickmay 1960
also Warren & Stelck 1956, pl. I as "Schuchertella nevadensis"

Taimyrophyllum sp.
For Canadian species of Taimyrophyllum, which seem to be restricted to DLM8 & DLM9, see Pedder, 1964.

DLM10/11 Atrypa arctica Zone

Atrypa arctica Warren 1944
also Warren & Stelck, 1956; Crickmay, 1960

Dechenella neotesca Ormiston, 1967

Dendrostella trigemme (Quenstedt 1881)
Pedder, 1964; Crickmay, 1960 (as "Itelophyllum virgatum");
Lenz, 1961, 1961, (as "Columnaria rhenana?")

Dialythophyllum? sp.
see Miedema (thesis) 1961

Emanuella meristoides (Meek 1868)
also Warren & Stelck, pl. IV, as "Ambocoelia meristoides";
Caldwell, 1967)

Microplasma fongi Yoh 1937
see Lenz, 1961

Radiastraea verrilli (Meek, 1868)
see Smith, 1945 (as "Phillipsastraea verrilli"); Lenz, 1961
(as "Billingsastraea verrilli"); Pedder, 1964

Sociophyllum glomerulatum (Crickmay, 1962)
see also Lenz, 1961 (as "Spongophyllum elongatum" Schlüter);
Pedder, 1964

Utaratuia acucipicta Crickmay 1960
This species occurs most prominently in the uppermost part of
the Nahanni Formation and equivalent Hume beds.

DLM 12 Warrenella kirki Zone

Agoniatites sp. undet.
A Lower? to Middle Devonian genus

Atrypa perfimbriata Crickmay 1957
see also Warren & Stelck, 1956, pl. VI (as "Atrypa sp.")

Buchiola retrostriata von Buch 1832
see Kindle, 1919
This is a pelecypod that ranges from Middle well up into
the Upper Devonian.

Emanuella sublineata (Meek, 1868)
see Warren & Stelck, 1956, (as "Martinia? sublineata");
Caldwell, 1967. Ranges to top of Givetian.

Hadrorhynchia intermissa Crickmay, 1963

Leiorhynchus castanea (Meek, 1868)
see also Warren & Stelck 1956, (pl. IX, as "Caryorhynchus castanea"; pl. IV as "Nudirostra sp."; McLaren, 1962, pls. XIV-XV (except XIV figs. 6&7).

Leiorhynchus n. sp. X

Lingula spatulata Vanuxem
see Warren & Stelck, 1956, pl. X
this brachiopod ranges well up into the Upper Devonian.

Productella verecunda Crickmay 1963

Pterochaenia sp. H. I.
an undescribed Hare Indian pelecypod which may be the same as one occurring in the age-equivalent Middle Pine Point, on Great Slave Lake.

Rhyssochonetes aurora (Hall) 1867
see J. G. Johnson, 1970, Pl. 1
a similar if not identical species occurs in the Upper Waterways (DFR4) in cores of Frobisher 5B, 140-155' on Hay River, Dist. of Mackenzie.

Styliolina sp. H. I.

Tentaculites sp. H. I.

Warrenella kirki (Merriam, 1940)
see Warren & Stelck, 1956, pl. IV, as Martinia? kirki; also Hogg, 1965, thesis.

DLM 12 Stringocephalus sapiens Zone.

This zone is the carbonate bank-cum-reef facies equivalent of the DLM12 Warrenella kirki Zone open marine facies.

Stringocephalus sapiens Crickmay 1960

Atrypa perfimbriata Crickmay 1957

DLM 13 Rensselandia laevis Zone

"Cyathophyllum" kobehense Stumm 1938, see Lenz, 1961.

?Disphyllum goldfussi (Geinitz) 1846
see Lenz, 1961

Emanuella sublineata (Meek) (1868)
see also Warren & Stelck, 1956 (as "Martinia? sublineata"); Caldwell, 1967.
Ranges through most of Givetian (DFR12-DFR14).

Geranocephalus inopinus Crickmay 1954
also Crickmay, 1968

Geranocephalus sp.

Moravophyllum sp. nov.

Rensselandia laevis (Meek 1868)
see also Warren & Stelck, 1956, Pl. IV

Rensselandia? sp.

Stringocephalus asteius Crickmay 1963

Stringocephalus axius Crickmay 1954

Temnophyllum richardsonense (Meek, 1868)
see Warren & Stelck, 1956, as "Aulophyllum? richardsonense"

DLM 14 Stringocephalus aleskanus Zone

Atrypa hormophora Crickmay 1963

"Cyathophyllum" kobehense Stumm 1938
see Lenz, 1961

?Disphyllum goldfussi (Geinitz) 1846
see Lenz, 1961

Emanuella sublineata (Meek, 1868)
see Warren & Stelck, 1956 (as "Martinia? sublineata").
Caldwell, 1967. Ranges through much of Givetian.

