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STUDY OF SAMPLES COLLECTED AROUND THE HUDSON BAY (LOWLANDS AND NORTHERN ISLANDS - CANADA). S. RUEFF - PH. ARTRU FIELD SURVEY - SUMMER 1968. COMPARISONS WITH KASKATTAMA NO. 1 WELL.

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ABSTRACT

STRATIGRAPHY

ORDOVICIAN

The biozones defined in Kaskattama Well No. 1 by palynological methods are also found in the Ordovician of the Hudson Bay, and the correlations are particularly good with the Northern Islands. The microfauna give the same results with the Ostracods and the Conodonts.

Some Ordovician microfacies are typical and may be used as markers, in the Bad Cache Rapids Group as well as in the Churchill River Group.

SILURIAN

The results of the analyses on the field samples do not correlate with Kaskattama Well No. 1.

There is no palynological evidence of Silurian. The occurrence of Silurian indicated by this method is usually denoted as "Ordovician to Silurian"; the isolated microfauna give 7 biozones with Conodonts and 10 biozones with Ostracods.

DEVONIAN

Some samples of the Kenogami River Formation Middle Member are dated as Middle Devonian (biozone 11) by Ostracods and Characeae. The Ostracods, with the associations of the biozones 12 and 14, also give a Middle Devonian age to the Kwataboahegan Formation. The Basal Famennian (Upper Devonian) was identified by pelagic Ostracods and Conodonts in one sample of the Stooping River Formation. However, the bentonic Ostracods of this Formation are Middle Devonian (?) in age. The palynology confirms the Devonian age of the samples from Grand Rapids and the Mattagami and Abitibi Rivers (Moose River Basin); some levels are dated with greater accuracy (Middle Devonian to Upper Devonian, Upper Devonian, Famennian).

LITHOLOGY - ENVIRONMENT.

Shelf facies with marine influences are common in the Ordovician (Bad Cache Rapids Group, Churchill River Group). In the Silurian (Fort Severn, Attawapiskat-Ekwan River), the facies from "restricted" or "protected" environments are the more numerous. These facies consist of the sediments deposited in

- restricted shelf area
- restricted basin
- intercotidal to supracotidal area, with locally evaporitic tendencies.

The frequent occurrence of these facies indicates a restricted origin which can be

- either general, for the entire basin   shallow intra-cratonic sea
- or local, existence of shoals or barriers (possibly reefal structures) which form the limit with the more open environments of the central and western parts of the Bay.

Build-up facies also occur in the sequence as well as facies derived from build-ups. These build-ups are of the algal and coral types and are associated with destruction facies (talus).

Facies of open shelf area or of open sea are rare.

As these types of facies are not lithostratigraphically characteristic and as there is still no accurate chronostratigraphical scale available for this basin, it was not possible to control the field hypotheses of the lateral equivalence of the Silurian Severn, Attawapiskat and Ekwan River Formations or of the lateral equivalence of the Devonian Kwataboahegan, Stooping and Sextant Formations. However, the field hypotheses seem realistic.

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REVISED MAY 1970

1. INTRODUCTION.

This study was undertaken in order

- to describe the facies, environment and paleogeography of the Palaeozoic,
- to date some levels, selected either by the field geologists or by the microfacies analysts, by means of microfauna (Ostracods, Conodonts), palynoplanktology and macrofauna methods.

1.1 STUDY OF MICROFACIES

Thin sections were examined in order·

- to characterise the environment in each locality,
- to follow the vertical evolution of the environment for the formations,
- to outline as far as possible the paleogeography of the different areas.

The different environments that we shall refer to are, from the continental shelf to the open sea, as follows

- a high supracotidal to intercotidal zone characterised by fine azoic sediments with evaporitic minerals or sulphate pseudomorphoses,
- an intercotidal zone characterised by
  - bird eyes facies and regression breccia;

- build-ups of the algal type (Stromatolites) or by their clastic facies. The accumulation of clastic facies occurred either behind the build-up (the elements are then aligned in a micritic cement) or on the open-sea side of the build-up,

- a shelf
  - internal shelf and restricted shelf with scarce, thin-shelled fauna,
  - open shelf with more abundant fauna, phosphate debris and glauconite,

- a talus accumulation of dead builder organisms,

- a build-up.

1.2 STRATIGRAPHIC STUDY

The Bad Cache Rapids Group and part of the Churchill River Group have a characteristic microfacies, but not the Silurian and the Devonian. The stratigraphy of the Silurian and of the Devonian is based upon palynoplanktology, Ostracods, Conodonts and macrofauna.

The palynoplanktological analyses are correlated with the stratigraphic scale of the Kaskattama Well (Report R/ST N° 21.691 of April 16, 1968).

For the Ostracods, the Ordovician reference is the Kaskattama Well. The Silurian and Devonian references are the bibliographical references from Sweden and North America.

There is no possible stratigraphical correlation with the Conodonts, however, they provide biozones of chronostratigraphical value.

2. INTERPRETATION OF LABORATORY RESULTS

The laboratory results are set out following the same plan as was used in the field report "General Geological Reconnaissance of Hudson Bay - Summer 1968 - Serge Rueff, Philippe Artru". Contradictions between the field stratigraphy and that given by the Laboratory are discussed at the end of the paragraphs.

The plate numbers referred to are those used in the Field Report, all the plates made by the Laboratory are designated as "maps".

The two following hypotheses were adopted, in order to simplify the laboratory work

- the field geologists' determinations were accepted in most cases with no further verification, as only a small number of the field samples was stratigraphically processed,

- the samples are typical of the Formations.

2.1 ORDOVICIAN.

2.1.1 BAD CACHE RAPIDS GROUP.

This Formation was identified and sampled in the Hudson Bay Lowlands and on Coats and Southampton Islands.

2.1.1.1 Hudson Bay Lowlands.

2.1.1.1.1 North Knife River (plate 11, section 1) and Churchill River at Portage Chute (plate 12) samples CN 13 and 14.

Calcareous sandstone and sandy limestone with Lamellibranchs and a few Crinoids.

2.1.1.1.2 Churchill River at Portage Chute (plate 12) samples CN 8, 9 and 10, Surprise Creek (plate 13) and Chasm Creek (plate 14).

All samples are biomicritic.

The laboratory results applied to this plate show the following paleogeographical features

- the sediments of the North Knife River and the sediments of samples CN 13 and 14 of the Churchill River were deposited in an environment with abundant terrigenous elements in the intercotidal area,
- on the Churchill River (samples CN 8, 9 and 10), in Surprise and Chasm Creeks, the sediments were deposited on an open shelf with little continental influence,
- the basin opens out in a south-west - north-easterly direction, with shoreline in the south-west and open shelf in the north-east.

No palynoplanktological or microfaunal study was carried out for the stratigraphy of the Bad Cache Rapids Group in this area.

2.1.1.2 Coats Island (plate 25, section 14).

Four samples from the Bad Cache Rapids Group were available for analysis. They consist of biomicrite with numerous fragments of Crinoids, Lamellibranchs, Brachiopods and a few fragments of Algae (Dasycladacae). The two basal samples are slightly sandy (5 to 10% quartz).

These sediments were deposited on a shelf with only slight amounts of terrigenous elements which occur only at the base of the section.

No stratigraphical information.

2.1.1.3 Southampton Island (plate 16, section 19, plate 19, section 20; plate 18, plate 19 section 18).

All the samples studied have approximately the same microfacies and were deposited on a shelf in an environment with a medium level of energy.

Stratigraphical information

- Ostracods
  the same association was found in samples CN 739 to 782 and CN 783 (sections 20 and 18), sample CN 782 only was dated as Ordovician, with Conulares,

- Palynoplanktology
  - section 18 - samples CN 782 to 787: presumably Middle to Upper Ordovician.
  - section 20 - samples CN 739 and CM 52: Middle to Upper Ordovician.

- Microfauna
  - section 19 CN 700 - Maclurites sp. and Endoceras?
    CN 701 - Receptaculites sp.
    CN 702 - Plasmopora aff. lambei
    "these fossils occur often in Member 2 of the Portage Chute Formation of the Bad Cache Rapids Group" (H. Pollard and J. Destombes).
  - geological sketch northwest of Coral Harbour (Southampton Island)
    Profile I CN 743 - Catenipora aff. rubra
    Profile II CN 746 - Receptaculites sp.
    Catenipora aff. rubra

"these fossils occur often in Member 2 of the Portage Chute Formation of the Bad Cache Rapids Group" (H. Hollard and J. Destombes).

- Section 20 CM 43 - Receptaculites
  Maclurites
  Nautiloide orthocone

"should correlate with Member 2 of the Portage Chute Formation" (H. Hollard and J. Destombes).

CONCLUSIONS ON THE BAD CACHE RAPIDS GROUP.

The micro- and macrofauna confirm the field observations.

All the samples belong to an internal shelf environment, with the exception of those from the south-western and western Hudson Bay Lowlands, which belong to an intercotidal environment nearer the shoreline (terrigenous elements and numerous fragments of Mollusca).

2.1.2 CHURCHILL RIVER GROUP

The Churchill River Group was sampled only in the Hudson Bay Lowlands and on Southampton Island.

2.1.2.1 Hudson Bay Lowlands (plate 13, section 2, plate 14, section 3, plate 15, section 4).

The samples show slight vertical variations of environment in this Group· they were deposited in a shelf environment close to the intercotidal zone (occurrence of Algae). The three upper samples of section 4 suggest a subsequent change to a more restricted environment.

Stratigraphical information

- Section 2 the phosphatic fragments (fish) of sample CN 28 are probably Ordovician.
  The macrofauna of sample CN 24 is not typical.

- Section 3 the Conularia of sample CN 33 suggest an Ordovician age.
  The macrofauna (genus Armenoceras) of CN 32 suggests an Upper Ordovician age.

2.1.2.2 Southampton Island (plates 18 and 20).

2.1.2.2.1 Geological Sketch ACC 81.1.1 to 81.1.8 and 82.1.0 (plate 18).

The Churchill River Group was sampled in 3 different locations.

- Profile IV: rusty yellow, finely bedded micrite: environment of very low to no energy, characteristic of the supracotidal to lagoonal zone.

  No stratigraphic analysis.

- Profile III· - lower samples pseudo breccia with fragments of builder organisms (reefal breccia deposited on a talus?),
  - upper samples locally bedded micrite with laths (pseudomorphosis of sulphate) deposited in a quiet supracotidal to lagoonal area.

  No stratigraphic analysis.

- Profile II. brecciated facies only with fragments of builder organisms, deposited on a talus.

  No stratigraphic analysis.

2.1.2.2.2 Geological Sketches ACC 85.1 to 85.3 (plate 20).

This sketch shows variations in facies occurring in a south-east - north-west direction.

- Small section on the south-east side of the sketch (CM 87 to 94).
  - Base of the section (CM 94, 91 and 92) micrite with rectilinear bedding (CM 94), locally recrystallised (CM 91), azoic. Facies of environment without energy.
  - Upper part of the section (CM 87 to 90, 93, 95 and 96) light coloured, locally bedded micrite to microsparite. Facies deposited in a supracotidal to lagoonal area with a very low energy or without energy.

- Northwest side of the sketch.
  - CM 83 to CM 85. Micrite with gypsum (CM 84) or pseudomorphosis of sulphate (CM 83). Evaporitic environment in a supracotidal to lagoonal area.
  - CM 78 to 82. Locally dolomitised or recrystallised microsparite with a few fragments of Echinoderms. Environment slightly open to marine influences.

No stratigraphic analysis.

Comment. The microfacies of samples CM 87 to 90, 95 and 96 do not belong to a build-up although the field observations leave no doubt as to the occurrence of the reefs - as shown on the sketch.

CONCLUSIONS ON THE CHURCHILL RIVER GROUP.

If the environments of the Bad Cache Rapids Group were approximately uniform in the northern and southern areas of the Hudson Bay, the Churchill River Group was deposited in two distinct environments.

- shelf in the Hudson Bay Lowlands,
- supracotidal to lagoonal area on Southampton Island.

2.2 SILURIAN

The Silurian was sampled in the Hudson Bay Lowlands, and on Mansel, Coats and Southampton Islands.

There is a stratigraphical problem for the Middle Silurian: the stratigraphy as described by the 1968 Aquitaine field party is different from that established by the Geological Survey of Canada (G.S.C.). The formational nomenclature of the Aquitaine field party is almost identical to that of the G.S.C. The Silurian divisions are the Severn River Formation, the Ekwan River Formation, the Attawapiskat Member and the Kenogami River Formation. In the G.S.C. stratigraphy, the Severn, Ekwan and Attawapiskat Formations are in superposition, whereas in the Aquitaine stratigraphy, the Severn River Formation, the Ekwan River Formation and the Attawapiskat Member are on the same chronostratigraphical level and correspond to lateral changes in facies.

This problem could not be solved by micro- and macrofauna analyses, although the following results favour the Aquitaine field party hypothesis

- macrofauna two samples of the Attawapiskat Member (CN 134 and 211) are chronostratigraphically equivalent to two levels of the Ekwan River Formation (CN 112 and 213),
- Ostracods the "3a" fauna, which has a chronostratigraphical value, occurs in sample CN 125 of the Attawapiskat Member and in samples CN 122, 148, 194, 196 and 244 of the Ekwan River Formation.

The micro- and macrofauna analyses could not solve the problem of the relationship between the Severn and the Ekwan-Attawapiskat.

2.2.1 EKWAN RIVER FORMATION - ATTAWAPISKAT MEMBER - AND SEVERN RIVER FORMATION.

2.2.1.1 Hudson Bay Lowlands (from the northwest to the southeast).

2.2.1.1.1 Shoreline between Cape Churchill and Nelson River (plate 30).

- Western area. From the bottom to the top of the section·
  - build-up facies of the Attawapiskat Member (CN 82, 83 and 84),
  - micritic limestone (CN 85 and 92). Few Lamellibranchs, Crinoids, Ostracods, Gastropods. Low energy environment on an internal shelf or in an internal basin,
  - very fine dolomicrosparite (CN 88 and 87). A few fragments of Gastropods and Ostracods. Environment with an evaporitic tendency.

- Eastern area. From the bottom to the top of the section
  - build-up facies (CN 90 and 91);
  - fine dolomicrosparite (CN 78 to 81 and 89). Very few Ostracods and Gastropods (CN 81). Laths (pseudomorphosis of sulphate) (CN 78, 79 and 80). Environment with an evaporitic tendency.

The dolomitic facies are porous.

The macrofauna from samples CN 82 to 86, 91 and 92 is Middle Silurian (Niagarian) in age.

2.2.1.1.2 Owl River (plate 31, Section 5).

From the bottom to the top of the section, the vertical variations of facies are as follows:

- Base of the section - CN 46 and 47. Dark micrite, rich in mud, with secondary silica. A few organisms mainly spicules of Sporifera, Ostracods, Trilobites, pelagic organisms. The angular elements are generally well sorted. Basinal environment (possible internal basin).

- CN 51 to 59. Dark micrite with benthic fauna; pellets (fragments of Algae?). This facies with pelletisation on an internal shelf might be the result of the destruction of Algae. The Ostracod genus Leperditiidae shows an environment which is closer to the shoreline than the environment of 1.2.1.

- CN 60 to 69. Dark micrite, mostly bedded, from two types of environment·
  - environment with marine influences. Spicules of Sporifera, few Conodonts (CN 64) and secondary silica;
  - environment with littoral influences. Algae, Oncolites, pellets, occurrence of burrowing organisms and large Ostracods (Leperditiidae).

  The environment in which these facies were deposited was probably at the limit between an internal shelf and an internal basin.

- CN 71 to 75. Sediments with numerous builder organisms (Alveolites, Solitaires ...). These sediments belong to a build-up - biostrom or bioherm - or were deposited very close to a build-up (talus? which is the case for sample CN 75).

The macrofauna from samples CN 72, 73 and 74 is Middle Silurian (Niagarian) in age.

2.2.1.1.3 Upper Severn River (plate 32).

- Southern part of the area.
  From the bottom to the top, the section is as follows
  - light microsparite. Fragments of builder organisms, few Lamellibranchs, Crinoids and Ostracods. Environment of a reefal talus (CN 101, 102 and 103),
  - light to dark grey calcareous micrite (CN 93 to 100). Numerous organisms. Lamellibranchs, Gastropods, Trilobites, Crinoids, Ostracods, Algae, few spicules of Sporifera ... Internal shelf environment. Only sample CN 98 (dolomitized micrite, apparently azoic) could have been deposited during a more regressive phase,
  - the macrofauna from samples CN 93 and CN 102 is Middle Silurian (Niagarian) in age.

- Central and northern parts of the area.
  Light micrite with pellets (CN 106 to 109), locally slightly dolomitized (CN 107) or bedded (CN 109). These samples are generally azoic except for sample CN 106 in which rare Lamellibranchs, Crinoids and Ostracods occur. Internal shelf environment with low energy.

2.2.1.1.4 Shoreline between Fort Severn and Winisk (plate 33).(CN 110 to 119).

Samples from isolated outcrops only.

Micrite or microsparite, azoic or with very few organisms (very large Ostracods), with calcispheres or with laths (pseudomorphosis of sulphate).

All these samples were deposited in a back-reef environment with a very low energy or no energy at all, close to evaporitic facies of a lagoonal type.

The macrofauna from samples CN 110/1, CN 112 to 115/1 and CN 115/2 is Middle Silurian (Clinton Group or Lower Niagarian) in age.

2.2.1.1.5 Area south of Winisk (plate 21).

- Mishamattawa River.
  - CN 129 and 130. Micrite with fragments of Lamellibranchs, Gastropods, Crinoids, Trilobites, Bryozoa, few spicules of Sporifera and rare fragments of Algae. Internal shelf environment.
  - CN 120 and 121. Micrite with bird eyes and rare fragments of Gastropods, Ostracods, Sclerite of Holothury and Characae (?). Intercotidal to supracotidal environment.
  - CN 125. Fine microsparite with intraclasts and numerous fragments of Lamellibranchs, Trilobites, Ostracods and Gastropods. Shelf microfacies, although there is field evidence that this sediment was sampled in a reef.
  - CN 122 and 123. Micrite with pellets and deformed intraclasts from destroyed Algae.

- Winisk River.
  - CN 132. Bioclastic micrite with Lamellibranchs, Crinoids, Trilobites, Bryozoa, Auloporidae (?) and a few Algae. Shelf microfacies, although there is field evidence that this sediment was sampled in a reef.
  - CN 135 to 148. From the bottom to the top, the section is as follows

- CN 135. Micrite with fragments of Lamellibranchs, Crinoids and Bryozoa. Shelf environment.
- CN 136 to 142. Bedded micrite, azoic, with laths (pseudomorphosis of sulphate). Environment with very low energy or no energy at all, close to an evaporitic area.
- CN 144 to 148. Oscillations between an area of algal build-up (CN 144 and 147) and a calm restricted area of bedded micrite with rare fragments of Ostracods (CN 145 and 146).