Stringocephalus aleskanus Crickmay 1962

Stringocephalus cf. fontanus Veevers
see Warren and Stelck, 1962

"Stringocephalus" giganteus (Sowerby)
see Warren & Stelck, 1962 (as "Geranocephalus cf. S. giganteus")

Temnophyllum richardsonense (Meek, 1968)
see Warren & Stelck, 1956 (as "Aulophyllum? richardsonense"

DLM 15 Cyrtina panda Zone

B kena homolibra McGill 1966

Cyrtina panda Meek 1868
compare Cyrtina robusta Stainbrook, 1943, A Cedar Valley species; probably not "Cyrtina panda" of Warren & Stelck, 1956, pl. VIII.

Cyrtina aff. panda Meek 1868
probably the same as the preceding but grown to giant proportions.

Devonoproductus aff. tertius Crickmay 1963
D. tertius is a DFR-2 species; the present species is probably new.

Grypophyllum mackenziense (Pedder) 1963
for further comment see Crickmay, 1968 (as "Ala ophyllum mackenziense").

Ladjia caligatae Crickmay 1967
Ladjia sp. MACKENZIE. Subsequent studies of additional material show that the above two species are part of a varied species population. Hence both may be referred to L. caligatae.

Ladogioides cf. sandersoni (Warren, 1944)
see also Crickmay 1963, page 5; Warren and Stelck, 1956, pl. VIII (as "Pugnoides sandersoni").

Nervostrophia cf. tulliensis (Hall)
ranges as high as the Middle Waterways

Productella gulosi Crickmay 1963

Spinatrypa sp. POWELL CREEK
probably same as "Atrypa andersonensis Warren var." of Warren & Stelck, 1956, pl. VIII, figs. 23-25.

Styliolina sp. BV

Temnophyllum (?) sp. nov.
identified by A. E. H. Pedder for the coral called "Macgeea, cf. M. gallica Lang and Smith" of Lenz, 1961, pl. III, figs. 6, 7.

Warrenella occidentalis (Merriam, 1940)
see also Warren & Stelck, 1956, pl. IX (as "Martinia? occidentalis"); Crickmay 1960 (as "Warrenella timetea"); Crickmay 1962, 1963 (as "Tingella timetea"); Crickmay, 1968 (as "Reticulariopsis timetea").

Aulacella (?) sp. KEE SCARP

Caunopora cf. ramosa Phillips
see Crickmay 1968, pp. 2-3; also Treatise on Invertebrate Paleontology, vol. F, "Coelenterata", p. 108.

DFR1Ladjia landesi Zone

Ladjia landesi Crickmay 1967

Ladjia vernilis (Crickmay) 1967
Note: we believe the above two brachiopods are probably the same species in different states of preservation.

Atrypa n. sp. SLAVE POINT
typically a DFR2 (Upper Slave Point) fossil, but recorded from one core at the DFR1 level. For a description of the species, see Vol. 1, appendix 1, p. 5.

Leperditia sp. undet.

Leperditia spp.
several species of Leperditia are present, and when taxonomically described, may prove valuable for purposes of correlation.

DFR 1 Ponticeras Zone

NOTE: this "zone" is an open marine, predominantly sub-euxinic off-shore facies time-equivalent to the restricted-marine facies represented by the Lower (and Middle?) Slave Point, Ladjia landesi Zone. At most localities, the Ponticeras Zone is in the Beavertail Facies and Formation, but locally the basal beds may be in the Upper Ramparts lithofacies.

Leiorhynchus hippocastanea (Crickmay) 1960
see also Warren and Stelck, 1956, pl. VIII, figs. 29-31 (as Leiorhynchus castanea).

Ponticeras cf. tschernyschewi (Holzapfel 1882)
see House & Pedder, 1963
The goniatite does not succeed the L. hippocastanea beds, but is interbedded with them.

Ilmenia? sp. POWELL CREEK
for descriptive remarks, see vol. I, appendix 1, page 5.

DFR 2 Ladjia n. sp. SLAVE POINT Zone

This Zone, occurring in the Upper Member of the Slave Point Formation, is probably a carbonate bank facies equivalent to the open-marine Ladogioides pax Zone, which occupies the basal, Firebag Member of the Waterways Formation and the Peace Point Formation.

Atrypa n. sp. SLAVE POINT

Atrypa independensis Webster 1921
(on charts as Atrypa cf. scutiformis) see also Stainbrook, 1938; Warren & Stelck, 1956, pl. X, figs. 11-13, pl. XII, figs. 1-4.