- Shamattawa River.
  - CN 155. Calm shelf environment.
  - CN 154. Bedded micrite, slightly dolomitized, with fine fragments of Ostracods. Calm environment.

The same association of Conodonts ("a" fauna) occurs in samples CN 122 to 125 and CN 129.

2.2.1.2 Southeastern area of James Bay.

2.2.1.2.1 Ekwan River (plate 29).

A vertical evolution of facies occurs between the western outcrop (CN 177 to 180) and the eastern outcrop (CN 181 to 184).

Micrite with occasionally rectilinear bedding and laths (pseudomorphosis of sulphate). Supracotidal or lagoonal environment without energy.

No stratigraphic analysis.

2.2.1.2.2 Attawapiskat River (plate 34).

- CN 185 to 190.

  All the samples were deposited in an internal shelf environment.

  Ostracods from sample CN 185 are Silurian, probably Llandovery, in age ("3b" fauna), the macrofauna from samples CN 186 and 190 is Middle Silurian in age.

- CN 191 to 197.
  - CN 192. Fragments of tabulates in micritic cement with pellets. Talus environment.
  - CN 191, 194 and 195. Environment of internal shelf or internal basin.
  - CN 197. Algal build-up from the intercotidal zone.

  Macrofauna from sample CN 192 is Middle Silurian (Lower Niagarian to Upper Clinton Group) in age.

- CN 200 to 210.
  - Base of the section (CN 201). Dark, fine micrite with spicules and Crinoids. Internal basin environment.
  - Central and upper parts of the section (CN 200 and 202 to 210). Internal shelf facies.

  The Ostracods and Conodonts of every sample are probably Llandovery ("4" fauna) in age. The macrofauna from sample CN 202 is Upper Niagarian (?) in age and the macrofauna from sample CN 209 is Middle Silurian in age.

2.2.1.2.3 Albany River (plate 35).

All the samples analysed (CN 238 to 240 and CN 244 to 246) were deposited in shelf environments.

The microfacies of sample CN 238 has no build-up characteristics although there is field evidence that this sediment was sampled in a reef.

The Ostracods from sample CN 236 are Middle Devonian in age. This sample of red plastic clay belongs therefore to a transgressive Devonian and not to the Ekwan River Formation as shown on plate 35.

2.2.1.2.4 Southwest corner of the Moose River Basin (plate 22).

- CN 264, 265 and 266. Open shelf facies with secondary silica.

- CN 261, 262 and 263. Internal shelf facies. The macrofauna from sample CN 263 is probably Silurian in age.

2.2.1.3 Northern Islands.

2.2.1.3.1 Mansel Island.

- Northwestern area of the Island (plate 24, section 12). From the bottom to the top, the succession of facies is as follows
  - CN 681 and 682. Dolomicrosparite with equidimensional crystals. Good porosity. Environment of an internal basin.
  - CN 683, 676 and 677. Calcarenite with fragments

of builder organisms and Crinoids, overlain by bedded micrite with a few organisms (Crinoids and fragments of Algae). Restricted environment (partial dolomitization of these facies) of the limit between the internal basin and the internal shelf.

- CN 678. Pelletoidal facies (from destruction of Algae) with sulphate pseudomorphosed by carbonate. Internal shelf environment.
- CN 679 and 680. Pelletoidal facies with fragments of builder organisms.
- CN 684. Calcarenite of an internal shelf.

The macrofauna from sample CN 685 is Middle Silurian (Upper part) in age.

- <u>Northeastern area of the Island (plate 36, section 13)</u>.
  - Base of the section. Pelletoidal micrite with fragments of builder organisms (CN 670 and 671) overlain by dark micrite and dark sparite with pellets (from destruction of Algae), with fragments of Crinoids, Lamellibranchs, Trilobites and rare Auloporidae.

Environment of the limit between an internal shelf and an internal basin.

- CN 666, 667 and 668. Dark pelletoidal microsparite with few intraclasts. Very few Crinoids, Bryozoa, Amphipora, fragments of Algae and Calcispheres. Restricted back-reef environment.
- CN 659. Azoic dolomicrite with traces of pseudomorphosed sulphates. Probably pseudo-evaporitic environment.
- CN 658 to 661. Dark micrite with a few Ostracods, Brachiopods and very few Crinoids. Restricted environment.

The macrofauna from sample CN 669 is Ordovician to Silurian in age.

- Southern central area of the Island (plate 37, section 11).
  The vertical evolution of the facies is as follows
  - CN 618, 619 and 620. Microsparite with well sorted algal pellets resulting from the destruction of Algae, laminated, associated with a few bird eyes structures. Environment of the limit between the internal shelf and the intercotidal zone.
  - CN 621 to 629. Facies as above plus calcarenite with fragments of builder organisms. Environment partly subject to bioclastic elements resulting from the destruction of reefs near by.
  - CN 632 to 640. New cycle. High energy environment to begin with, then energy decreasing progressively with time. The open sea environment is proved by the occurrence of phosphatic fragments and of pelagic organisms.

Fairly shallow sea; the energy level is weak to medium.

The macrofauna from samples CN 622 to 630 and CN 636 is Middle Silurian in age.

- Southern area of the Island (plate 38).
  - Area to the north-north-east (CN 641 to 649). Facies of the destruction of algal build-up micrite to microsparite with pellets and intraclasts. A few samples (CN 641, 645 and 649) belong to the algal build-up. Intercotidal environment (Algal "platier" i.e. flat deposit of Algae over a wide area).
  - Area to the south-south-west:
    - CN 650 and 651. Microsparite with a few pellets and intraclasts and with a few Crinoids and Lamellibranchs.

- \+ CN 652, 653 and 654. Same facies.
- \+ CN 686 to 689. Microsparite with a few pellets and with fragments of Crinoids, Gastropods and of some builder organisms.
- \+ CN 691, 692 and 693. Microsparite as above.

The evolution of the facies from the north-north-east to the south-south-west is as follows from an intercotidal environment (Algal "platier"), the environment becomes gradually and laterally an internal shelf environment with fewer and fewer elements from the "platier".

2.2.1.3.2 Coats Island.

\- Northern area of the Island.

- Plate 25, section 14.
  - \+ CN 931 to 934. Beginning of a build-up facies with Algae (Oncolites and Stromatolites).
  - \+ CN 930. Pseudocontemporaneous dolomite at the top of the section.

Every sample shows good porosity.

Intercotidal environment.

- Plate 39, section 17.
  - \+ CN 929 to 912. Algal build-up with Oncolites and Stromatolites and facies of the destruction of these build-ups. A few organisms Ostracods.
  - \+ CN 913 to 906. Calcarenite with or without

angular fragments, mostly poorly sorted. Various organisms Crinoids, Bryozoa, Lamellibranchs, Brachiopods, Gastropods, Ostracods. Occurrence of black micritic pebbles. The level of energy is higher than in Plate 25. The following facies are interfingered:
= facies of the destruction of an Algal build-up,
= facies with bioclastic elements from a calcareous build-up near by,
= facies of a restricted basin (CN 905 and 906).

The microfauna from samples CN 905, 912, 913, 917 and 923 to 927 is probably Silurian in age. The macrofauna from sample CN 911 is probably Middle Silurian in age.

- Eastern central area of the Island.
  - Plate 26, section 15.

    From the bottom to the top, the succession of facies is as follows

    + CN 941 to 943 and CM 3 and 4. "Severn River Formation " for the field party. Bedded dolomite with traces of sulphate. Facies close to an evaporitic environment.
    + CN 949 to 945. Facies of the destruction of algal build-up with local intercalations of levels of higher energy shown by the occurrence of calcarenite.
    + CN 946 and 947. Decreasing level of energy. Back-reef or lagoonal environment.

- Plate 27, section 16.
  Facies of the destruction of algal build-up and facies of back-reef to lagoonal environment.

- Southern area of the Island (plate 40).
  - CM 27, 28 and 39 to 42.
    Dolomicrosparite and dolosparite with a few fragments of Crinoids and builder organisms? (CM 27 to 29), overlain by fine dolomicrosparite with rectilinear bedding of a very low energy environment or of an environment without any energy (CM 40 to 42).
  - CM 29 to 38 and 99.
    - \+ CM 29 to 35. Bedded dolomicrite (CM 29) being the sole of a section more or less built up (CM 30 to 35).
    - \+ CM 36 to 38 and 99. Partly bedded dolomicrite with rare fragments of Lamellibranchs (CM 38). Very calm environment. Back-reef facies?

No stratigraphic analysis.

2.2.1.3.3 Southampton Island.

- South-west of Coral Harbour (plate 41, section 21).
  Light coloured micrite with frequent rectilinear bedding overlain by bedded dolomicrosparite with sulphate pseudomorphosed by carbonate. Back-reef or lagoonal environment with a very low energy or without any energy.

No stratigraphic analysis.

- Area south-east of Salmon Pond (plate 18).

  On profile II, the outcrop on which CN 754 to 763 were sampled was dated as Ekwan River Formation (Silurian) by the field party. However, these samples are of a shelf facies type very similar to the facies of the Bad Cache Rapids Group (Ordovician).

  The macrofauna from sample CN 762 is frequent in Member 2 of the Portage Chute Formation of the Bad Cache Rapids Group. The macrofauna from sample CN 763 occurs in the Caution Creek Formation of the Churchill River Group.

- Area of Renny, Ruin and Bear Cove Points (plate 42).

  From the south-west to the north-east, the evolution of the facies is as follows:
  - CN 734 and 735. Light coloured, fine micrite and microsparite. Fragments of Lamellibranchs, Crinoids, a few Bryozoa, Ostracods. Occurrence of pellets and intraclasts. Probable internal shelf environment with medium to low level of energy.
  - CM 130, 131 and 132. Light coloured, fine, dolomitized, bedded microsparite. Fewer organisms than above. The level of energy is lower, the environment is more protected.
  - CN 728, 729 and 730. Brownish, partly dolomitized microsparite. Pellets and a few intraclasts. A few Lamellibranchs, Crinoids and Ostracods. Slightly more turbulant environment of a restricted shelf.
  - CN 718 to 727. From the bottom to the top of the section, the succession of facies is as follows:
    - \+ CN 718 to 721 Light coloured micrite with a few pellets. Very low level of energy.
    - \+ CN 722 to 727. Light coloured microsparite and sparite with fragments of builder or-

ganisms and a few fragments of Lamellibranchs, Crinoids, Bryozoa and Ostracods. High level of energy; the environment may become favorable to the development of builder organisms.

- CN 713 to 716. Grey micrite with pellets and fragments of Lamellibranchs, Crinoids, Trilobites, Bryozoa, spicules, traces of burrowing organisms. Low level of energy, shelf environment.
- CN 710, 711 and 712. Light coloured recrystallized microsparite.

The macrofauna from sample CN 715 is Upper Ordovician to Middle Silurian in age, the macrofauna from sample CN 722 is probably Middle Silurian in age.

- The Points area (plate 43, section 22).
  - CM 133 to 142.
    - Lower part of the section (CM 133 to 138, 141 and 142). Dolomite with pellets and Ostracods. Back-reef to lagoonal, restricted environment with a low level of energy.
    - Upper part of the section (CM 139 and 140). Calcarenite with fragments of builder organisms. Open sea environment with high level of energy.

- Hut Point, Cape Low and Ranger Brook (plate 44, section 23).
  From the bottom to the top, the vertical evolution of facies is as follows:
  - CN 695 to 699. Sparite and microsparite with various builder organisms which are probably reworked. It

seems to be more a bio-accumulation in a high energy environment of a talus area than a reefal build-up.

- CM 54 to 58. Dark coloured, bedded microsparite and micrite with pellets and gravel (from the destruction of Algae). Ostracods, Gastropods and Irregularina. The environment is better protected than the section above and is behind it. Restricted shelf as shown by the following section.
    - \+ CM 60 and 61. Algal build-up of intercotidal environment.
    - \+ CM 59 to 75. Bedded microsparite with pellets. Gullying facies at the top. High intercotidal environment.
    - \+ CM 76 and 77. Light coloured, finely bedded, azoic micrite and dolomicrite. Calm environment with lagoonal tendency.

No stratigraphic analysis.

\- Area east-north-east of Cape Low (plate 45).
Light coloured, finely dolomitized microsparite. Very rare Ostracods and a few Lamellibranchs. Calm environment with lagoonal tendency.

\- Mouth of Boas River (plate 46).

- Western area (CM 149, 150 and 151).
  Light coloured dolomitized microsparite with fragments of builder organisms, a few Lamellibranchs and Ostracods. Fairly high level of energy. Facies of the destruction of a reefal build-up.
- Eastern area (CM 145 to 148).
  Dark coloured micrite with fragments of Lamelli-

branchs, Crinoids and of a few builder organisms. Level of energy lower than that of western area.

- Area south-west of Cape Kendall (plate 47).

  From west-north-west to east-south-east, the variations in facies are as follows.

  - CM 170 and 169. Light coloured, bedded, apparently azoic micrite. Environment with lagoonal tendency, with very low level of energy or without any energy.
  - CM 168 and 167. Light coloured, finely bedded, algal(?) micrite (CM 167) overlain by micrite with Crinoids and fragments of Algae. The level of energy is higher than that of CM 170 and 169 and the environment is more open.
  - CM 165 and 166. Sparite with Crinoids, a few Bryozoa and Lamellibranchs. High energy environment.

- Area north of Cape Kendall (plate 48, section 25).

  From the bottom to the top of the section, the level of energy increases and the vertical variation of facies is as follows.

  - CM 172 to 179. Partly bedded dolomite. A few organisms. Percentage of pellets increasing towards the top. Restricted internal shelf environment.
  - CM 180 to 182. Algal build-up.
  - Zone of destruction of these build-ups. Intercotidal environment.

- Shoreline south-east of Ne Ultra Strait (plate 49).

  From the bottom to the top of the section, the vertical variation of facies is as follows.

  - CM 192 to 195. Brown micrite with a few fragments of Lamellibranchs, Gastropods, Crinoids and Ostracods. Calm restricted shelf environment.

- CM 196. Light coloured micrite with a few pellets and a few fragments of Lamellibranchs and Crinoids. Level of energy slightly higher than that of CM 192 to 195.
- CM 197 to 199 and CM 184 to 189. Microsparite with pellets and intraclasts (from the destruction of algal build-up) and algal build-up (CM 198 and 187). Fairly high level of energy of an intercotidal area.

- North-west end of Bay of God's Mercy (plate 50, section 24). From the bottom to the top of the section, the vertical variation of facies is as follows.
  - CM 152. Porous dolosparite.
  - CM 153 to 155. Calcarenite with Crinoids and fragments of builder organisms. High energy environment.
  - CM 161 and 157 to 159. Partly bedded, pelletoidal micrite and microsparite. A few fragments of Crinoids, Ostracods and Calcispheres. Level of energy lower than that of CM 153 to 155 and environment with back-reef tendency.

CONCLUSIONS ON THE SILURIAN (EKWAN - ATTAWAPISKAT - SEVERN)

During the Middle Silurian, the general evolution of the facies seems to be as follows.

- Southern part of the Hudson Bay: restricted shelf and lagoonal facies prevail in the Hudson Bay Lowlands. Facies of a more marine type develop towards James Bay.

- Northern part of the Hudson Bay. restricted and lagoonal facies prevail in the northern areas of the Islands. The opening towards the basin seems to occur in the southern and south-western areas of the Islands.

Most of the outcrops indicated as reefs by the field party have microfacies corresponding to algal build-up from an intercotidal environment or from the limit with the internal shelf. As the opening towards the basin seems to occur towards the southern and south-western areas of Southampton, Coats and Mansel Islands, it is in this direction that more significant build-ups should be looked for, if they do in fact exist.

2.2.2 KENOGAMI RIVER FORMATION.

Hudson Bay Lowlands. Sections 6 and 7 along the Albany River.

- Base of the Formation. pale yellow, azoic dolomicrite (CN 247).
- Central part of the Formation· partly rubified siltstone. Environment of very low energy.
- Upper part of the Formation light coloured, bedded, apparently azoic dolomicrite.

CONCLUSIONS ON THE KENOGAMI RIVER FORMATION.

Ostracods and Characae from samples CN 241, 242, 255 and 256 (section 7) would give a Middle Devonian age ("11" fauna) to some levels of the Kenogami River Formation Middle Member.

All these samples were deposited in coastal to evaporitic environments with abundant terrigenous elements.

2.3 DEVONIAN.

The Devonian was only sampled around the James Bay Lowlands.

The main characteristics of each formation and the results of the stratigraphic analyses are reported below.

2.3.1 SEXTANT FORMATION (section 8).

Very clastic sediments irregularly cemented sandstone and argillaceous limestone. Environment with mainly continental material.

The palynological analyses give the following results:

- CN 303: Silurian to Devonian,
- CN 299· Famennian to Carboniferous.

2.3.2 STOOPING RIVER FORMATION

2.3.2.1 Albany River (plate 52, section 6).

From the bottom to the top, the different facies of this section are as follows.

- CN 225 to 231. Bedded, partly dolomitized, slightly silty, microsparite. Very low energy environment.
- CN 218 and 219. Light coloured, porous, calcarenite. High energy environment with marine influences.
- CN 232, 233 and 234. Partly bedded micrite with fragments of Crinoids, Brachiopods and Trilobites. Environment open to marine influences with an energy level lower

than that of CN 218 and 219.

The association of Conodonts from samples CN 220 and 234 is Devonian in age. The association of Ostracods from sample CN 218 is probably Middle Devonian in age.

2.3.2.2 Long Rapids (plate 54).

Alternating micrite and microsparite in brightly coloured clay.

Results of the palynoplanktological analyses:

- CN 321	Givetian
- CN 322	Famennian to Carboniferous
- CN 323	Devonian to younger
- CN 324	Devonian
- CN 327	Upper Devonian
- CN 329:	Devonian to younger

The Conodonts from samples CN 319 and 323 to 326 are Basal Famennian in age.

2.3.3 KWATABOAHEGAN FORMATION.

2.3.3.1 Long Rapids (plate 54).

Yellow micrite with continental organisms (Spores) and marine organisms (Lamellibranchs, Crinoids, Trilobites, Gastropods, Ostracods and very few Pteropods).

The Ostracods from sample CN 333 are Middle Devonian in age. The microfauna from sample CN 320 is as follows:

- Atrypa reticularis - Silurian to Devonian,
- Pleuronotus decensi - Lower to Middle Devonian.

2.3.3.2 Grand Rapids, Mattagami River (plate 55).

The samples CN 286 to 288 are Frasnian to Famennian in age (palynoplanktology).

2.3.3.3 Moose River (plate 57).

Light grey, mostly bedded micrite with pellets and a few Crinoids, Lamellibranchs, Ostracods and Spores. Low level of energy.

The macrofauna from sample CN 349 is Lower to Middle Devonian in age (same macrofauna as for sample CN 320).

2.3.3.4 Moosonee Area (plate 58, section 9).

Basinal dark micrite with torn builder organisms. Slight continental influence. Very low level of energy.

The macrofauna from sample CN 402 is Silurian to Devonian in age.

2.3.3.5 Cheepash River (plate 59, section 10).

Light coloured, mostly bedded microsparite and micrite with a possible algal origin (?)

CONCLUSIONS ON THE DEVONIAN.

There is a large amount of clastic elements in the Sextant Formation. These decrease in the Stooping River Formation which was deposited in a more marine environment. The environment of the Kwataboahegan Formation is alternately continental and marine. The samples analyzed are Middle to Upper Devonian in age.

2.4 STUDY OF THE HEAVY MINERALS.

This study was generally disappointing samples mostly calcareous, poor recovery of heavy minerals, mostly non specific associations*. However, the 130 analyses carried out gave the results shown on Map 3.

Evolved associations occur frequently in the Proterozoic. The ubiquist minerals (tourmaline and zircon) are prevalent, associated with magnetite. The heavy minerals of the Proterozoic come from either more or less weathered rock or from hydrothermal manifestations (fluorine, ankerite).

The Ordovician is the most disappointing. lack of residue in the Northern Islands (area sheltered from clastic elements except those from sandy sedimentary rocks). The Ordovician is often poorer in heavy minerals than the Proterozoic. In the west, the Ordovician indicates the subsequent enrichment.

The southern James Bay area is geographically characterized by a large supply of garnets during the Silurian and the Devonian. The Kenogami River Formation differs greatly from all the other formations by the richness of its heavy mineral associations.

The associations of heavy minerals in the Cretaceous and Pleistocene are highly diversified and are not characteristic, this could be due to a direct supply from the associations of the underlying formations that they may rework.

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* For detailed analyses, see Note STR N° 117/69 of 2/20/69. "Study of heavy minerals of samples from the Hudson Bay (Canada)".

3. GENERAL CONCLUSIONS.

The results of the studies of the Ordovician and Silurian facies are shown on maps. Only the main features of the environment and of the paleogeography of the analyzed locations are related below.

3.1 ORDOVICIAN - Map 1.

3.1.1 ENVIRONMENT.

3.1.1.1 Bad Cache Rapids Group.

On Coats and Southampton Islands, the environment is of an open shelf type with marine influences.

Clastic coastal facies occur in the western Hudson Bay Lowlands and disappear towards the east where they are replaced by open shelf facies with marine influences. Deeper facies occur in the southern James Bay area (PP1 and MF1).

3.1.1.2 Churchill River Group.

Supracotidal to lagoonal facies occur on Southampton Island.

The facies of the Churchill River Group are very similar to those of the Bad Cache Rapids Group in the Hudson Bay Lowlands.

3.1.2 STRATIGRAPHY.

The Ordovician was easily distinguished by the various microfauna techniques and by macrofauna. The field samples were easily correlated with the Kaskattama Well, particularly by palynoplanktology (palynoplanktological intervals I to II). The characteristics of the Bad Cache Rapids Group stand out more clearly than those of the Churchill River Group. It is difficult to state precisely the relationship between these two Groups with the limited results available.

Chronostratigraphy. The Lower Ordovician does not seem to occur in the Hudson Bay area, but the Middle to Upper Ordovician seems to be present. The most difficult problem is the upper limit of the Ordovician. Some techniques, such as palynoplanktology, tend to raise this upper limit as the associations of micro-organisms continue without change (the Silurian usually stands out clearly because of its palynological characteristics). The Macrofauna and the Ostracods/Conodonts already show a tendency towards the Silurian (Llandovery). Only a detailed knowledge of the distribution of the strictly Canadian fauna could solve this question, which was not settled in this report.

3.2 SILURIAN Ekwan-Attawapiskat and Severn - Map 2.

3.2.1 ENVIRONMENT.

3.2.1.1 Northern Islands.

A north-south evolution occurs on Southampton, Coats and Mansel Islands. The lagoonal types of facies of the northern parts of the Islands are replaced towards the south by restricted shelf or back-reef facies which are themselves replaced at the southern tips of Southampton and Coats Islands by build-ups. This evolution of facies suggests that significant build-ups occur south of these islands.

3.2.1.2 Hudson Bay Lowlands.

Most of the facies are of the restricted shelf or back-reef type. Build-ups (observed by microfacies techniques) are localised in the Kaskattama Well and along the Attawapiskat River. Build-ups should be looked for - should they exist - north of the actual shoreline of the Hudson Bay Lowlands and along the western shoreline of James Bay.

3.2.2 STRATIGRAPHY.

The Silurian is the sequence for which the most analyses were carried out using the three techniques - palynoplanktology, isolated microfauna and macrofauna; the results of these analyses are heterogeneous.

- The Silurian does not stand out clearly by its palynological characteristics: all the determinations are very broad, "Ordovician to Silurian".

- Datations show important differences and these variations always show the same trend. According to the various techniques, the ages are as follows
  - palynology Upper Ordovician,
  - Ostracods, Conodonts and teeth of fish. Lower to Middle (Lower Middle) Silurian;
  - macrofauna Middle (Lower to Upper Middle) Silurian.

These differences, which are difficult to explain, could be due to reworked Ordovician fauna or to different, localised, geographical distribution. They differ particularly in the Ekwan River Formation and Severn River Formation of the Harricanaw River (ACC 64.01 to 64.10).

Middle Devonian fauna occur locally in the Kenogami River Formation. The microfauna isolated from samples CN 241, 242, 255 and 256 is Middle Devonian in age. The Kenogami River Formation of the Kaskattama Well was also dated as Middle Devonian by palynology. Consequently, either this Formation is pro parte Devonian in age or, the definition of the Kenogami River Formation by the field party was not accurate enough. In the latter case, the samples would come from Silurian and/or Devonian Formations.

- The few biostratigraphical results available and their frequent inaccuracy do not give a solution to the problem of the relationship between the Silurian Formations. The field hypothesis is, therefore, still justifiable.

3.3 DEVONIAN.

3.3.1 ENVIRONMENT.

The continental influences which are already strong in the Kenogami River Formation control the sedimentation of the Sextant Formation which shows littoral tendencies. Throughout the Devonian the marine influences are frequent, mainly in the Stooping River Formation, they alternate with clastic sedimentation (reddish clay) or with coastal sedimentation (Algae?). Clastic elements occur in variable amounts in the entire Devonian section.

3.3.2 STRATIGRAPHY.

The Devonian was clearly distinguished by the different techniques. The Kwataboahegan, Stooping River and Sextant Formations were analysed and dated. The results are heterogeneous each Formation has many different datations, from the Middle Devonian (probably Givetian) up to the Famennian.

At present, there is only one possible conclusion to these analyses only the upper part of the Devonian section was sampled on the field (Middle Devonian (Upper Middle) to Late Devonian). This conclusion is supported by the analyses of the James Bay wells where the basal Devonian section is more complete (Eifelian - Emsian?).

The nature and limited number of the results available do not provide a solution to the problem of the relationship between the Devonian Formations. However, as the Sextant Formation was dated as Famennian (Late Devonian), it seems that this Formation is the lateral equivalent of the entire Devonian section on the edge of the basin, and not merely the lateral equivalent of the basal section as assumed by the field party.

3.4 CRETACEOUS AND PLEISTOCENE.

Traces of Upper Ordovician and of Devonian pollen were found in the samples of red, green and grey clay. These sediments are therefore either decomposed older clay or Drift deposits. In the latter hypothesis, the Drift eroded the underlying Ordovician and Devonian Formations.

STUDY OF THE FIELD SAMPLES FROM THE GENERAL GEOLOGICAL RECONNAISSANCE OF HUDSON BAY (Summer 1968 - Serge RUEFF - Philippe ARTRU) - COMPARISONS WITH KASKATTAMA N° 1 WELL.

ANNEX I

PALYNOPLANKTOLOGY

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SUMMARY

1. INTRODUCTION.

Approximately one hundred samples were analysed by palynoplanktological techniques. The analyses were carried out exactly as requested by the field geologists and according to the numerical order of the samples. The sections and geological sketches of the Field Report were used only to interpret the results of the analyses.

Although the aim of this work was mainly stratigraphical (age determination of the designated samples), the thin sections were studied at the same time in order to evaluate:

- the quality of the organic matter;
- the maturation of the organic material.

2. RESULTS OF THE ANALYSES.

The attached tables (nos. 5, 6 and 7) give the interpreted and synthetic results for each sample. These tables feature

- the different references used to locate the sample;
- the occurrence of the different groups of micro-organisms;
- the stratigraphy proposed by the field geologists, compared with the palynoplanktological datation,
- the unit and the "organic area" to which the sample belongs,
- the average value of carbonization (arithmetical average of ten measurements of the sample and its possible class of maturation.

The palynoplanktological datations shown in the stratigraphical column were obtained as follows.

- Ordovician and Silurian. The results of the analyses were compared with the local scale of Chitinozoa, Acritarchs and Scolecodonts from the Kaskattama Well. This microfauna occurred in numerous samples. Each group of micro-organism was analysed separately for each sample, the results shown on the tables are synthetic.

- Devonian. As there is no scale of reference, the results of the analyses were compared with the General System of palynoplanktological units ("Sr" units for the Spores - "Hy" units for the Acritarchs). This may explain the relative inaccuracy of some of the stratigraphical attributions.

3. COMMENTS ON THE RESULTS

The main results relative to the stratigraphy and the organic matter are as follows.

3.1 STRATIGRAPHY

3.1.1 SECTIONS.

3.1.1.1 Section 7. Albany River (CN 241 to 260).

Heterogeneous results for this sequence. The stratigraphical analyses are based on Acritarchs which are the only occurring micro-organisms. Proposed palynoplanktological age. "Ordovician to Silurian". No contradiction with the Silurian age proposed by the field geologists.

3.1.1.2 Section 8. Abitibi River - Sextant Rapids (CN 289 to 300).

Spores from sample CN 299 are "Famennian to Lower Carboniferous" in age. This "probable Devonian" sequence is more likely "Upper Devonian" in age.

3.1.1.3 Section 18. North-west of Coral Harbour (CN 782 to 787).

This Ordivician section correlates perfectly with the palynoplanktological interval I of the base of the Kaskattama Well. Acritarchs, Chitinozoa and Scolecondonts all give the same datation.

3.1.1.4 Section 17. Coats Island (CN 921).

Acritarchs, Chitinozoa and Scolecodonts only occur in sample CN 921. They correlate with the palynoplanktological interval II of the Kaskattama Well and are Upper Ordovician in age. This does not agree with the attribution of this sample to the Silurian Ekwan River Formation by the field geologists.

3.1.2 SKETCHES.

3.1.2.1 Winisk River Area. Area south of Winisk (CN 149).

The Acritarchs from this sample are Ordovician in age. (Interval I of the Kaskattama Well). The attribution of this sample to the Pleistocene by the field geologists implies the occurrence of Ordovician elements. The ferruginous clay of this sample could equally well be decayed Ordovician clay. However, the occurrence of a Silurian microfauna in sample CN 148, which is below sample CN 149 in the section, seems to prove the field geologists' hypothesis.

3.1.2.2 Attawapiskat River. Ekwan River Formation and Attawapiskat Member (CN 204 and 205).

The palynoplanktological elements from sample CN 205 are Ordovician in age (Interval I of the Kaskattama Well). The Acritarchs from sample CN 204 are either Ordovician in age (Intervals Ib - IV), or younger - limit between IIIb and IV
- or Ordovician-Silurian limit.

The green plastic clay of this sample may be proof of an alternation.

3.1.2.3 Mattagami River. Stooping River and Kwataboahegan Formations (CN 286 to 288).

Spores and Acritarchs confirm the assumed Devonian age of these samples. More accurately they should be Upper Devonian (probable Famennian) in age.

3.1.2.4 Abitibi River. Stooping River and Kwataboahegan Formations (CN 321 to 328).

Confirmed Devonian, most frequently "Middle to Lower", sometimes "Upper" only, possible "Givetian" for sample CN 321. This latter attribution may be too accurate considering the Research Centre's knowledge of the local distribution, which may be different from the general world distribution. However, the horizontal and vertical positions of the samples in the sketch allow the joint occurrence of Middle Devonian and of Upper Devonian, and the position of CN 322 does not present any problem since it is a loose sample.

3.1.2.5 Moose River. (CN 340 to 348).

The accurate Devonian age of sample CN 340 is "Famennian". The Acritarch Leiovalia similis (Hy 215) from sample CN 348 is Upper Ordovician in age (interval Ib). No Cretaceous or Pleistocene element in this sample.

3.1.2.6 Harricanaw River. Middle Silurian complex (CN 455 to 488).

The Acritarchs, Chitinozoa and Scolecodonts from most of the samples are Upper Ordovician in age (intervals II and/or III of the Kaskattama Well). Samples CN 482 and 483 are Upper

Devonian (probable Famennian) in age. All the samples were Silurian - Ekwan River Formation in age according to the field geologists. There is a large discrepancy between the two datations. However:

- the palynoplanktological interval I was found in the green clay and bioclastic limestone of samples CN 462 and 463 in which older elements could occur;

- CN 479 to 488 were sampled in cross-bedded bituminous sandstone. Pollens occur only in samples CN 482 and 483 and are Upper Devonian in age. Therefore, the field geologists' attribution is wrong but there is a disconformity between this sequence of sand and clay and the underlying sandy limestone;

- samples CN 475 and 478 are probable Upper Ordovician in age (probable Interval III). However, as these samples were correlated with the Kaskattama Well only and as it is possible that the vertical variations of the palynoplanktological elements are local, these samples may still be Silurian in age (Intervals IV and V).

3.1.2.7 Southampton Island. North-west of Coral Harbour (CN 790 to 800).

CN 800 is Middle to Upper Ordovician in age.

3.2 ORGANIC ENVIRONMENT

Among the qualities of organic matter which are characterised by palynology, the colloid organic matter (C.O.M.) seems the most interesting from the oil bearing point of view. The corresponding "organic units" are IIB, IIB - IIIA, IIIA and IIIB. The ligneous organic matter (L.O.M.) and the organic matter from tracheids and wood vessels (T.O.M.) are either absent or are in the minority.

As shown on the table of analytical results, the interesting sequences are as follows.

3.2.1 SECTIONS.

-	Section No. 13	Mansel Island (Ekwan River Formation)
-	Section No. 18	Southampton Island (Bad Cache Rapids Group)
-	Section No. 15	Coats Island (Severn River Formation)
-	Section No. 21	Southampton Island (Ekwan River Formation)
-	Section No. 22	Southampton Island (Ekwan River Formation).

3.2.2 SKETCHES.

-	ACC 25.02	Albany River	Ekwan River Formation
-	ACC 43	Mattagami River	Kwataboahegan Formation and Coral Rapids Member
-	ACC 51.1 to 51.3	Abitibi River	Kwataboahegan and Stooping River Formations
-	ACC 81.1 to 81.8.1	Southampton Island	Churchill River Group.

All the samples selected for their content in organic matter were taken from the Northern Islands and the south-western area of James Bay.

3.3 DEGREE OF CARBONIZATION.

The evaluation of the degree of carbonization of the samples was obtained by measuring the light absorbtion on smooth Spores (or on Tasmanacae when no Spore was available). It was often impossible to take these measurements because of the lack of Spores and Tasmanacae in the samples. However, they were numerous enough to locate, by extrapolation, series of samples in the different levels of the scale of coalification "immature", "mature" and "senile".

Nearly all the samples show an "immature" tendency but with a lesser degree than in the Kaskattama Well. Surface alterations may be responsible for the high values recorded and the carbonization may only be apparent. If the analytical results reflect the true maturation of the sediment, the relatively more "mature" series are the following.

3.3.1 SECTIONS.

- Section No. 8 Abitibi River (Sextant Rapids), questionable because only one sample analysed, with a very low value(?)
- Section No. 18 Southampton Island (Bad Cache Rapids Group)
- Section No. 17 Coats Island (Ekwan River Formation)
- Section No. 20 Southampton Island (Bad Cache Rapids Group).

3.3.2 SKETCHES.

- ACC 43 Mattagami River (Kwataboahegan Formation and Coral Rapids Member)
- ACC 51.1, 51.2 and 51.3 Abitibi River (Kwataboahegan and Stooping River Formations)

- ACC 81.1.1 to 81.1.8	Southampton Island (Churchill River Group).

From the point of view of the maturation as well as from that of the content in organic matter, the Northern Islands and the south-western area of James Bay are more favorable areas.

3.4 ECOLOGY AND PALAEOGEOGRAPHY.

The samples are not numerous enough and the field sections and sketches are not continuous enough to use the ecological information obtained from the palynoplanktology. The ecological meanings of the main groups of organic microfossils are as follows.

- Chitinozoa:	the most marine, open sea, basinal fore-reef and off-reef;
- Tasmanacae:	marine prairies, shallow water, more or less connected with open sea (?), lagoon (?). Inter-reef;
- Scolecodonts	numerous, nearest to the reef itself, reefal tendency most marked;
- Spores:	terrigenous, back-reef;
- Acritarchs:	at the limit, for certain types at least, between off-reef and back-reef.

Using this information, the following suggestions can be made.

3.4.1 - A relatively more reefal tendency for the following samples.

- CN 5:	Section No. 1 - North Knife River - Bad Cache Rapids Group,

- CN 739 and CM 52:	Section No. 20 - Coats Island - Bad Cache Rapids Group;
- CN 782 to 787.	Section No. 18 - Southampton Island - Bad Cache Rapids Group;
- CN 921	Section No. 17 - Coats Island - Ekwan River Formation;
- CN 466, 467 and 477:	Harricanaw River - Severn River Formation;
- CN 287.	Mattagami River - Kwataboahegan Formation and Coral Rapids Member.

Most of these samples belong to the Bad Cache Rapids Group*.

3.4.2 - A back-reef to inter-reef tendency for the following samples in which terrigenous elements are still present.