Eleutherokoma implana Norris 1964
a Horn Plateau species.

Ladogiodes cf. pax McLaren 1961
a Firebag species; see also McLaren, 1962

Ladjia n. sp. SLAVE POINT
For descriptive remarks see Vol. 1, appendix 1, page 3.

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The above 25 references represent a minimum required for a reasonable attempt at determination of Western Canadian Middle and Early Upper Devonian Devonian Faunas.

WELL LOG SUMMARIES

In Volume II, which deals with the core descriptions of the wells used in our study, the descriptions in many cases are followed by summaries giving tops, diagnostic fossils, etc. The summaries are to be regarded as tentative.

The summaries on the pages which follow take precedence, in case of any descrepancies with the preceding, over those appearing in Volume II. The present summaries were prepared following laboratory study of the fossils collected from the cores, supplemented by published tops, electric log examination, and (in some cases) sample log examination.

1. McDermott et al Hay River I-41

61° 01'N; 115° 38'W

Slave Point — 185-520'=335+
Cored: 185-520'
Ladjia vernilis/landesi
20'-131' below top

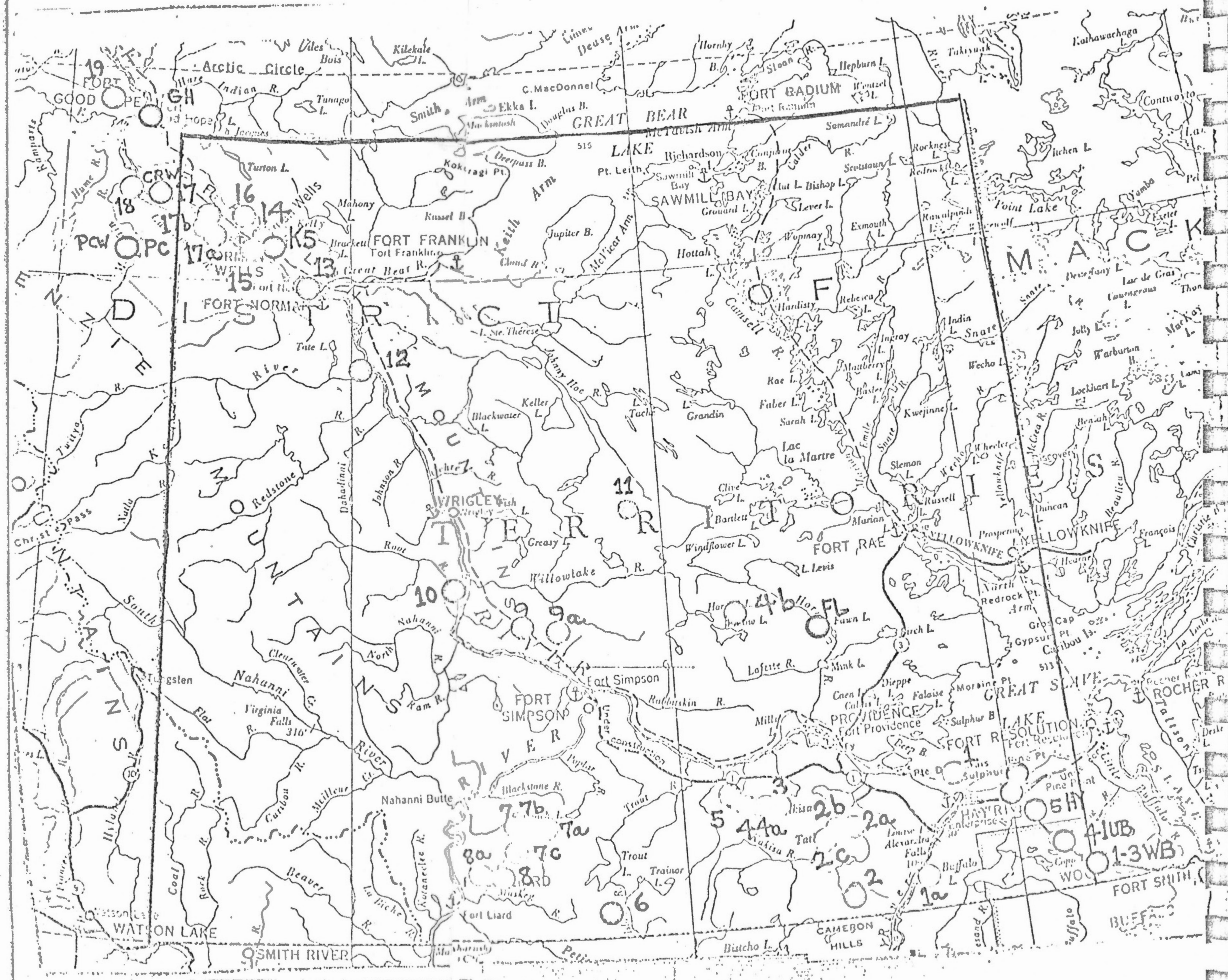
Fort Vermilion Evaporite — 520-529'=9'
Cored: 520-529'

Beavertail — 529-654'=125'
Cored: 529-654'
Ladjia cf. *caligatae*
105-110' above base

Watt Mt. Ss. — 654-656'=2'
Cored: 654-656'

Middle Pine Pt. (Hare Indian) — 656-824'=168'
Cored: 656-824'
Warrenella kirki
3-4' above base 820'
Leiorhynchus castanea
57-161' above base 763-767
Rhyssochonetes?
91-101' above base 723-733'
Lingula sp.
94-150' above base
Styliolina sp. H. I
94-150' above base 674-730
Pterochaenia? sp.
123-126' above base

Lonely Bay (Hume) — 824'
Cored: 824-834' TD



Arctic Circle
FORT GOOD HOPE
GREAT BEAR LAKE
FORT RADIUM
SAWMILL BAY
FORT FRANKLIN
Fort Franklin
NORMAN WELLS
FORT NORMAN
Point Lake
DISTRICT OF MACKENZIE
MACKENZIE MOUNTAINS
MACKENZIE RIVER
TERRITORIES
Lac la Martre
WRIGLEY
FORT RAE
YELLOWKNIFE
Fort Simpson
FORT SIMPSON
Nahanni Butte
Fort Liard
Virginia Falls 316'
GREAT SLAVE LAKE
PROVIDENCE
Fort Providence
FORT RESOLUTION
ROCHER R
HAY RIVER
FORT SMITH
WATSON LAKE
SMITH RIVER
CAMERON HILLS
Tungsten
Redstone
Keller L.
Blackwater L.
Willowlake R.
Rabbitskin R.
Trout L.
Buffalo L.
Faun L.
Kakisa R.
Tathlina L.
Alexandra Falls
Gypsum Pt.
Caribou Is.
Redrock Pt.
Moraine Pt.
Sulphur B.
Deep B.

1a. Murphy Canada Alexandra Falls 2

60° 15.5'N; 116° 35'W

Waterways	to 1870'
Slave Point Cored: 1896-1935' Ladjia landesi 83?, 96'-103' above base	*1870'-*2000'=130'
Fort Vermilion	*2000'-*2032'=32'
Watt Mt.	*2032'-*2040'=8'
Presqu'ile/Sulphur Pt. Cored:2368-2393'	*2040-2465'=465'
Middle Pine Pt. (Hare Indian)	*2465'-*2535'=70'
Lower Keg River (Hume)	*2535'-*2710*=175'
Chinchaga	*2710'

* DIA & ND Schedule Data
x E-log Data
o Well-sample Data

2. H. B., Cameron Hills A-05

60° 10'N; 117° 30'W

Canol (Muskwa)	to x4360'
Slave Point Cored: 4443-4449' Ladjia vernilis 19'-48' above base	x4360'-4499'=139'
Fort Vermilion	4499'-x4525'?=26'?
Beavertail?	x4525'?-4602'=77'
Watt Mt. cgl. & regolith Cored: 4602-4604'	4602'-4604'=2'
Muskeg evap., dol. & gn. sh. Cored: 4604-4627'	4604'-o4862'=258'
Upper Keg River Cored: 4875'-4905' Stringocephalus 38' below top	o4862'-4946'=84'
Precambrian	o4946'

2b. Briggs W. Tathlina Lake 3

60° 40'N; 117° 43'W

x2640'-x2835'=195'

Slave Point
Cored: 2706-2731'
Ladjia landesi
104-123' above base

x2835'-2850'=15'

Watt Mt.

x2850'-x2900'=50'

Presqu'ile

x2900-x3235'=335'?

"Pine Point"

*3235'

"Chinchaga"

2c. Briggs W. Tathlina Lake 2

60° 38'N; 117° 45.5'W

*2786'-*2985'=199'

Slave Point
Cored: 2880-2895'
Ladjia landesi
96-103' above base

*2985'-*3005'=20'

Watt Mt.