- CN 286 to 288.	Mattagami River - Kwataboahegan Formation and Coral Rapids Member;
- CN 295 and 296:	loose samples,
- CN 299 to 303.	Abitibi River - Sextant Formation;
- CN 321 to 335 and CN 339 and 340	Abitibi River - Kwataboahegan and Stooping River Formations;
- CN 482	Harricanaw River - Severn River Formation (?);
- CN 492:	loose sample.

Most of these samples belong to the Devonian Kwataboahegan, Sextant and Stooping River Formations.

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* This palynoplanktological observation conflicts with the conclusions of the Field Report in which the Bad Cache Rapids Group is the less reefal sequence of the Palaeozoic of the Hudson Bay.

3.4.3 - The other fossiliferous samples contain only Acritarchs and particularly Tasmanacae. Their positioning among the different reefal formations is less obvious but they may belong to all the different environments between the back-reef and the off-reef, with the exception of the reef itself.

4. CONCLUSIONS ON THE PALYNOPLANKTOLOGICAL STUDY.

The study by palynoplanktological methods of approximately one hundred samples collected around the Hudson Bay gives the following results and leads us to make the following conclusions.

4.1 STRATIGRAPHY.

4.1.1 ORDOVICIAN.

- relatively easy correlations with the Kaskattama Well (the same palynoplanktological zonation of this well was used - Intervals I to III);

- the occurrence of Middle to Upper Ordovician on Southampton and Coats Islands was revealed.

4.1.2 SILURIAN.

This sequence could not be distinguished by palynological methods. However, the determinations such as "Ordovician to Silurian" leave open the possibility of the occurrence of Silurian. Only certain samples attributed to the Severn River Formation should be examined very closely (CN 455 to 488). Older elements may have been reworked.

4.1.3 DEVONIAN.

Most of the samples analysed belong to the Upper Devonian, and particularly to the Famennian. A few samples belong to the Middle Devonian (Givetian?).

4.2 OIL BEARING POTENTIAL.

The combination of the results obtained separately from the study of the organic environment (PA/CH), of the degree of carbonization and of the ecology and palaeogeography shows that the sequences with the most interesting oil bearing potential are

- the Ordovician (Bad Cache Rapids Group) of the Northern Islands,

- the Devonian (Kwataboahegan Formation, Coral Rapids Member and Stooping River Formation) of the south-western area of James Bay.

COMMENT.

It must be pointed out, however, that in view of the importance of the problem for the stratigraphical attributions as well as for the suggested oil bearing possibilities:

- the number of samples analysed was small,
- the geographical distribution of these samples is very irregular.

Also, the results obtained should not be considered as definite, too restrictive or too categorical. A further study could very likely confirm or, on the other hand, invalidate, the tendencies indicated in this report.

STUDY OF THE FIELD SAMPLES FROM THE GENERAL GEOLOGICAL RECONNAISSANCE OF HUDSON BAY (Summer 1968 - Serge RUEFF - Philippe ARTRU) - COMPARISONS WITH KASKATTAMA N° 1 WELL.

ANNEX II

ISOLATED MICROFAUNA

By J. Le Fèvre.

SUMMARY

1. INTRODUCTION.

Approximately 130 samples of the CN series were analysed. As for the Kaskattama Well, the treatment of the samples consisted of systematic extraction on rough samples (giant Ostracods Leperditiidae, Beyrichiidae and other forms which cannot be isolated from the carbonate rocks by standard procedures), acid attack (Conodonts, fish scales and teeth, Ostracods ...), washings with hydrogen peroxide, petroleum or with "Quarternary O" (Ostracods, Tentaculites, Conodonts, Characae, Spicules etc.).

The samples were pre-selected whenever possible by the examination of their thin sections. This efficient method was used to select those samples which would give the best results with the "isolated microfauna" technique.

2. STRATIGRAPHICAL RESULTS (see plates 8 to 11).

2.1 Generally speaking, the results of the study of the microfauna confirm the broad stratigraphical units proposed in the Field Report.

In the Ordovician, few samples were analysed but the results obtained tend to confirm the proposed age.

In the Silurian, an interesting fauna of Ostracods, Conodonts and fish elements occurs in the samples attributed to the Ekwan River - Attawapiskat - Severn River Formations these associations confirm broadly the proposed age (except sample CN 236). Some samples from the Kenogami River Formation Middle Member are not Silurian in age as suggested, but are Middle Devonian in age by their Ostracods, Characae and associated elements. This seems to confirm the palaeontological datation of the Kenogami River Formation of the Kaskattama Well as "Middle to Upper Devonian".

Ostracod associations which are Middle Devonian in age occur in the Kwataboahegan Formation, Ostracods which are probably Middle Devonian in age and Conodonts of the Basal Famennian occur in the Stooping River Formation.

2.2 DETAILS OF THE STRATIGRAPHICAL RESULTS.

2.2.1 ORDOVICIAN.

The Ordovician seems to correlate with the Ordovician of the Kaskattama Well (same palaeogeography?). The Ostracod association of biozone 7 does not occur in the Kaskattama Well.

2.2.2 SILURIAN (see plates 8 and 11).

It is difficult to establish the datation and the accurate correlation of the microfaunal associations of the CN samples relative to each other and also in relation to the Kaskattama Well.

2.2.2.1 The <u>Conodonts</u> can be grouped into 7 biozones s.l. (a, b_1, b_2, c, d, e_1, e_2) whose exact vertical relationship and accurate age are not known (insufficient bibliography on the Alexandrian, almost nothing on the Niagarian and the isolated information and different associations of the CN samples vary in comparison with the Kaskattama Well*).

2.2.2.2 The <u>Ostracods</u> can be grouped into 10 biozones s.l. which are stratigraphically close (1, 2, 3_a, 3_b, 4, 5_a, 5_b, 5_c, 5_d, 6). Almost all the forms isolated are new and unknown in the literature. The two characteristic associations which occur in the interval 2036' - 2160' and at the 1500' level of the Kaskattama Well cannot be correlated with the CN samples. It is especially interesting to note that the Beyrichiidae, giant Ostracods of great stratigraphic value and which determine these ten biozones, do not occur either in the Kaskattama Well or in the Ekwan River Formation of Churchill and Fort Severn (biozones 1 and 2). The Beyrichiidae from biozones 3a, 3b(?), 4, 5a, b, c and d are <u>probable Llandovery</u> in age which correlates approximately with the Alexandrian + Lower Niagarian (Clinton) of North America. Biozone 4, equivalent to biozone 5a (and similar to biozones 5b, 5c and 5d) is probably Lower Niagarian in age (Clinton Group).

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* "fair number of Beyrichiacean species have a range corresponding roughly to the size of a Graptolite zone, or less" (Martinsson, Sweden), determination of 7 (seven) zones of Beyrichiidae in the American Clinton.

2.2.2.3 The fish (scales) of biozones $E_1 - E_2$ (= Ostracod biozones 5c and 5b) are Llandovery-Wenlock in age (= Alexandrian + Niagarian in age).

2.2.3 DEVONIAN.

2.2.3.1 The Ostracods and Characae of the Kenogami River Formation Middle Member are Middle Devonian (middle part; biozone 11) in age.

2.2.3.2 There are two associations of Ostracods in the Kwataboahegan Formation (biozones 12 and 14) which are probably Middle Devonian in age.

2.2.3.3 A species of lagoonal Ostracod (biozone 13) from sample CN 333 of the Kwataboahegan Formation is equivalent in age to the Traverse Group of the Michigan (Lower Gravel Point Formation, Welleria zone, middle part of the Middle Devonian).

2.2.3.4 The Conodonts and pelagic Ostracods (Entomozoides) of the Stooping River Formation are Lower Famennian in age. The benthic Ostracods of this Formation are Middle(?) Devonian in age.

3. ENVIRONMENTAL AND PALAEOGEOGRAPHICAL RESULTS (see plates 8 to 10).

3.1 PALAEOGEOGRAPHICAL RESULTS OF THE STUDY OF THE SILURIAN FAUNA ISOLATED (see plate 8).

Two provinces could be distinguished·

- province of Churchill, Kaskattama and Fort Severn (associations 1 and 2 of Ostracods and no Beyrichiidae);

- province of Winisk, Attawapiskat, Ogoki and Harricanaw River (associations 3a, 3b, 4, 5a, b, c and d of Ostracods with Beyrichiidae).

For technical reasons, it is too early to consider this distinction as final.

3.2 ANALYTICAL INFORMATION ON THE ENVIRONMENT (see plates 9 and 10).

A definition of the environment can be suggested for many samples. Indeed, in the case of the Kaskattama Well, the environmental results of the study of the isolated microfauna correlated well with the results of facies and geochemical-sedimentological studies.

The following parameters were used:

- Conodonts. their frequent occurrence suggests "open sea area" or "open sea area ?";
- Benthic Ostracods (normal size and Beyrichiidae, Leperditiidae - smooth giant forms): back-reef or coastal intertidal tendencies;
- Pelagic Ostracods (Wellaria),
- Lagoonal Ostracods;

- Fish (scales, teeth): coastal tendency;
- Serpulidae, Characae, Megaspores coastal to continental tendencies.

3.3 COMMENTS (see plate 8).

3.3.1 ORDOVICIAN.

In the few samples analysed, the open sea tendency is comparable to that observed in the Kaskattama Well.

3.3.2 SILURIAN (Ekwan, Attawapiskat and Severn).

The open sea area to possible open sea area tendencies seem to predominate, except along the Severn, Ekwan and Harricanaw Rivers where these tendencies are strongly counterbalanced by the intertidal to coastal influences (Fish + Serpulidae + Leperditiidae).

3.3.3 DEVONIAN.

Very littoral features (Ostracods, Tentaculites, massive Spicules and Characae) occur in the Kenogami River Formation Middle Member and in sample CN 236.

Two associations of benthic Ostracods and a monospecific fauna of Ostracods (CN 333) occur in the Kwataboahegan Formation. This fauna was described by KESLING, 1957, in the Michigan and is of a lagoonal type according to this author*.

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* "no doubt that it lived in large lagoons", ... "occurs in the Traverse ... Group of rocks, which consists of shales and limestones and which contains numerous reefs, many of them large. There were undoubtedly lagoons associated with some of these reefs".

From a theoretical point of view, the occurrence of Middle Devonian reefs belonging to the same palaeogeographical province as the Michigan is possible in the Hudson Bay.

In the Stooping River Formation (Lower Famennian)

- the occurrence of numerous Conodonts and Macrospores in the clay indicates an open sea area. However, samples CN 323 to 332 were deposited in an environment of slow sedimentation (?),

- the Conodonts and benthic Ostracods from samples CN 218 to 234 (Fort Albany) indicate an open sea area.

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ANNEX III

MACROFAUNA

by J. Destombes and R. Hollard.

SUMMARY

1.	DETERMINATIONS BY MR. DESTOMBES	-	24.01.69
2.	DETERMINATIONS BY MR. HOLLARD	-	20.01.69
3.	DETERMINATIONS BY MR. HOLLARD	-	02.02.69
4.	DETERMINATIONS BY MR. HOLLARD	-	28.02.69
5.	DETERMINATIONS BY MR. HOLLARD	-	03.06.69
6.	DETERMINATIONS BY MR. DESTOMBES	-	April '69
7.	DETERMINATIONS BY MR. HOLLARD	-	27.06.69

1. DETERMINATIONS BY MR. DESTOMBES - 24.01.69.

The material studied comes from six layers which are interbedded in white-grey limestone. They contain Cephalopods, Gastropods, Brachiopods, Trilobites and Anthozoa.

"As this fauna comes from an extra Mediterranean area, it is fairly difficult to give accurate information on the genus and, a fortiori, on the species, especially as this fauna contains mainly groups of fossils which are unfamiliar to us.

This explains the caution that we request in the use of the following data".

1.1 CN 6: Maclurite sp.
Calapoecia sp?

1.2 CN 7: Hormotoma sp.
Maclurite sp.
Calapoecia sp.
Cyrtogomphoceras cf. baffinense?

CN 6 and CN 7 contain a fauna which is also partly found in Member 2 of the Portage Chute Formation of the Bad Cache Rapids Group (corresponding to the lower part (Dog Head Member) of the Red River Formation), and also in the upper part of the Ottawa Formation (Coburg). These samples seem to be Upper Trentonian to Lower Richmondian in age (between the Upper Caradoc and Lower Ashgill).

Ordovician (Upper Trentonian to Lower Richmondian).

1.3 CN 15: *Strophomena* sp.
Rafinesquina sp.
Dinorthis? sp.
Isotelus?

This fauna is similar to the fauna of the middle to upper part of the Ottawa Formation. It is very close in age to CN 7 (maybe slightly older).

Ordovician (Upper Trentonian to Lower Richmondian).

1.4 CN 24: Crinoids with circular and pentagonal sections.

Rafinesquina
Dinorthis? sp.
Streptelasma? or *Bighornia?*
Fragments of undeterminable Trilobites.

This sample was certainly collected near CN 15 as it contains some of the same elements.

Upper Ordovician.

1.5 CN 25 *Streptelasma?* or *Bighornia?*

The Polyp of this sample occurs in the Ottawa Formation.

Ordovician (Mohawkian; Ottawa Formation).

1.6 CN 32: *Armenoceras*

This genus occurs in the very Upper Ordovician of the Stony Mountain

Formation which is Upper Richmondian in age (Upper Ashgill).

<u>Ordovician (Upper Richmondian)</u>.

To summarize, the fauna of these layers seems to be Trentonian to Upper Richmondian in age, that is, fairly Upper Caradoc to Upper Ashgill.

This fauna has great affinities with that described for Baffin Island (Frobisher Bay and Sillman's Fossil Mountain), Eastern Canada.

2. DETERMINATIONS BY MR. HOLLARD - 20.01.69.

2.1 CN 51: Alveolites sp.
Gastropod

Undetermined age.

2.2 CN 72: Favosites sp. (the closest, in the bibliography of Eastern Canada, seems to be F. favosus Goldfuss, of the Clinton Group).

Middle Silurian (Niagarian).

2.3 CN 73: Favosites sp. (the closest is probably F. sp. pl. VIII fig. 4 or F. hispidus ROMINGER, or F. sp. pl. VI fig. 16 in Bolton 1966 - all three from the Hill Formation of the Clinton Group).

Middle Silurian (Niagarian).

2.4 CN 74 cf. Favosites forbesi deperensis BOLT.
Dyer-Bay Formation.

Middle Silurian (Niagarian).

2.5 CN 82. cf. Favosites sp. pl. VI of the Bolton Hill Formation.

Middle Silurian (Niagarian).

2.6 CN 83 Same Favosites sp. as in CN 72.

Middle Silurian (Niagarian).

2.7 *CN 84*: *Alveolites* sp. cf. *A.* *ondosus*
Hill Formation.

Middle Silurian (Niagarian).

2.8 *CN 85*: *Alveolites* sp.

Undetermined age.

2.9 *CN 86*: Rugged Solitaire (Streptelasmatide?)
Not determined.

Undetermined age.

2.10 *CN 91*: *Alveolites* sp. or *Coenites* sp.

Middle Silurian (Niagarian).

2.11 *CN 92*: idem. cf. *A.* *ondosus*

Middle Silurian (Niagarian).

3. DETERMINATIONS BY MR. HOLLARD - 02.02.69.

3.1 CN 97: Gastropods (two samples might eventually be studied more thoroughly).

Undetermined age.

3.2 CN 99: ? Eotomaria (Gastropod)
Halysites cf. H. catenularia (LINNE)

The species is very widespread throughout the world especially in the Middle Silurian. In Ontario, it occurs in the Clinton Group, for example in the Fossil Hill Formation (but according to Bassler, there are Ordovician varieties). Close forms are known up to the top of the Niagarian.

Middle Silurian? (Niagarian?).

3.3 CN 102: cf. Fletcheria elegans (Whiteaves)

The cf. - Fletcheria elegans - is used here, as I am not sure of having seen all the literature. In fact, the sample is identical to those so named in the area. It consists of a Rugosa type of the Stauriidae family, sometimes called Pycnostylus, and which should occur only in the Upper Middle Silurian.

The species is mentioned along with F. guelphensis (see later) in the Guelph and Lockport Formations in U.S.A. and Canada.

Middle Silurian (Upper Niagarian).

3.4 CN 105: A nautiloidae not yet encountered in the literature.

Undetermined age.

3.5 CN 110/1. Hegalomphala robusta Whiteaves
"Scutellum" ekwanensis Whit.

Both of the Ekwan Formation which, according to Bolton, correlates with the Fossil Hill Formation. Top of the Clinton Group or Lower Niagarian.

3.6 CN 110/2: (idem CN 110/1)
"Scutellum" ekwanensis

The nautiloidae resembles slightly that described by Bolton (1966) - pl. XIII, fig. 22 - and which he calls Lechtrichoceras desplainense (McChesney) (it is a hypotype). This form belongs to the Annabel Group and therefore is more recent than the Trilobite. The sample characteristics are doubtful as is the stratigraphic value of the species compared.

Middle Silurian (Lower Niagarian).

3.7 CN 112: Pentamerus sp. (? or possibly Lissocoelina)

It differs from those which appear on the sketches (to follow).

Undetermined age.

3.8 CN 115/1: Fletcheria guelphensis (Whiteaves)

To the above notes (CN 102) we must add that in the Pagwa River Formation (Martison 1953) of the Western James Bay Lowlands, these rugged forms are associated with other corals which would indicate the Fossil Hill Formation. Therefore.

- either the Fletcheria begins with the Fossil Hill Formation as well as CN 115/1,

- or the correlation between the Ekwan River Formation and the Fossil Hill Formation as given by Bolton is wrong and the Ekwan River Formation is younger the Scutellum ekwanensis would then be as young as the Lockport Formation, their age depending only on the real age of the Ekwan River Formation,

- or, lastly, their age would be at the limit between the Clinton Group and the Albermarle Group, (Lower Niagarian and/or Upper Niagarian).

If the samples occur in the section as they are numbered, the Scutellum Ekwanensis occurs between the two Fletcheria. This is probably new information.

3.9 CN 115/2: ? Favosites favosus (Goldfuss) and ? F. hisingeri (Edw. and Haime)

Determinations very questionable. These forms occur in the Clinton Group (Lower Niagarian).

A Gastropod, genus Raphistomina (Ordovician - Silurian), occurs with these corals.

Middle Silurian (Niagarian).

3.10 CN 127: Gyrocone Nautiloidae still to be determined?
Undetermined Gastropod.

Undetermined age.

3.11 CN 128: Gastropod:
?Naticonema niagarense (HALL)

Decew Formation, top of the Clinton Group; Gasport Formation, base of the Albermarle Group, Eramosa Member, top of the Lockport Formation, etc. Of no great significance.