*3005'-*3065'=60'

Presquile

*3065'-*3360'=299'

"Pine Point"

*3360'

"Chinchaga"

3. Briggs Foetus Lake 1

60° 55'N; 118° 32'W

Canol (Muskwa)	to x2250'
Slave Point Cored: 2252'-2470' Ladjia landesi/L? vernilis 146'-205' above base Leperditia spp. 3'-199' above base	x2250'-2470=220'
Watt Mt. cgl. & regolith	2470-2474'=4'
Middle Pine Pt. (Hare Indian) Rhyssochonetes aurora 1-23' above base Productella cf. verecunda Styliolina sp. H. I. 18'-20' above base Emanuella sublineata Leiorhynchus sp. X both 18-23' above base	2474'-2532'=68'
Upper Keg River Tongue Stringocephalus sp. 17'-19' above base	2532-2552'=20'
Horn River (H. I.) Tongue Leiorhynchus castanea 4'-54' above base	2552-2612'=60'
Lower Keg River (Hume) Atrypa arctica 10-16' below top Cored: 2612'-2644'	2612'-*2674'=62'
Upper Chinchaga	*2674'

4. Briggs Rabbit Lake 2

60° 55'N; 118° 50'W

Slave Point Cored: 2495'-2647' *Ladjia landesi* 103-147' above base Ostracod fauna 1' above base is new	*2495-2647'=152'
Watt Mt. cgl. & regolith	2647-2649'=2'
Middle Pine Point (Hare Indian) *Rhyssochonetes aurora* *Productella verecunda* *Styliolina* sp. H. I. *Emanuella sublineata* *Leiorhynchus* sp. X all 2' above base	2649'-2658'=9'
Upper Keg River *Stringocephalus* sp. 37'-42' above base	2658-2705'=47'
Lower Keg River (Hume) Cored: 2705'-2718'	2705'-*2830'=125'
Upper Chinchaga	*2830'

4a. Briggs Rabbit Lake 1

60° 56'N; 118° 47.5'W

Slave Point — x2382'-2546'=164'
Cored: 2382'-2546'
Ladjia landesi
2'-51' above base
Leperditia sp. undet.
6'-34' above base

Watt Mt. cgl. & gn. sh. — 2546'-*2574'=28'
Cored: 2546'-2563'
n

Presqu'ile/Sulphur Point — *2574'-*2591'=17'

Horn River (Hare Indian) tongue — *2591'-2618'=27'
Cored: 2606'-2618'
Atrypa perfimbriata
Emanuella sublineata
Warrenella cf. *kirki*
all 4'-12' above base

Lower Keg River — 2618'-*2762'=144'

Upper Chinchaga — *2762'

4b. Imperial-Triad Willow Lake B-28

62° 17'N; 119° 04.5'W

Canol (Muskwa) to x2075'

Lonely Bay (Hume) *2075'-
Cored: 2080'-2099'
Atrypa arctica
11' below top

SEE ALSO: Braun in Norford et al, 1970, G. S. C. Paper 70-15, p. 15.

5. Imperial Redknife N-6

60° 55'N; 119° 16'W

Canol (Muskwa)	to x2868'
Slave Point Cored: 2877'-2912', 2969-3009' Ladjia landesi 21'-121' above base	x2868'-3009'=141'
Watt Mt. regolith	3009'-3031'=22'
Lower Ramparts (Presqu'ile) Cored: 3031-3075' Geranocephalus sp. 5' above base cgl. 3074.5'-3075'	3031'-3075'=44'
Horn River (Hare Indian) Cored: 3167-3175' Leiorhynchus castanea 0'-8' above base	*3075'-3175'=100'
Lower Keg River (Hume) Atrypa arctica 5' below top Cored: 3175-3197	3175'

SEE ALSO: Pedder/Norris, in Norford et al, 1970, G. S. C. Paper 70-15, pp. 9-10.

6. Imperial Island River 1

60° 09.5'N; 121° 08'W

Canol (Muskwa)	to x6912'
Slave Point/Kee Scarp unconformity at 7278.5' rich ostracod fauna, 7160, 7298.5' Cored: 6929-6949'; 7090-7299.5'	x6912-7299.5'=387.5'
Watt Mt. regolith	7299.5'-7302'=2.5'
Lower Ramparts-Upper Keg River Cored; 7302-7402' *Geranocephalus* cf. *inopinus* 2' below top *Atrypa perfimbriata* *Stringocephalus sapiens* reported by Crickmay, 1960, from 48' below top (7350') *Stringocephalus* sp. 51-84' below top	7302'-7402' plus
Undet. formations in gap	(7402'-7729'=327')
Lower Keg River (Hume)? Cored: 7729'-7740' Cored: 7840'-7852.5'	(? to 7852.5')
Basal clastics	(7852.5-7865+)

NOTE: ignore reference in vol. 2, p. 58 to "*Stringocephalus*??" at 7161.5' and 7164'.

6a. Union Pan-Am. Trainor L-59

60° 28.5'N; 120° 41'W

Slave Point — x5664'-5772'=108'
Cored: 5770'-5772'

Kee Scarp — 5772'-x5983'(?)=211'
Cored: 5772-5950'
Warrenella occidentalis
26'-53' below top
Grypophyllum mackenziense
95'-170' below top
Temnophyllum (?) sp. nov.
155'-177' below top
Cyrtina panda
161-168' below top
Spinatrypa sp. "Powell Creek"
164-168' below top
Ladjia cf. caligatae
164' below top
Styliolina sp. BV
164' below top

Watt Mt.? — x5983'-x5988'=5'

Upper Keg River and/or Hare Ind. — x5988'-x6086'?=98'

Nahanni (Hume) — x6086'?-

7. Imperial-Sun-Netla Raven F-73

60° 51'N; 122° 30'W

Canol (Muskwa) — to x6880'

Slave Point — x6880-7073'=193'
Cored: 6886-7073'

Beavertail — 7073'-x7230'=157'
Ladogioides cf. sandersoni
3'-6' below top
Grypophyllum mackenziense
20-77' below top
Cyrtina cf. panda
35' below top
Rhombopora? sp.
35-65' below top
Productella gulosi
36-103' below top
Warrenella occidentalis
60' below top
Cored: 7073'-7189'

Hare Indian — x7230'-x7330'?=100'

Nahanni (Hume) — x7330'/-7571'==241+
Cored: 7536-7571'
Schuchertella adoceta
209-217' below top (?)

7a. Murphy-B. O. C. Arrowhead River 1

60° 50.5'N; 122° 06'W

*5694'-x5866'(?)=172'(?)

Slave Point
Cored: 5694-5792'
Atryba n. sp. "Slave Point"
82' above base

x5866'(?)-x5876'(?)=10'(?)

Watt Mt.

x5876'(?)-*6045'=169'

Carbonate undivided

*6045'-x6145'=100'

Hare Indian

*6145'-

Nahanni (Hume)
Cored: 6178-6253'

7b. Imperial-Sun Arrowhead I-46

60° 45'N; 122° 22.5'W

Canol (Muskwa) — to 6137'

Slave Point — 6137'-6284'=147'
Cored: 6119-6551'
Ladjia landesi
127' above base

Kee Scarp — 6284'-6413'=129'

Beavertail — 6413'-6551=138'
Grypophyllum mackenziense
2'-27' below top
Temnophyllum (?) sp. nov.
(="Mcgeea gallica" of Lenz, etc.)
2'-29 below top

Kee Scarp reefoid tongue
30'-83' below top
Warrenella occidentalis
84'-86' below top
Nervostrophia cf. *tulliensis*
84'-86' below top
Cyrtina aff. *panda*
116' below top

Nahanni (Hume) — 6551'
Cored: 6551-6620'
Atrypa arctica
19'-33' below top
cf. *Sociophyllum glomerulatum*
45-48' below top
Microplasma fongi
45-51' below top

7c. Imperial-Sun Arrowhead Aurora M-47

60° 40'N; 122° 30'W

Canol (Muskwa) — to x7223'

x7223'-7585'=362'

Slave Point
Cored: 7223'-7509'
Ladjia landesi
216-281' below top

x7585'-7590'=5'

Watt Mt.

x7590-7794'=204'

L. Ramparts/Upper Keg River
Cored: 7767-7794'
Stringocephalus sp.
8' above base

Upper Keg-Hare Indian transition
0'-7' above base

7794'

Nahanni (Hume)
Utaratuia acucipicta
15' below top
Cored: 7794-7817'

8. B. A. - Texaco Arrowhead N2

60° 32'N; 123° 01'W

Beavertail
Cored: 8604-8642', 8650'-8708'
Grypophyllum mackenziense
8677'
Caunopora cf. ramosa Phill
8677'

8a. B. A.-Texaco Arrowhead B-76

60° 30'N; 122° 45'W

Canol (Muskwa) — to x8480'

Slave Point — x8480-8720'=240'
Ladjia landesi
13' above base

Note: basal contact drawn above a limestone that appears to have been lithified before deposition of the overlying, as its upper part shows regolithic-type breakup.