Undetermined age.

3.12 CN 133 Gastropods: cf. "Platyceras" subumbonatus (Northrop).
Brachiopods. Strophonella sp. undetermined because badly preserved. (It is similar to S. subenglypha (Northrop) (West Point Formation. Upper Niagarian) and even more similar to Strophonella cf. S. euglypha (HIS.) of BOUCOT. It would be Wenlock in age).

Silurian.

3.13 CN 134: One fragment of Glabella of Scutellum (undetermined), Gastropods of no stratigraphical significance.

Probably same age as CN 213?

4. DETERMINATIONS BY MR. HOLLARD - 28.02.69.

4.1 CN 115/2: Note on the Favosites related to F. favosus mentioned earlier Stearn mentions a category of F. gothlandicus with similar tabulae. This would then be Middle Silurian in age - top of the Interlake Group (Cross Lake Member). (See determinations of 02.02.69).

4.2 CN 186: Loweceras sp. in BOLTON, 1966, pl. XVIII. Severn River Formation (lower than the Ekwan River Formation) very similar to the L. southamptonense (FOERTE et se), see FLOWER and TEICHERT, 1957, pl. 27.
Very large Ostracods (cf. Leperditia) (not studied).
Crinoids. undetermined Encrinites.
Strophonella sp.
?Stegerhynchus sp. or Plectatrypa sp.

Middle Silurian.

4.3 CN 190: Crinoids: undetermined Encrinites.
Gastropods and Nautiloides orthocones - undetermined
cf. Strophonella subenglypha (Northrop) species of the Bouleaux and West Point Formations.

Middle Silurian.

4.4 CN 192: Favosites sp. (cf. F. hispidus of the Fossil Hill Formation)
Halysites "catenularia" LINNE and anctorum.

Probably Lower Niagarian, top of the Clinton Group.

Middle Silurian.

4.5 CN 202: cf. Coenites rectilineatus (SIMPSON) in Norford 1962, pl. VII, Sandpile Group

?Stegerhynchus sp. (undetermined). The most similar seems to be S. indianensis (HALL)

Strophonella sp. (undetermined)

?Platystrophia sp. (undetermined)

Resseralla sp. elegantula (DALMAN) or visbyensis (LIND) Clinton and Rochester Formations.

Cornulites sp. cf. arcuatus Conrad

Undetermined Gastropods, probably undeterminable.

Encrinurus (Encrinurus) sp., undeterminable (the pygidium axis is badly preserved). Lockport Formation?

Middle Silurian? (Upper Niagarian?).

4.6 CN 209: Favosites cf. gothlandicus Lamark, variety pointed out by Stearn, 1956, p. 54, pl. IV, fig. 7 in the Upper Interlake Group (Chemahawin Member).

Middle Silurian.

4.7 CN 211. Pentamerus sp. cf. that of CN 112.

Undetermined age.

4.8 CN 213 "Scutellum" ekwanense Whiteaves.

Ekwan River Formation, similar to Fossil Hill Formation, Clinton Group, should correlate with CN 110/1 and maybe with CN 134.

Middle Silurian (Clinton).

5. DETERMINATIONS BY MR. HOLLARD - 03.06.69.

5.1 CN 221: Rugged Polyp, undetermined
Crinoids, undetermined
Platyorthis sp. (Devonian type)
Brachiopods, undetermined (Rhynchonellida, Spiriferida, Chonetida?).

Devonian.

5.2 CN 263: Halysites sp.
Stromatoporoid (Silurian)
Rugged Polyp, undetermined.

Silurian.

5.3 CN 266: A siphuncle of Discosorida (Nautiloidae), undetermined.

Undetermined age.

5.4 CN 320: Atrypa reticularis LINNE (Silurian - Devonian) cf. Pleuronotus decewi (Billings).

?Lower - Middle Devonian.

5.5 CN 349: Atrypa reticularis LINNE
cf. Pleuronotus decewi (Billings).

?Lower - Middle Devonian.

5.6 CN 402. Rogusa, undetermined
Favosites sp.
Syringopora sp. 1
Syringopora sp. 2
Atrypa reticularis LINNE
cf. Schuchertella sp. undetermined (badly preserved)
?Nautiloidae.

Probable Devonian.

5.7 CN 409. Atrypa reticularis LINNE

Silurian - Devonian.

5.8 CN 441 Strophochonetes sp. aff. S. mediocostalis (Koz) but larger. This relationship indicates, either a very young Silurian (Brownsport Formation), or a very old Devonian.
"Camarotoechia" acutiplicata Amsden or "C" cedarensis Amsden, two species very close to the Brownsport Formation.

Upper Silurian.

5.9 CN 444. Brachyprios sp.
?Camarotoechia acutiplicata Amsden.

Undetermined age.

5.10 CN 446: cf. Halysites compactus Rominger
Syringopora sp.

Middle - Upper Silurian.

5.11 *CN 447*: *Halysites* "*catenularia*" (LINNE)
or *H*. *Labyrinthicus* (Goldfuss)

Middle - Upper Silurian.

5.12 *CN 454*. Dalmanellacea, undeterminable
"*Camarotoechia*" sp. either *C* *indianensis* (HALL) or
C *acutiplicata* Amsden
Favosites sp. e gr. *hisingeri* (H. Edw. and H.)

Upper Silurian.

(Brownsport Formation or Lockport).

5.13 *CN 459* *Favosites* sp.

Undetermined age.

5.14 *CN 464*. *Camarotoechia* *vicina* (Billings)
Strophoedontidae, undeterminable, similar to Leptostrophiinae.
The Rhynchonellidae occurs in the Chicotte Formation (Upper Niagarian).

Silurian - Devonian.

6. DETERMINATIONS BY MR. DESTOMBES - April 1969.

6.1 CN 700: Maclurites sp.
Endoceras?

Undetermined age.

6.2 CN 701. Receptaculites sp.

Ordovician (Bad Cache
Rapids Group).

6.3 CN 702 Plasmopora aff. lambei Schuchert.

Ordovician (Bad Cache
Rapids Group).

6.4 CN 738 Favosites sp.

Undetermined age.

6.5 CN 743: Catenipora aff. rubra.

Ordovician.

6.6 CN 746: Receptaculites sp.
Catenipora aff. rubra.

Ordovician.

6.7 CN 761: Halysites?

Undetermined age.

6.8 CN 762 Maclurites aff. manitobaensis (Whiteaves)

Ordovician (Bad Cache Rapids Group).

In this section, fossils from CN 701, 702, 743, 746 and 762 are common in Member 2 of the Portage Chute Formation (Bad Cache Rapids Group).

6.9 CN 763: Favosites aff. wilsonae (Nelson) - quite similar to to Favosites Wilsonae Nelson which occurs in the Caution Creek Formation (Churchill River Group).

Ordovician? (Churchill River Group?).

6.10 CN 766: Maclurites aff. cuneata (Whitfield)
Endoceras sp.

Ordovician (Bad Cache Rapids Group).

6.11 CN 767: Maclurites aff. cuneata (Whitfield)
Catenipora sp.
Endoceras sp.

Ordovician (Bad Cache Rapids Group).

6.12 CN 770: Maclurites aff. cuneata (Whitfield)
Endoceras sp.

Ordovician (Bad Cache
Rapids Group).

6.13 CN 774: Westenoceras aff. greggi Roy
Deiracorallium aff. manitobaense Nelson?

Ordovician (Bad Cache
Rapids Group).

6.14 CN 780: Maclurites
Halysites or Catenipora
Cephalopod, undetermined.

Undetermined age.

6.15 CN 901: Graptolites
Pseudogygites probably latimarginatus (HALL)

CN 901 with Graptolites and probably with Pseudogygites latimarginatus Trilobites is important because, according to Thorsteinson (Cornwallis and Little Cornwallis Islands, District of Franklin, Northwest Territories, G.S.C. Memoir 294, 1958, pp. 89-90), it belongs to the Dicellograptus anceps zone, that is, to the Ashgill (Upper Ordovician).

The Graptolites from CN 901 could equally well be Ordovician in age. The Trilobites are Ordovician and in some places associated with known Graptolites "n. sp. "A" or other letters of the alphabet". We must therefore rely on what we know to be certain, in this case, the Trilobites.

Upper Ordovician (Ashgill)
(~ Richmond).

6.16 CN 938: Catenipora aff. rubra or robusta
Macluri tes sp.

Undetermined age.

6.17 CM 43: Receptaculites
Maclurites
Nautiloidae orthocone

Must be equivalent to Member 2 of the Portage Chute Formation.

Ordovician (Bad Cache Rapids Group).

The macrofauna from samples CN 766, 767, 770 and 774 seem very similar to those collected in Silliman's Fossil Mount on Baffin Island, and which is now considered as being equivalent to the Bad Cache Rapids Group; see:

- Roy (1941): The Upper Ordovician fauna of Frobisher Bay, Baffin Island, Geol. Mem. Field Museum of Nat. History, vol. 2, Sept. 1941.
- Nelson (1963): Ordovician Palaeontology of the Northern Hudson Bay Lowlands, Geol. Soc. of America, Memoir 90.

7. DETERMINATIONS BY MR. HOLLARD - 27.06.69.

7.1 CN 622: Stromatoporoid probably Clathrodictyidae, very similar to Clathrodictyon.

?*Clathrodictyon* cf. *regulare* Rosen

(from the species named *Cl.* cf. *regulare* ROSEN in Stearn 1956). The forms mentioned by Stearn are Middle Silurian (Upper Part) in age.

Silurian.

7.2 CN 630: Favositidae with corallites of 1.5 mm. to a maximum of 2 mm. in diameter. Numerous Tabulae (16 with a diameter of 5 mm. for example). Numerous pores on the walls. *Favosites* sp. e gr. *niagarensis* (HALL), mostly Middle Silurian.

Silurian.

7.3 CN 632 Favosites with slightly convex tabulae, corallites 3 mm. in diameter.

cf. *Favosites*, sp. pl. VI or pl. VIII in BOLTON (Fossil Hill Formation) or (?) *Michelinia* *niagarensis* Davis (in Hume 1925) (Lockport Formation).

Silurian?

7.4 CN 636· *Favosites* with very large corallites

cf. *Favosites* *gothlandicus* *magnus* of *F.* *favosus* (Goldfuss).

Stratigraphical range the first species occurs only in the Lower Silurian, but it is a sub-species recognized only in 1956. It is possible that many of the F. favosus mentioned by the authors are related to it. In this case, the range is not accurate.

Silurian.

7.5 CN 664. Rugged Polyp, undetermined cf. Strombodes, cf. Columnaria sp. M, cf. Palaeophyllum sp., Favosites e gr. gothlandicus.

Undetermined age.

7.6 CN 665: cf. Columnaria columba NORFORD - this form would indicate the Clintonian, i.e. the Middle Silurian with the exception of the Upper Formations (Lockport, Guelph).

Middle Silurian.

7.7 CN 669: Palaeofavosites e gr. prolificus.

Ordovician - Silurian.

7.8 CN 685 Favosites favosus (Goldfuss)
Favosites niagarensis cf. inaequalis Stearn, 1956.
Favosites cf. hisingeri M.-E. and H.

Upper part (?) of the
Middle Silurian.

7.9 CN 715: Palaeofavosites sp. cf. prolificus or asper (D'ORB).

Some authors, STEARN in particular, call prolificus those forms with corallites smaller than 2 mm. in diameter. This fossil seems to be a Palaeofavosites with larger corallites. Forms of this fossil occur in the Upper Ordovician as well as in the Lower and Middle Silurian. A microscopic analysis is necessary.

Ordovician - Silurian.

7.10 CN 722: Favosites sp. e gr. niagarensis (HALL).

Silurian (Middle?).

7.11 CN 723: Brachiopods.

7.12 CN 730: Brachiopods (Stronphaodontidae of the genus Brachyprion or Strophonella).

7.13 CN 736: Brachiopods plus Nautiloidae orthocone, undetermined.
?Palaeofavosites prolificus or Favosites gr. hisingeri.

Silurian.

7.14 CN 746: Catenipora cf. gracilis (HALL)
Maclurites sp.

Ordovician.

7.15 CM 103: Favosites cf. forbasi dyerensis BOLTON, F. favosus (Goldfuss).

Probably Middle Silurian.

7.16 CN 907: Gastropods and Nautiloidae orthocone.

Undetermined age.

7.17 CN 911: Brachiopods
Palaeofavosites sp. aff. *transicus* STEARN.

The species belongs to the Middle Silurian, but the determination is doubtful.

Middle Silurian??.

7.18 CN 916: Brachiopods.

7.19 CN 938: *Catenipora* sp.

Ordovician?

7.20 CM 1 Rugged Polyp, undetermined
Brachiopods.

7.21 CM 2, 7,
and 15 . Brachiopods.

7.22 CM 26: - 1. *Palaeofavosites* sp. with large corallites (3 to 4 mm. in diameter), slightly convex tabulae, differs from *P. kirki* Stearn by the diameter of the corallites and is closer to *P. marginatus* (HILL) which occurs in Australia. It is similar to *P. prolificus* which is wide-spread. Nevertheless, it should not be younger than the top of the Middle Silurian and probably belongs to the Lower Silurian.

- 2. cf. Favosites sp. pl. VI, BOLTON, Fossil Hill Formation (Clintonian).

Lower to Middle Silurian.

7.23 CM 127: Favosites sp. e gr. hisingeri M.E. and H./Loere - Middle Silurian.

Lower - Middle Silurian.

7.24 CM 129: Brachiopods.

7.25 CM 132: Brachiopods.

7.26 CM 152. Probable Favositidae.

Undetermined age.

7.27 CM 162: Brachiopods.

7.28 CM 165: Two species·

1. Favosites favosus (Goldfuss)
2. Palaeofavosites sp. e gr. asper (D'ORB).

Lower to Middle Silurian
(no younger than Upper
Clintonian), most likely
Lower Silurian.

7.29 CM 173: Brachiopods (Stropheodaetidae).

7.30 CM 191 - 1. Palaeofavosites sp. not found in the literature. It differs from P. prolificus in its dimensions and is rather similar to P. capax from this point of view. However, it differs from this latter Ordovician species in the dimension of its pores which are large. It differs from P. okulitchi Stearn which has mural pores and angular pores.

- 2. Favosites cf. forbesi dyerensis BOLTON (because of the irregularity of the corallites and other structures, it belongs to the forbesi group).

Lower to Middle Silurian.

STUDY OF THE FIELD SAMPLES FROM THE GENERAL GEOLOGICAL RECONNAISSANCE OF HUDSON BAY (Summer 1968 - Serge RUEFF - Phillippe ARTRU) - COMPARISONS WITH KASKATTAMA N° 1 WELL.

TABLE OF THE SAMPLES
ANALYSED BY
MICRO - AND MACROPALAEONTOLOGY

-

SYNTHESIS OF THE RESULTS

STUDY OF SAMPLES COLLECTED AROUND THE HUDSON BAY (LOWLANDS AND NORTHERN ISLANDS - CANADA) S. RUEFF - PH. ARTRU FIELD SURVEY - SUMMER 1968.

COMPARISONS WITH KASKATTAMA NO. 1 WELL.

SAMPLE INVENTORY - Page 1.

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						(SEE LEGEND PAGE 17)
5	Ordovician	Bad Cache Rapids Group	(+) (111a/111b) Upper Ordovician			*
6	"	"			Ordovician (Upper Trenton to Lower Richmond)	*
7	"	"			"	*
15	"	"			"	*
23	"	Churchill River Group		-		
24	"	"			~ CN 15	*
25	"	"			Ordovician (Mohawkian : Ottawa Formation)	Inconsistent with position of CN 32
28	"	"		Ordovician? (K1, 2907'-2317'?)		*
30	"	"		-		
32	"	"			Upper Ordovician (Upper Richmond)	*
33	"	"		Ordovician (K1, 2907'-2317')		*
36	"	Bad Cache Rapids Group		-		
37	"	Churchill River Group		-		

SAMPLE INVENTORY - Page 2.

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
40	Ordovician	Churchill River Group		-		
46	Silurian	Ekwan River Formation		(fauna 1)		
47	"	"		(fauna 1)		
51	"	"				
52	"	"		(fauna 1)		
54	"	"		(fauna 1)		
64	"	"		(fauna 1)		
72	"	"			Middle Silurian (Niagarian)	*
73	"	"			"	*
74	"	"			"	*
81	"	"		-		*
82	"	Ekwan River Formation - Attawapiskat Member			"	*
83	"	"			"	*
84	"	"			"	*
85	"	Ekwan River Formation			-	
86	"	"			-	
91	"	Ekwan River Formation - Attawapiskat Member			Middle Silurian (Niagarian)	*
92	"	Ekwan River Formation			"	*
93	"	"		~ CN 122, 125		*
97	"	"			-	

SAMPLE INVENTORY - Page 3.

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
99	Silurian	Ekwan River Formation			Middle Silurian (Niagarian?)	*
102	"	Ekwan River Formation - Attawapiskat Member		-	Middle Silurian (Upper Niagarian)	*
103	"	"		(fauna 2)		
105	No sample	-			-	
110	Silurian	Ekwan River Formation			Middle Silurian (Lower Niagarian) = CN 213	*
112	"	"			-	
115	"	"			Middle Silurian (Niagarian)	*
122	"	"		(fauna a) (fauna 3a)		*
125	"	Ekwan River Formation - Attawapiskat Member		∼SP 23, ∼ CN 93, = CN 194		
127	"	"			-	
128	"	"			-	
129	"	Ekwan River Formation		CN 93?, 122 - 125?		*
131	"	"		-		
132	"	Ekwan River Formation - Attawapiskat Member		-		
133	"	"			Silurian	*
134	"	"			- (= CN 213?)	*
135	"	"		-		*
148	"	Ekwan River Formation		(fauna 3a ?) ∼ or = CN 122, 125, 194		

SAMPLE INVENTORY - Page 4.

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
149	Pleistocene	-	(+) (1) Middle to Upper Ordovician			* inconsistent with CN 148 and with the proposed age.
155	Silurian	Ekwan River Formation				
185	"	"		(fauna 3b) probable Llandovery $\simeq$ CN 122, 125, 194		*
186	"	"			Middle Silurian	*
188	"	"				
190	"	"			"	
192	"	"			Middle Silurian (Upper Clinton?)	* (and consistent with field comparison with CN 93 to 97)
194	"	"		(fauna 3a) = CN 122, 125		
196	"	"		~ CN 122, 125, 93?		*
200	"	"		(fauna 4) probable Llandovery		
202	"	"		"	Middle Silurian (Upper Niagarian?)	*
203	"	"		"		
204	"	"	(+) (Ib - II + IIIb/IV) Middle to Upper Ordovician + Ordovician-Silurian limit	"		* possible reworked Ordovician
205	"	"	(Ia) Middle to Upper Ordovician	"		inconsistent with determinations by Ostracods and palynology: reworked (?)
208	"	"		-		
209	"	"			Middle Silurian	*

SAMPLE INVENTORY - Page 5.

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
210	Silurian	Ekwan River Formation		(fauna 4) probable Llandovery		*
211	"	Ekwan River Formation - Attawapiskat Member			-	
213	"	Ekwan River Formation			Middle Silurian (Clinton) = CN 110, 134?	*
218	Devonian	Stooping River Formation		Devonian (Middle?) fauna 10		*
219	"	"		-		
220	"	"		Devonian		*
221	"	"			Devonian	*
232	"	"				
234	"	"		Devonian		*
235	"	"				
236	Silurian	Ekwan River Formation	-	Middle Devonian (fauna 11) (∼ CN 241, 242, 255?, 256?)		inconsistent with the age of the Ekwan River Formation
237	"	"				
241	"	* Kenogami River Formation - Middle Member	(+) (Ia - Va) Ordovician to Silurian	= CN 242?		} shown as "polluted" in the Field Report
242	"	"	Middle Devonian (fauna 11) = CN 236			
244	"	Ekwan River Formation		(∼ fauna 3a - 3b), Kaskattama Formation? (∼ 1786' - 1790'), ∼ CN 194, 185, 148, 122, 125		*
245	"	"		-		

SAMPLE INVENTORY - Page 6.

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
247	Silurian	Kenogami River Formation - Lower Member	-	-		
248	"	Kenogami River Formation - Middle Member	-	-		
249	"	"	-	-		
250	"	"	(+) (II - V) Upper Ordovician to Silurian	-		*
251	"	"	(+) (Ia - Va) Ordovician to Silurian	-		*
252	"	"	-	-		
253	"	"	-	-		
254	"	"	-	-		
255	"	"	-	} = CN 236 to 242		inconsistent with the age of
256	"	"	-	} = Middle Devonian?		the Kenogami River Formation
257	"	"	-	-		
258	"	"	-	-		
259	"	"	(+) (Ia - Va) Ordovician to Silurian	-		* with field determination as regards age, see stratigraphical position of samples CN 255, 256
260	"	"	-	-		
263	"	Ekwan River Formation			Silurian	*
266	"	"			-	

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
271	Cretaceous	Mattagami River Formation	-	-		
272	"	"	-	-		
273	"	"	-	-		
274	"	"	-	-		
275	Devonian	Stooping River Formation	-	-		
283	"	Kwataboahegan Formation				
285	"	"				
286	"	Kwataboahegan Formation - Coral Rapids Member	Frasnian - Famennian			*
287	"	"	Famennian to Carboniferous			*
288	"	"	Frasnian - Famennian			*
292	"	Kwataboahegan Formation		Devonian (Middle?) (fauna 14)		*
293	"	"				
294	"	"		Devonian (Middle?) (fauna 12)		*
295	Cretaceous or Pleistocene	-	Lower to Middle Devonian	-		inconsistent with the age of the Kwataboahegan Formation
296	"	-	Upper Devonian	-		"
298	Devonian	Sextant Formation	-			
299	"	"	Famennian to Carboniferous			*
300	"	"	-			
301	"	"	-			

SAMPLE INVENTORY - Page 8.

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERV'TIONS
CN						
303	Devonian	Sextant Formation	Silurian to Devonian			*
320	"	Kwataboahegan Formation			Lower to Middle Devonian? = CN 349	*
321	"	Stooping River Formation	Givetian			*
322	"	Kwataboahegan Formation	Famennian to Carboniferous			loose sample
323	"	Stooping River Formation	Middle to Upper Devonian			*
324	"	"				
325	"	"		Upper Devonian		
326	"	"	-	Lower Lower Famennian		
327	"	"	Upper Devonian			* biostratigraphy
329	"	"	Middle to Upper Devonian			but the relationship of the samples on Plate 55 is questionable (ACC 51.2 and 51.3)
332	"	"	-			
333	"	Kwataboahegan Formation	-	Middle Devonian, Traverse Group, Gravel Point Formation (fauna 13)		
334	"	"				
335	"	Stooping River Formation	Middle to Upper Devonian			
336	"	"	Devonian			
338	"	Kwataboahegan Formation - Coral Rapids Member	Devonian			
339	"	Stooping River Formation	Upper Devonian			loose sample
340	"	"	Famennian to Carboniferous			same problem for Plate 54 as for Plate 55

SAMPLE INVENTORY - Page 9.

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
347	Devonian	Moose River Formation	-			
348	Cretaceous or Pleistocene	-	(+) (Ia) Middle to Upper Ordovician			inconsistent
349	Devonian	Kwataboahegan Formation			Lower to Middle Devonian? = CN 320	
402	"	"			Probable Devonian	* same problem as for CN 340
409	"	"			Silurian - Devonian	
424	"	"		Lower Ordovician? (reworked?)		
437	Silurian	Ekwan River Formation		Probable Llandovery (fauna 5a)		*
441	"	"			Upper Silurian	* but
442	"	"		"		* inconsistent
444	"	"		Probable Llandovery (fauna 5c)	-	* microfauna
				Probable Clinton (fauna 4) = interval CN 200 - 204		macrofauna
445	"	"		-		
446	"	"			Middle to Upper Silurian	*
447	"	"			"	*
448	"	Ekwan River Formation with Severn River Formation characteristics		(fauna b2)		
449	"	"		Llandovery - Wenlock (fauna E1		*
451	"	Ekwan River Formation		Probable Llandovery (fauna 5b)		*

SAMPLE INVENTORY - Page 10

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
:N						
454	Silurian	Ekwan River Formation			Upper Silurian	
455	"	"	(+) (Ia - IIIa) Middle to Upper Ordovician	(fauna b2) Probable Llandovery (fauna 5b) Llandovery - Wenlock (fauna E1)		
456	"	"				
457	"	"		(fauna b2) Llandovery - Wenlock (fauna E1)		
459	"	"			-	
460	"	"		Probable Llandovery (fauna 5b)		field datations inconsistent with palyno/microfauna/ macrofauna analyses (see text)
461	"	"		Llandovery - Wenlock (fauna E1)		
462	"	"	(+) (II) Upper Ordovician			
463	"	"	(+) (II) Upper Ordovician	Probable Llandovery (fauna 5d)		
464	"	"	(+) (II - IIIa) Upper Ordovician		Middle Silurian (Upper Niagarian)	
465	"	Severn River Formation with Ekwan River Formation characteristics		-		
466	"	Severn River Formation	(+) (IIIb) Upper Ordovician	-		
467	"	"	(+) (II - Va) Ordovician to Silurian	Llandovery - Wenlock (fauna E) Probable Llandovery (fauna 5c)		
468	"	Severn River Formation with Ekwan River Formation characteristics		(fauna b1)		

SAMPLE INVENTORY - Page 11

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
469	Silurian	Severn River Formation with Ekwan River Formation characteristics				
470	"	Severn River Formation	-	≃ CN 479		
471	"	"	-	-		
472	"	"	-	-		
473	"	"	-	-		
474	"	"	-	-		
475	"	"	(+) (Ib - IIIb) Upper Ordovician			475 - 478 ino: field datations inconsistent with Palyno analyses
476	"	"	(+) (IIIa) Upper Ordovician			
477	"	"	(+) (II - IIIb) Upper Ordovician			
478	"	"	(+) (Ia - Va) Ordovician to Silurian	-		
479	"	"	-	≃ CN 470		
480	"	"	-	Llandovery - Wenlock (fauna E) (fauna d)		*
481	"	"	-			Probable Famennian (possibly reworked)
482	"	"	Famennian	Llandovery - Wenlock (fauna E) (fauna d)		"
483	"	"	Upper Devonian to Carboniferous	Llandovery - Wenlock (fauna E) (E1 ?)		"

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
486	Silurian	Severn River Formation				
487	"	"				
488	"	"	-			
489	"	"				
492	"	Ekwan River Formation	Upper Silurian to Middle Devonian	-		*
493	"	"	-	-		
621	"	"		-		
622	"	"			Silurian	*
630	"	"			Silurian (Middle ?)	*
631	"	"		(fauna 6)		
632	"	"			Silurian ?	*
636	"	"			Silurian	*
638	"	"				*
639	"	"		Similar to CN 202 ?		*
640	"	"				
658	"	"	-	-		
660	"	"				
664	"	"			-	
665	"	"			Middle Silurian (Probable Clinton)	*
668	"	"				

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
N						
669	Silurian	Ekwan River Formation			Ordovician - Silurian	*
672	"	"				
685	"	"			Middle Silurian (Upper part ?)	*
700	Ordovician	Bad Cache Rapids Group			-	
701	"	"			Ordovician (Bad Cache Rapids Group)	*
702	"	"			idem	*
715	Silurian	Ekwan River Formation			Ordovician - Silurian	*
717	"	"	-	-		
722	"	"			Silurian (Middle ?)	*
723	"	"			-	
730	"	"				
733	"	"				
736	"	"			Silurian	*
738	Ordovician	Bad Cache Rapids Group			-	
739	"	"		(fauna ?) Ordovician		*
743	"	"			Ordovician (Bad Cache Rapids Group)	*
746	"	"			Ordovician	*
761	Silurian	Ekwan River Formation			-	
762	"	"			Ordovician ? (Bad Cache Rapids Group ?)	? interpretation to be checked

NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
N						
763	Silurian	Ekwan River Formation			Ordovician ? (Churchill River Group ?)	? interpretation to be checked
766	Ordovician	Bad Cache Rapids Group			Ordovician (Bad Cache Rapids Group)	*
767	"	"			Idem	*
770	"	"			Idem	*
774	"	"			Idem	*
780	"	"			-	
782	"	"	(+) (I) Middle to Upper Ordovician	(fauna 7) - K1, 2849-2509'		*
783	"	"	(+) (I) Middle to Upper Ordovician	(fauna 7) Ordovician		*
784	"	"	(+) (Ia) Middle to Upper Ordovician			*
785	"	"	(+) (Ib) Middle to Upper Ordovician			*
786	"	"	(+) (I) Middle to Upper Ordovician			*
787	"	"	(+) (Ib) Middle to Upper Ordovician			*
790	"	Churchill River Group	-			
800	"	"	(+) (Ia - IIIa) Middle to Upper Ordovician			*
901	"	"			Upper Ordovician (Ashgill) (~ Richmond ?)	*

SAMPLE INVENTORY - Page 15

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CN						
903	Ordovician	Churchill River Group	-			
904	"	"	-			
905	Silurian	Ekwan River Formation		Silurian ??		*
907	"	"			-	
911	"	"			Middle Silurian ??	*
913	"	"		Silurian ?? (fauna c2)		*
915	"	"		-		
916	"	"				
917	"	"		(fauna c1)		
921	"	"	(+) (II) Upper Ordovician	-		inconsistent
924	"	"		Silurian ?? (fauna c2)		*
926	"	"		Silurian ?? (fauna c2)		*
937	Ordovician	Bad Cache Rapids Group				
938	"	"			Ordovician ??	*
945	Silurian	Ekwan River Formation				
948	"	"				
M						
1	Silurian	Ekwan River Formation				
2	"	"				

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
M						
3	Silurian	Severn River Formation	-			
4	"	"	-			
7	"	"				
15	"	Ekwan River Formation				
26	"	"			Lower to Middle Silurian	*
43	Ordovician	Bad Cache Rapids Group			Ordovician (Bad Cache Rapids Group)	*
52	"	"				
103	Silurian	Ekwan River Formation			Probable Middle Silurian	*
120	"	"	-			
121	"	"	-			
122	"	"	-			
123	"	"	-			
127	"	"			Lower to Middle Silurian	*
129	"	"				
132	"	"				
142	"	"	-			
152	"	"			-	
162	"	"				
165	"	"			Lower Silurian (to Clinton ?)	*

SAMPLE NUMBER	AGE ACCORDING TO THE FIELD HYPOTHESIS	GROUP OR FORMATION	PALYNOSTRATIGRAPHY (+) = unit from Kaskattama Well.	EXTRACTED MICROFAUNA (K1 = Kaskattama Well) biozones and/or age and/or equivalence.	MACROFAUNA	OBSERVATIONS
CM						
173	Silurian	Ekwan River Formation				
191	"	"			Lower to middle Silurian	*

LEGEND

* = no inconsistency between the field datations and the datations by the palynoplanktology/extracted microfauna and macrofauna techniques

\- = sample undetermined by at least one of the techniques

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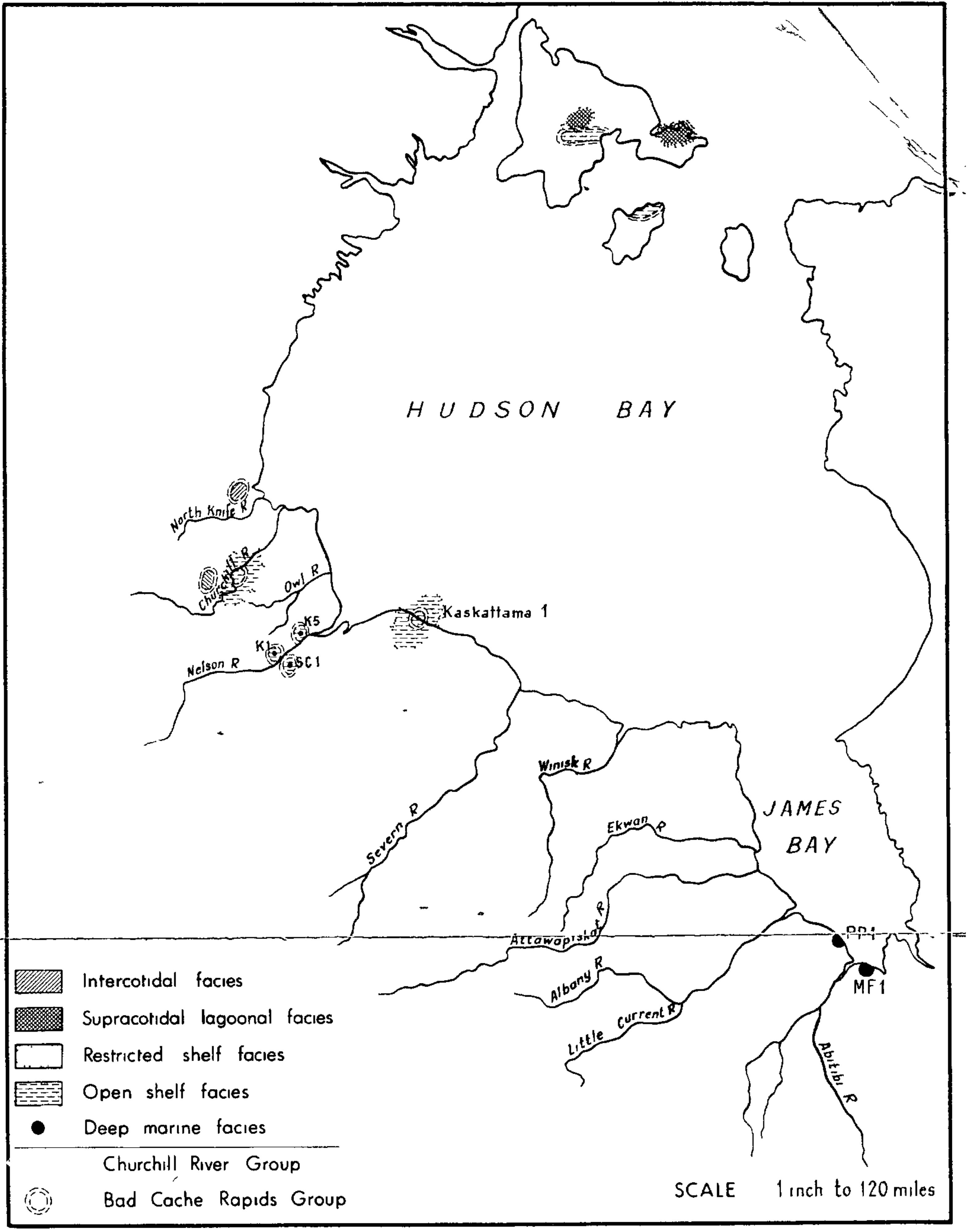
NOTE - R/ST No 470 / 69 -

PALAEOGEOGRAPHICAL INTERPRETATION ACCORDING TO THE ORDOVICIAN MICROFACIES

PL 1



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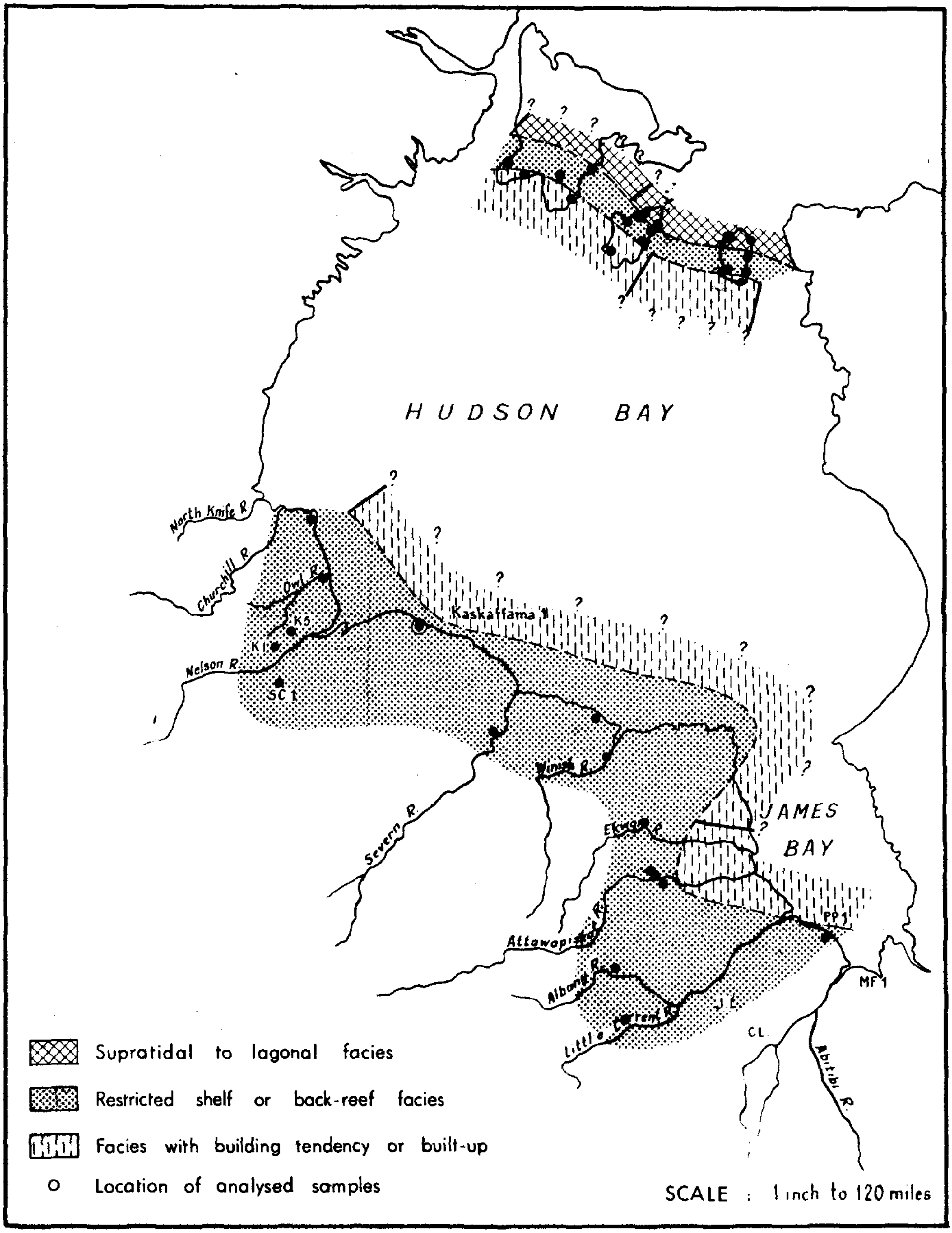
PALAEOGEOGRAPHICAL INTERPRETATION ACCORDING TO THE SILURIAN MICROFACIES
Ekwan River Formation - Attawapiskat Member - Severn River Formation