Beavertail — 8720-x8790=70'
Cored: 8720-8748'

Watt Mt. — x8790-8823'=33'

Upper Keg River — 8823-8927'=104'
Cored 8910-8927'

Hare Indian — 8927-8958'=31'
Cored 8927-8960'
Leiorhynchus castanea
7'-30' above base
Warrenella kirki
6-30' above base
Hadrorhynchia cf. *intermissa*
15' above base

Nahanni (Hume) — 8958'
Cored: 8958'-9010'
Dendrostella trigemme
13'-37' below top
Microplasma fongi
16-43' below top
Emanuella meristoides
33-49' below top

9. I.O.E.-Triad Ebbut D-50

62° 19'N; 122° 23.5'W

Canol (Muskwa) to 1532'

Hume (Nahanni) 1532'-1834'=302'+
Cored 1531.9'-1534'
Conglomeratic: 1531.9-1532.1'
Microplasma fongi
1' below top

Lower Hume ostracods (Braun): 1550-1834'

See Also: Norford et al, 1970, G. S. C. Paper 70-15

9a. I.O.E.-Triad Ebbut J-70

62° 19.5'N; 121° 57'W

As in the nearby Ebbutt D-50 (#9), the target interval is entirely absent, so that the Canol Shale rests directly on Hume Formation.

10. FPC-Tenneco Root River I-60

62° 40'N; 123° 25'W

Canol (Muskwa) — to x2710'

Hume (Nahanni) — x2710-3053'=343'+
Cored: 2825-2845'
Cored: 3033-3053'
Microplasma fongi
116-118' below top
Taimyrophyllum sp.
342' below top

11. Imperial Cartridge F-72

63° 11'N; 120° 29'W

Canol (Muskwa) — to*733'

Horn River (Hare Indian) — *733'-802'=69'
Cored: 756-802'
Leiorhynchus castanea
Emanuella sublineata
Lingula spatulata
Tentaculites sp. H. I.
all 22.5'-41' below top

Hume (Nahanni) — 802'*911=109'
Cored:802-823'
Cored:835-869'
Dendrostella trigemme
39-42' below top
Dialythophyllum? sp.
48' below top

Bear Rock? — *911'-

12. Imperial Redstone 1

64° 12'N; 124° 38'W

to x1780'

Canol (Muskwa)

x1780-2020'=240'

Carbonate, undivided

x2020-2622'=602'

Hare Indian (Horn River.)
Cored: 2061-2075'

Fauna same as Imperial Morrow Creek 1 (#17a) and Imperial-Canol Hossier Ridge 2 (#17b).

x2622'

Hume (Nahanni)

13. Imperial-Canol Bluefish 1A

64° 56'N; 125° 51'W

Canol (Muskwa) — to x2520'

Hare Indian? — x2520-x2547'=27'

Hume (Nahanni) — x2547-*2910=373'

Cored: 25 3-2565'
No diagnostic fossil

Bear Rock — *2910'

14. Imperial Norman Wells 37x

65° 17'N; 126° 52'

Canol (Muskwa) — to *1023'

Kee Scarp — *1023-1274'=251'

Cored: 1032-1274'

Ladjia cf. caligatae
141-142' below top

Grypophyllum mackenziense
reported by Crickmay (1968, p. 3)
0-177' below top

Lower Ramparts — 1274-1439' TD.=165'+

Cored: 1274-1439'

Stringocephalus sp.
1-24' below top

Rensselandia? sp.
4' below top

NOTE: Kee Scarp-Lower Ramparts contact drawn at ¼ inch black shale coating a highly undulating limestone surface. This compares with contacts observed in outcrop in the Norman Wells-Fort Good Hope area.

15.1 Imperial-Canol Bear Island 4

65° 15'N; 126° 15'W

Canol (Muskwa) — to *2108'

Carbonate undivided — *2108-2272' 164'

Kee Scarp
Cored: 2162-2181'
Temnophyllum (?) sp. nov.
(="Macgeea gallica" of Lenz)
55' below top

Beavertail
Cored: 2181-2193'
Temnophyllum (?) sp. nov.
11' below top

Hare Indian (Horn River) — *2272-2318' TD. 46'+
Cored: 2305'-2315'

151.a - Imperial-Canol Bear Island No. 7

65° 15'N; 126° 53'W

NOTE: Core of this well proved to be in very poor condition and yielded no diagnostic fossils.

15.2 Imperial Loon Creek 1

65° 11'N; 126° 54.5'W

CORES have poor recovery and no diagnostic fossils.

Tops given in Schedule 3 (1964) are interpreted as follows:

Canol (Muskwa)	to 2890'
Kee Scarp Tongue	2890-2924'=34'
Hare Indian (Horn River)	2924-3160'=236'
Hume (Nahanni)	3160'-3545'=385'
Bear Rock	3545'

15.3 Imperial Seepage Lake 1A

65° 18'N; 126° 50.5'W

Canol (Mus[illegible]wa) — to 989'

989'-1003'=14'

Beavertail
Ladinia cf. caligatae
Productella gulosi
both 3' above base

1003'-1001'=8'

Lower Ramparts — *1010-*1530'-520'

Hare Indian (Horn River) — *1530'-*1636' T. D.

Hume (Naharnni)

15.4 Imperial Goose Island #19 (E-57)

65° 16'N; 126° 58'W

Kee Scarp x2135-2735' TD.

Cored: 2135-2335'
Cored: 2586-2735'

Ladjia cf. caligatae
454'-598' below top

Warrenella occidentalis
454-586' below top

Devonoproductus aff. tertius
454-587' below top

Nervostrophia cf. tulliensis
598' below top

NOTE: as dips in core range from 20° to 80°, thicknessess are abnormal and should be ignored. Dips could hardly be other than tectonic in origin; this is supported also by fact that carbonate top in Goose Island 21 lies 1379' higher than in the present well.

16. Pacific-Westcoast Oscar Creek H-77

65° 26'N; 127° 08'W

Canol (Muskwa) — to x1631'

Beavertail ("Upper Ramparts") — x1631-x1711'=80'

Leiorhynchus hippocastanea
78' above base

Ladjia cf. caligatae
48' above base

Styliolina sp. BV
48-22' above base

Bakena homolibra
46' above base

Cyrtina aff. panda
36' above base

Cored: 1631'-1702'

17. Imperial Judile 1

65° 29.5N; 127° 36'W

Canol (Muskwa) — to *1305'
Carbonate undivided — *1305-1589'=284'
Cored: 1321-1362'

Beavertail — 1589-1605'=16'+
Cored: 1589-1605'
Gryphophyllum mackenziense
1' below top of core (at 1590')
carbonate undivided:

*1605-*1765'=160'

Hare Indian (Horn River) — *1765-*2302'=537'

Hume (Nahanni) — *2302-*2600'=298'
Cored: 2307-2348'
Dendrostella trigemme
13' below top

Bear Rock — *2600'

17a. Imperial Morrow Creek 1

65° 24'N; 127° 23'W

to *990'

Canol (Muskwa) *990-*1104'=114'
Carbonate undivided
Cored: 1090-1099' (Kee Scarp?)

*1104-1610'=506'

Hare Indian (Horn River)
Cored: 1596-1608'
Styliolina sp. H. I.
Tentaculites sp. H. I.
Buchiola retrostriata
all 6'-14' above base
Pterochaenia sp. H. I.
Agoniatites sp. undet.
both 8-11' above base

*1610-1960'=350'

Hume (Nahanni)
Cored: 1694-1714'

17b. Imperial-Canol Hossier Ridge 2

65° 25'N; 127° 32'W

Canol (Muskwa) — to *920'
Carbonate undivided — *920-*1390'=470'
Cored: 928-958'
Cored: 1199-1208'

Hare Indian (Horn River) — *1390-*2160'=770'
Cored: 2018-2028'; 2051-2137'
Leiorhynchus castanea
Styliolina sp. H. I.
Tentaculites sp. H. I.
all 65'-109' above base
Pterochaenia sp. H. I.
65' above base

Hume (Nahanni) — x2160-x2500'=340'
Cored: 2168-2178'
Dendrostella trigemme
8-18' below top

18. Imperial Sans Sault 1

65° 43'N; 128° 49'W

Canol (Muskwa) Carbonate, undivided Cored: 1409-1423'	to *1387' x1402-x1845'=443'
Hare Indian (Horn River) Cored: 1942-1991'; 2531-2549' Atrypa perfimbriata 104' below top	x1845*2590'=745'
Hume (Nahanni) Dendrostella trigemme Dechenella neotesca both 196' below top Cored: 2782-2801'	*2590-*2925'=335'
Bear Rock	*2925'

19. Atlantic S. W. Airport Creek 1

66° 21'N; 129° 15'W

Canol (Muskwa) — to *362'

Upper Ramparts — *362-382'=20'
Cored: 370-382'
Ladjia cf. oligatae
Spinatrypa sp. "Powell Creek"
both 11' above base
Ladjia sp. "Mackenzie"
6' above base
Gryposphyllum mackenzie
3.5' above base

Lower Ramparts — 382-*485'=103'
Cored: 382-400'
Moravophyllum sp. nov.
5' below top
Temnophyllum richardsonense
8-9' below top

Hare Indian — *485-*1275'=790'

Hume (Nahanni) — *1275 -*1630'=355'
Cored: 1355-1367'
Dendrostella trigemme
80-81' below top
Sociophyllum glomerulatum?
84' below top
Radiastraea verrilli
90' below top

Gossage — *1630