PL. 2



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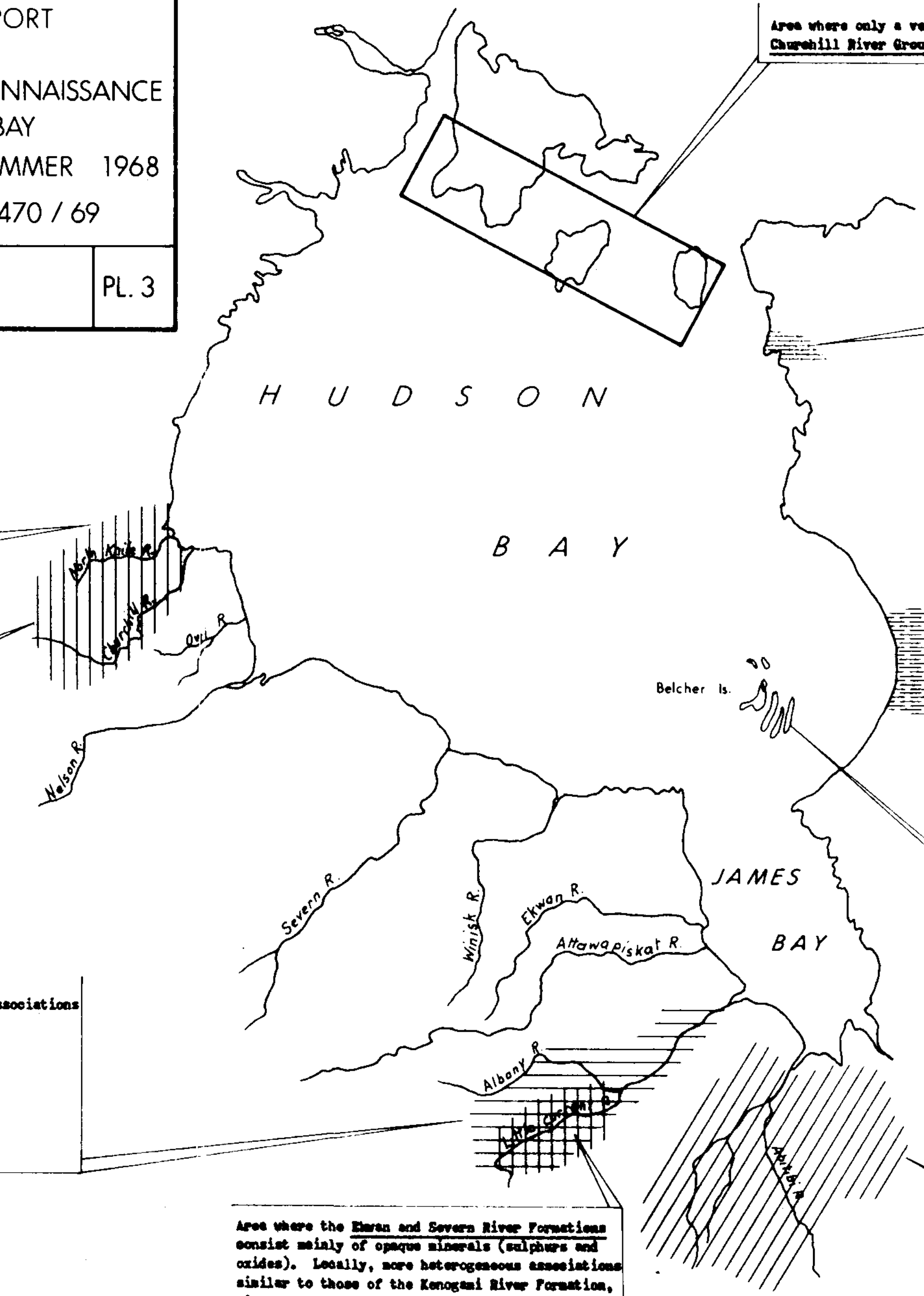
DISTRIBUTION OF THE MAIN ASSOCIATIONS OF HEAVY MINERALS

PL. 3



Area where only a very few heavy minerals occur in the Churchill River Group, in the Severn and Ekwan River Formation

Area where the Proterozoic is very poor or with hornblende and pyroxene

Area where the Bad Cache Rapids Group consists mainly of evolved magnetite, with some heterogeneous associations (hornblende, hypersten).

Pleistocene with magnetite

Area where the Proterozoic heavy minerals are highly evolved:
magnetite and ubiquist minerals;
(tourmaline zircon) all well rounded –
the zircon is often pink

Area where the Proterozoic is either very poor or with:

- Fluorine
- Anatase
- Hornblende
- Zoisite

Kenogami River Formation with heterogeneous associations of silt sized particles of heavy minerals:

Garnet
Sphen
Zircon
Tourmaline
Hornblende
Rutile

Monazite
Brookite
Epidote
Staurotide
Andalousite

Area where the Ekwan and Severn River Formations consist mainly of opaque minerals (sulphurs and oxides). Locally, more heterogeneous associations similar to those of the Kenogami River Formation, with fewer species.

Area with garnets.
Garnets prevail in the Severn River, Ekwan River, Sextant Rapids, Stooping River and Kwataboahegan Formations and in the Coral Rapids Member.

(Sextant Rapids Formation = almandin
Stooping River Formation = staurotide)

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RESULTS OF THE PALINOPLANKTOLOGICAL ANALYSES
STRATIGRAPHY PA - CH - MV

SECTIONS

PL. 5

LEGEND :

*	Area with medium to high content in C.O.M. (colloid organic matter).
$\boxed{MV}$	Mature section of the carbonization scale.
--	Undetermined sample.
D	Denticulae - Scolecodont.
Sr	Spore.
Cz	Chitinozoa.
Hy	Achritarch - Hystrichosphere
UP-PA	I to III : palynoplanktological interval from Kaskattama well no 1. Hy unit : unit of the general scale of Acritarchs. Sr unit : unit of the general scale of Spores.

Sample Number	Section Number	Name of the Section	Area	Province	Group and Formation	STRATIGRAPHY			Microfos.				Organic Environment		Degree of Carbonization	
						Field Hypothesis	UP - PA	Laboratory Hypothesis	Cz	Hy	D	Sr	Unit	Area	MV Measurement	Interpretation
CN 5	1	North Knife River (ACC 1)	Churchill	Manitoba	Bad Cache Rapids Group	Ordovician	III_A/III_B	Upper Ordovician		x	x		III_B		20,2	"Mature / Immature"
CN 241		Albany River (ACC.33.2, 34.1, 34.2, 34.3)	The Albany Forks	Ontario	Kenegami River	Silurian	$I_A - V_A$	"Ord.to Silur."		x			III_A	R_A	24,5	"Mature / Immature"
242					" "	Silurian		--		x			I_B	Ligneous area		
259					" "	Silurian	$I_A - V_A$	"Ord.to Silur."		x			I_B			
258					" "	Silurian		--		x			I_B			
260					" "	Silurian		--		x			$I_B - II_A$			
257					" "	Silurian		--		x			$I_B - II_A$			
256					" "	Silurian		--		x			I_A			
255					" "	Silurian		--		x			I_A			
254					" "	Silurian		--		x			I_B			
250					" "	Silurian	II - V	Upper Ord.		x			I_B			
249					" "	Silurian		to Silurian"		x			I_A			
253					" "	Silurian		--		x			I_B (II_B?)			
252					" "	Silurian		--		x			Undet.			
251					" "	Silurian	$I_A - V_A$	"Ord.to Silur."		x			I_B		21	
248					" "	Silurian		--		x			I_A			
247					" "	Silurian		--		x			II_A	I_A		
300	8	Sextant Rapids Abitibi River (ACC. 42.01 B)	Coral Rapids (Moose River Basin)	Ontario	Sextant	Dévonian		--		x			I_B	Ligneous area		
303					"	Dévonian	2 - 11 S_r	"Silur.to Dev."		x		x	I_A			
299					"	Dévonian	10 - 11 S_r	"Famen.to Carb"				x	I_A		$\boxed{7}$	"Senile ? "
301					"	Dévonian		--		x			I_A		28	"Immature"
298					"	Dévonian		--					III_A (?)	R_A (?)		
CN 658	13	Mansel Island (ACC.78.01)	Mansel Island	NW. Territories Dist^t. of Keewatin	Ekwan River	Silurian		--		x			III_A *	R_A		
CN 787	18	NW. of Coral Harbour (ACC. 83.1.5)	Southampton Island	NW. Territories District of Keewatin	Bad Cache Rapids Group	Ordovician	I_b	Middle to	x	x	x		II	I_A / R_A	25,3	"Mature / Immature"
786					" "	Ordovician	I	Upper Ord.	x	x	x		$II_B - III_A$ *		$\boxed{7}$	
785					" "	Ordovician	I_b	"	x	x	x		$II_B - III_A$ *		23,6	
784					" "	Ordovician	I_a	"	x	x	x		II		24,6	
783					" "	Ordovician	I	"	x	x	x		$II_B - III_A$ *		$\boxed{11,3}$	
782					" "	Ordovician	I	"	x	x	x		II		28,6	
CN 921	17	N. Coats Island (ACC.79.7A)	Coats Island	NW. Territories Dist^t. of Keewatin	Ekwan River	Silurian	II	Upper Ord.	x	x	x		I_B	Ligneous area	$\boxed{16}$	"Mature"
CM 3	15	N.E. Coats Island (ACC. 79.2.4)	Coats Island	NW. Territories Dist^t. of Keewatin	Severn River	Silurian		--		x			I_A *	Ligneous area		"Immature"
4					"	Silurian		--		x			III_B	R_A	28,5	
CM 52	20	Area N.NE of the Mouth of the Rocky Brook (ACC.81.0.1)	Southampton Island	NW. Territories Dist^t. of Keewatin	Bad Cache Rapids Group	Ordovician	I_b	Middle - Upper	x	x	x		II	I_A	20,3	
CN 739					" "	Ordovician	I	Ordovician "	x	x	x		Undet.		$\boxed{18,7}$	"Mature"
CM 123	21	Sixteen Mile Brook (SW of Coral Harbour) (ACC. 81.0.9)	Southampton Island	NW. Territories Dist^t. of Keewatin	Ekwan River	Silurian		--		x			III_B *	R_A		
122					"	Silurian		--		x			III_A *			
121					"	Silurian		--		x			III_B *			
120					"	Silurian		--		x			III_A *			
CM 142	22	"The Points" (ACC. 83.4.3)	Southampton Island	NW. Territories Dist^t. of Keewatin	Ekwan River "	Silurian		--		x			III_A *	R_A		

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S. RUEFF _ Ph. ARTRU _ SUMMER 1968

NOTE R/ST No 470 / 69

SOGEPET AQUITAINE KASKATTAMA PROV # 1
BIOSTRATIGRAPHY AS OF 25 - 8 - 1969

PL. 4

LEGEND

D15.215 / D 97.193 Biozone defined by overlap

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RESULTS OF THE PALINOPLANKTOLOGICAL ANALYSES
STRATIGRAPHY PA - CH - MV

SKETCHES

PL. 6

LEGEND :

*	Area with medium to high content in C.O.M. (colloid organic matter).
$\boxed{MV}$	Mature section of the carbonization scale.
--	Undetermined sample.
D	Denticulae - Scolecodont.
Sr	Spore.
Cz	Chitinozoa.
Hy	Achritarch - Hystrichosphere
UP-PA	I to III : palynoplanktological interval from Kaskattama well n. 1. Hy unit : unit of the general scale of Acritarchs. Sr unit : unit of the general scale of Spores.

Sample Number	Sketch Number	Name of the Sketch	Area	Province	Group and Formation	STRATIGRAPHY			Microfos.				Organic Environment		Degree of Carbonization	
						Field Hypothesis	UP - PA	Laboratory Hypothesis	Cz	Hy	D	Sr	Unit	Area	MV Measurements	Interpretation
CN 149		Area South of Winisk Winisk River (ACC. 9.35)	Winisk	Ontario		Pleistocene	I	Mid. to Up. Ordovician		x			I_B	L_A	29,5	"Immature"
CN 205		Attawapiskat (ACC. 23.1.2)	Attawapiskat	Ontario	Ekwan River	Silurian	I_a	Middle-Upper Ordovician + Silurian limit		x			III_A	R_A	29,8	"Immature"
204					" "	Silurian	I_b-II+III_b/IV			x			II_B - III_A		34,4	
CN 236		Albany River (ACC. 25.02)	Ogoki	Ontario	Ekwan River	Silurian		--		x			II_B *	I_A	25	"Mature/Immature"
CN 288		Grand Rapids			Kwataboahegan et Corals	Devonian	9-10 S_r	"Frasnian/Fam."		x		x	III_A *		$\boxed{19,4}$	
287		Mattagami River	Ranoke	Ontario	Rapids Member	Devonian	10-11 S_r	"Famen.to Carb".		x	x	x	III_A *	R_A	$\boxed{16}$	"Mature"
286		(ACC. 43)	(Moose River Basin)		" "	Devonian	9-11+20-27H_y	"Frasn./Fam."		x		x	III_B *		$\boxed{19,5}$	
CN 321					Stooping River	Devonian	7 S_r+20-24H_y	"Givetian"	x	x		x	III_A *		21	
322		Abitibi River			Kwataboahegan	Devonian	10-11 S_r	"Fam.to Carb."				x	II_B -III_A *		$\boxed{14,8}$	
329			Ranoke		Stooping River	Devonian	5-14S_r+7-31H_y	Mid.to Up.Dev.		x		x	II_B -III_A *		$\boxed{15,5}$	"Mature"
327					" "	Devonian	9-11+7-31	Up.Devonian		x		x	III_B *	R_A	24,4	
326			(Moose River		" "	Devonian		--		x			III_B *		$\boxed{19}$	
324			Basin)	Ontario	" "	Devonian	3-10+7-32	Devonian		x		x	III_B *		$\boxed{18,8}$	
323		(ACC. 51.1, 51.2, 51.3)			" "	Devonian	7-11+24-32	Mid.to Up.Dev.		x		x	III_B *		29,3	
338		Long Rapids and Williams Island			Kwataboahegan et Corals Rapids Member	Devonian	20-27 H_y	Devonian		x			III_A *			
333					Kwataboahegan	Devonian		--		x			I_B - II_A			
334					" "	Devonian		--		x			II_B -III_A			"Immature"
336					Stooping River	Devonian	19-31 H_y	"Devonian"		x			II			
332					" "	Devonian		--		x			I_A			
339					" "	Devonian	9-11S_r+7-32H_y	Up.Devonian		x		x	III_A *		24,6	
335					" "	Devonian	5-14S_r+19-31H_y	Mid.to Up.Dev.		x		x	II		33,3	
CN 340		Abitibi River	Moose River		Stooping River	Devonian	10-12 S_r	Fam.to Carb.				x	II_B -III_A		37	
347		(Devonian of Moose River	(Moose River	Ontario	Moose River	Devonian		--		x			III_A	I_A / R_A		"Immature"
348		Area) (ACC. 481 à 483)	Basin)		?	Cretac.to Pleist	I_a	Mid.to Up.Ord.		x			II_B -III_A		29	
CN 455					Ekwan River	Silurian	I_a - III_a	Mid.to Up.Ord.	x	x			II	I_A	26,6	
462					Ekwan River	Silurian	II	Up. Ordovician	x	x			II		31,2	"Immature"
463					" "	Silurian	II	" "	x	x			I_B		32,6	
464					" "	Silurian	II - III_a	" "	x	x			I_B	L_A	23,6	
467					Severn River	Silurian	II - V_a	"Ord.to Silur."	x	x	x		I_B - II_A		27,5	
466		Harricanaw River			" "	Silurian	III_b	Up.Ordovician		x	x		I_B	I_A / L_A	21,3	
488					Severn River	Silurian		--		x			I_B - II_A		21,5	
483			Harricanaw		" "	Silurian	9 - 13 S_r	Up.Dev.to Carb.		x			I_B		25,5	
482					" "	Silurian	10-11S_r+7-31H_y	"Famennian"		x		x	III_A *	R_A	23	
481		Middle Silurian Complex		Quebec	" "	Silurian		--		x			II			
480					" "	Silurian		--		x			II	I_A	24,8	
479			River		" "	Silurian		--		x			I_A	L_A	23	"Immature"
478					" "	Silurian	I_a - V_a	"Ord.to Silur."		x			III_A		28,2	
477		(ACC. 64.01 to 64.10)			" "	Silurian	II -III_b	Up. Ordovician	x	x	x		III_B *		30,4	
476					" "	Silurian	III_a	" "		x			III_B	R_A	30,1	
475					" "	Silurian	I_b -III_b	" "		x			III_B *			
471					" "	Silurian		--		x			Indét.		22	
474					" "	Silurian		--		x			I_A		29,2	
473					" "	Silurian		--		x			I_A	R_A		
472					" "	Silurian		--		x			I_A			
470					" "	Silurian		--		x			Indét.			
CN 717		In the Areas of Renny, Ruin and Bear cove points (ACC. 80.2.1)	Southampton Island	NW. Territories Dist^t of Keewatin	Ekwan River	Silurian		--		x			II	I_A		
CN 800		NW. of Coral Harbour, Southampton Island (Lower part of the Paleozoic Section) (ACC. 81.1.7 to 81.1.8)	Southampton Island	NW. Territories Dist^t of Keewatin	Churchill River Group	Ordovician	I_a -III_a	Mid.to Up.Ord.		x			III_B *		23	
903					" "	Ordovician		--		x			III_B *	R_A		
904					" "	Ordovician		--		x			III_B *			"Mature"
790					Churchill River Group	Ordovician		--		x			III_B *		$\boxed{17}$	
Isolated Samples																
CN 271						Cretaceous		--		x			I_A		30,8	"Immature"
272						Cretaceous		--		x			I_A			
273						Cretaceous		--		x			I_B	L_A		
274						Cretaceous		--		x			Indét.			
275						Cretaceous		--		x			I_B			
295						Cretaceous or Pleistocene		Low to mid.Dev. (7-26 Hy + 7-9 Sr)		x		x	II_B - III_A	I_A	29	"Immature"
296						Cretaceous or Pleistocene		Up. Devonian (20-27Hy + 9-11Sr)		x x		x x	II		23,8	"Mature/Immature"
492						Silurian		Up.Silur.-Mid. Dev.(17-23 Hy+1		x		x	II	I_A		
493						Silurian		--		x			I_B	L_A		

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STRATIGRAPHICAL AND GEOGRAPHICAL DISTRIBUTION OF THE SILURIAN MICROFAUNAL BIOZONES

PL 7

Area	Formation	Provisional Biozones Conodonts	Ostracods	Fish (Scales)
CHURCHILL	Ekwan		1	
FORT SEVERN	Ekwan & Ekwan/Attawapiskat		2	
----	----			
[illegible]	Ekwan & Ekwan/Attawapiskat	a	3a	
ATTAWAPISKAT	Ekwan		3a,3b,4	
OGOKI	Ekwan		3a, 3b	
[illegible]	Severn	d		E_1 a E_2 (E_1 ?)
	Severn/Ekwan	b_1	5c	E_2
	Severn		5d	
	Ekwan			
	Ekwan	b_2	5b	E_1
	Ekwan	c	5a 4	
----	----			
[illegible]	Ekwan			
COATS ISLAND	Ekwan	super- posed e_1		

DATATIONS

Ostracods (Beyrichiides):

Llandovery probable : 3b, 4, 5abcd, 3a ?
(Llandovery~Alexandrian (Albion) + Niagaran inf. (Clinton)
Clinton probable 4
(Jupiter Fm ?)

Conodonts:

Lower Lower Silurian to Middle Silurian

Fish:

Llandovery - Wenlock
(Alexandrian - Niagaran)

Comments and comparisons with Kaskattama No. 1 Well:

Kaskattama 1
- Ostracods: isolated data, only 2 species occuring also in the CN series (from 2036' to 1500') - No extracted Beyrichiidae
- Conodonts: isolated data; different allocations from the CN series
- Fishes: no extracted element

Comments

Fauna very close in age
1) b_1 - b_2
2) e1 - e2
3) 3a - 3b
4) 5a, 5b, 5c, 5d
5) E1, E2

Stratigraphical equivalence

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RESULTS OF THE ANALYSES OF THE EXTRACTED MICROFAUNA STRATIGRAPHY ENVIRONMENT

AREA OF CHURCHILL - FORT SEVERN - WINISK

PL. 8

Sample Number CN	[illegible]	Number of Section/ Sketch	Name of Section/ Geological Sketch	Area	Province	Level selected for microfacies analysis: Conodonts	Level selected for microfacies analysis: Ostracods	EXTRACTED MICROFAUNA AND ENVIRONMENT: Conodonts	Ostracods benth.: Normal size	Ostracods benth.: Leperditiidae	Ostracods benth.: Beyrichiidae	Ostracods: Pelagic entomozoids	Tentaculita	Fish and Phosphated Fragments: Phosphated fragments	Cf. Conularia trentonensis	Conularia ?	Fish E : scales D : teeth	Misc.	Environment	STRATIGRAPHY: FIELD HYPOTHESIS: AGE	FIELD HYPOTHESIS: Group / Formation	AGE AND CORRELATION ACCORDING TO EXTRACTED MICROFAUNA: Conodonts	Ostracods	Fish and other phosphated fragments	Tentaculites	Laboratory Hypothesis regarding age	CORRELATIONS: Kaskattama	CORRELATIONS: Hudson Bay samples
28		Section 2	Surprise Creek	Churchill	Manitoba		o	–						X						Ordov.	Churchill			Ordov. ?		Ordov. ?	2907-2317?	
23		"	Churchill River	"	"		o		o											"	"							
30		Section 3	Chasm Creek	"	"		o	–												"	"							
33		"	Churchill River	"	"		o	c								X			Open Sea	"	"			Ordov.		Ordov.	2907-2317?	
40		Section 4		"	"	o	o	–	o											"	"							
37		"	Red Head	"	"	o	o	c											Open Sea ?	"	"							
36		"	Churchill River	"	"	o	o	–												"	"							
64		Section 5	Owl River	"	"			c		L									Open Sea? littoral ?	Mid.Silur.	Ekwan		(Fauna) (1)					
54		"	"	"	"					L										"	"							
52		"	"	"	"		o			L										"	"							
47		"	"	"	"		o	–	o											"	"							
46		"	"	"	"		o		o											"	"							
81		Sketch ACC.11	Shore line between Cape Churchill & Nelson River				o	–												"	Ekwan							
93		Sketch ACC.28.31	Upper Severn River	Fort Severn	Ontario		o	c											Open Sea?	"	Ekwan	~CN 122 125	(Fauna 2)					
103		" 28.32	"	"	"			–	o	L										"	"/Attaw.							
102		" "	"	"	"		o	–	o											"	"/ "							
129		Sketch Area South of Winisk	Mishamattawa	S.Winisk	Ontario	c		c											Open Sea	"	Ekwan	~CN 93? 122-125? ?						
131			"	"	"		o	–	o											"	"							
122		"	"	"	"		o	c	o	L									Open Sea	"	Ekwan	(faune a) ≅ SP 23	(Fauna 3a)					= CN 194
125		"	"	"	"		o	c		L	B									"	"/Attaw.	Probable, ~ CN 93	(Fauna 3a)					
132		"	Winisk	S.Winisk	Ontario	c		c												"	Ekwan/Attaw.							
148		"	"	"	"		o	c	o										Open Sea?	"	Ekwan		(Fauna 3a?)					Close or equiv. CN 122 - 125 - 194?
135		"	"	"	"		o	–												"	Ekwan/Attaw.							
155		"	Shamattawa R.	"	"	c?		c											Open Sea?	"	Ekwan							

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JAMES BAY AREA

PL. 9

Sample No	Azoic sample	Number of Section/ Sketch	Name of Section / Geological Sketch	Area	Province	Level selected for microfacies analysis: Conodonts	Level selected for microfacies analysis: Ostracods	EXTRACTED MICROFAUNA AND ENVIRONMENT: Conodonts	Ostracods benth.: Normal size	Ostracods benth.: Leperditiidae	Ostracods benth.: Berychiidae	Ostracods: Pelagic Entomozoids	Tentaculita	Fish and phosphated fragments: Phospated fragments	Cf. Conularia trentonensis	Conularia ?	Fish E: scales D: teeth	Misc.	Environment	STRATIGRAPHY: FIELD HYPOTHESIS: AGE	FIELD HYPOTHESIS: Group / Formation	AGE AND CORRELATION ACCORDING TO EXTRACTED MICROFAUNA: Conodonts	Ostracods	Fish and other phospated fragments	Tentaculites	Laboratory Hypothesis regarding age	CORRELATION: Kaskattama	CORRELATION: Hudson Bay samples
18		Sketch 22.1.1	Ekwan Riv.& Attawa-piskat	Attawapiskat	"		o		o	L	B									"	Ekwan		Silur. (Fauna 3b) (Llandov. probable)					Close or equiv. CN 122, 125, 194
195		"	"	"	"	c		c											open sea ?	"	"							
[illegible]		"	"	"	"		o	c	o										open sea ?	"	"	~CN 122,125? 93 ?						
[illegible]		"	"	"	"		o	c	o	L									open sea ?	"	"		(Fauna 3a)					= CN 122, 12[illegible]
[illegible]		"	"	"	"		o		o											"	"							
[illegible]		"	"	"	"	c		c	o		B								open sea ?	"	"							
[illegible]		"	"	"	"			c	o		B									"	"							
[illegible]		"	"	"	"		o	c	o											"	"	~CN 122						cf. Sch[illegible]
202		"	"	"	"				o	L	B		T							"	"					?		
203		"	"	"	"		o	c	o										open sea	"	"				Silurian			
204		"	"	"	"				o		B		T						open sea ?	"	"				Silurian			
234		Section 6	"	Port Albany	"		o	c	o	L?				×			D		open sea ?	Devo.	Stooping Riv.	Devonian						
220		"	"	"	"	c		c											open sea ?	"	"	Devonian						
219		"	"	"	"				o											"	"							
[illegible]		"	"	"	"				o											"	"		(Mid) Devon. (Fauna 10)					
[illegible]		Sketch 25.01	Ekwan River	Ogoki	"		o		o											Silur.	Ekwan						Close 1786-1790! ?	~CN 194, 19[illegible], 198 122, 125
244		"	"	"	"	c	o	c	o										open sea	"	"	Kaskattama Fm ?	(Fauna 3a-3b)					
[illegible]			Albany River						o				T					Characae Crinoids Spicules	Very littoral (Characae)	Silur.	Ekwan		(Mid) Devon. (Fauna 11)					~CN 241, 242 (2[illegible], 2[illegible])
[illegible]																												
241		Section 7		The Albany Ports	""								T					Crinoids Characae Foram.?	Very littoral (Characae)	Silur.	Kenogami Mid. Member		(Fauna 11)			Mid.Devon.	Remark : Middle Kenogami = Middle to Upper Devonian by palynology at Kaskattama	CN 23[illegible] (2[illegible],2[illegible])
242		"		"	"															"	"							
259		"		"	"															"	"							
258	Az	"		"	"															"	"							
260	Az	"		"	"															"	"							
257	Az	"		"	"															"	"							
[illegible]		"		"	"													Crinoids Spicule Crinoids		"	"		(Fauna 11?)			Mid.Devon. probable		~CN 23[illegible],241,242
[illegible]		"		"	"															"	"							
[illegible]		"		"	"									×						"	"							
[illegible]	Az	"		"	"															"	"							
[illegible]	Az	"		"	"															"	"							
[illegible]	Az	"		"	"															"	"							
[illegible]	Az	"		"	"															"	"							
[illegible]	Az	"		"	"															"	"							
[illegible]	Az	"		"	"															"	"							
[illegible]	Az	"		"	"															"	Lower Member							
[illegible]	Az																											
[illegible]	Az																											
[illegible]	Az																											
[illegible]	Az																											
[illegible]	Az		?	?																Devon.	Stooping							
[illegible]									o											Devon.	Kwatabohegan		(Mid.?) Dev. (Fauna 14)					
[illegible]									o		B?									"	"		(Mid.?) Dev. (Fauna 12)					
[illegible]	Az																											
[illegible]	Az	Pleistoc.																										
332				Abitibi River														Sulfates	Confirmed									
32[illegible]												Ent.						Megaspores	Open sea littoral	Devon.	Stooping		Up.Devonian					
32[illegible]								c										Megaspores	Open sea littoral	"	"							
[illegible]																		Megaspores	Very littoral	"	"							
[illegible]								c										Megasp. ?	Open sea littoral	"	"							
[illegible]								c										Megaspores	Open sea littoral	"	"							
[illegible]									o										Lagoonal Ostracod	"	Kwataboahegan		Mid.Devon. = Traverse Gp (Lower Gravel Point Fm ?) (Fauna 13)					
[illegible]	Az		Grand Rapids Mattagami River																	"	"					Lower Ord.? (reworked)		
[illegible]		Sketch 64.01to10	SE Corner Moose River Basin	Harricanaw River	Québec									Large		?	E		Coastal fish	Silur.	Severn			Llandovery Wenlock Fauna 5 (G 1 ?)				
[illegible]		"		"	"			c									E		Open sea littoral ?	"	"							
[illegible]		"		"	"			c											Open sea littoral	"	"							
[illegible]		"	SE	"	"				(o)					Large			E			"	"							
479		"		"	"				c	(L)								Serpule	"Intertidal"	"	"	Fauna d						[illegible]
47[illegible]	Az	"		"	"															"	"							
477		"		"	"			(c)											open sea	"	"							
[illegible]		"		"	"			(c)	o										open sea	"	"							
[illegible]		"		"	"			(c)											open sea ?	"	"							
474	Az	"		"	"															"	"							
473	Az	"		"	"															"	"							
472	Az	"		"	"															"	"							
471	Az	"		"	"															"	"							
47[illegible]		"		"	"													Serpule	~ "Intertidal"	"	"							[illegible]
[illegible]		"		"	"	c?		(c)	o								2		open sea	"	Severn + Ekwan characteristics	(Fauna b1)						
[illegible]		"		"	"		o	c	(o)		(E)			Small		!	(E)		Open sea (?) littoral (fish)	"	Severn		Llandov.prob (Fauna 5c)	Llandovery Wenlock				
[illegible]		"		"	"													Arenaceous Foram.		"	"							
[illegible]		"		"	"				o											"	Severn + Ekwan characteristics							
462		Sketch 64.01to10		[illegible]	[illegible]															Silur.	[illegible]		Silur. (Llandov prob (Fauna 6)					
463		"		R					(o)											"								
464		"					o													"								
460					"				o										open sea	"	"							
461														Medium		!	(O)		Coastal (fish)	"	"		Llandov prob (Fauna b)					
455		"		"	"									Large		!			open sea	"	"		Llandovery prob (Fauna b)					
456		"		"	"															"	"							
457		"		"	"			(c)						Large			(E)		open sea	"	"	(Fauna b2)						
451				"	"			c	o										open sea	"	"		Llandovery prob (Fauna b)					
449				"	"	c		c	o					Large		!	?		open sea	"	"							
448		"		"	"															"	"							
445		"		"	"			c											open sea	"	"							
444		"		"	"				o										open sea	"	"	(Fauna 5)	Clinton prob Llandovery prob (Fauna [illegible])					= [illegible] CN 200 - 204
442			NW	"	"									×						"	"							
437				"	"					L	B								open sea	"	"		Llandovery (Fauna 5a)					

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NORTHERN ISLANDS

PL. 10

						EXTRACTED MICROFAUNA AND ENVIRONMENT														STRATIGRAPHY								
						Level selected for microfacies analysis			Ostracods, benth.					Fish and Phosphated Fragments				Misc.	Environment	FIELD HYPOTHESIS		AGE AND CORRELATION ACCORDING TO EXTRACTED MICROFAUNA					CORRELATIONS	
Sample No CN	Azoic sample	Number of Section / Sketch	Name of Section / Geological Sketch	Area	Province	Conodonts	Ostracods	Conodonts	Normal size	Leperditiidae	Berychiidae	Pelagic entomozoids	Tentaculita	Phosphated fragments	Cf. Conularia trentonensis	Conularia ?	Fish scales teeth			AGE	Group / Formation	Conodonts	Ostracods	Fish and other phosphated fragments	Tentaculites	Laboratory Hypothesis regarding age	Kaskattama	Hudson Bay samples
[illegible]	A_z	[illegible] 11	Missisicabi River																	Silur.	Ekwan							
[illegible]	A_z	"	"																	"	"							
[illegible]		Section 11		Mansel Island	NWT	c														Silur.	Ekwan							
639		"		"	"		o		o	L			T							"	"							
638		"		"	"		o		o											"	"							Close [illegible] 2-2[illegible]
631		"		"	"		o		o											"	"							
621		"		"	"	c?	o		o	L	(Large size)									"	"		(Fauna 6)					
660		Section 13					o																					
[illegible]	A_z	"				—	—		—																			
668		"					o																					
672		"					o																					
717	A_z	Sketch [illegible] 2.1		Southampton Island	NWT															Silur.	Ekwan							
739		Section 20		"	"			c	◎										open sea ?	Ordov.	Bad Cache Rapids	Ordov.	(Fauna 7)					
787		Section 1[illegible]	[illegible] Coral Harbour	"	"				—											"	"							
786		"	"	"	"				—											"	"							
[illegible]		"	"	"	"				—											"	"							
[illegible]		"	"	"	"			c	—											"	"							
[illegible]		"	"	"	"			ⓒ	o					x						"	"		(Fauna 7)					
[illegible]		"	"	"	"			ⓒ	o						x	x				"	"	Ordov.	"				2[illegible]-2[illegible]	
[illegible]		Section 17	North Coast Island	Coats Island	NWT															Silur.	Ekwan							
[illegible]		"	"	"	"	—	T?	c	—											"	"	Silur.?						
910		"	"	"	"															"	"							
909		"	"	"	"															"	"							
908		"	"	"	"															"	"							
915		"	"	"	"	—	o	c	o											"	"							
914		"	"	"	"															"	"							
913		"	"	"	"	—	o	c	o	L									open sea	"	"	Silur.?						
912		"	"	"	"															"	"							
[illegible]		"	"	"	"															"	"							
[illegible]		"	"	"	"	—	o	c	o										open sea	"	"	Silur.? (Fauna 2)						
923		"	"	"	"															"	"							
[illegible]		"	"	"	"															"	"							
927		"	"	"	"															"	"							
[illegible]		"	"	"	"	—	o	c	—										open sea	"	"	Silur.?						
[illegible]		"	"	"	"															"	"							
921		"	"	"	"				—											"	"							
920		"	"	"	"															"	"							
919		"	"	"	"															"	"							
918		"	"	"	"															"	"							
917		"	"	"	"	—	o	c	—										open sea	"	"	(Fauna e1)						
929																												
[illegible]		Section 1[illegible]	"	"	"															"	"							
[illegible]		"	"	"	"															"	"							
[illegible]		"	"	"	"															"	"							
935		"	"	"	"															"	"							
932		"	"	"	"															"	"							
931		"	"	"	"															"	"							
940		"	"	"	"															Ordov	Bad Cache R.							
939		"	"	"	"															"	"							
[illegible]		"	"	"	"			—	o	L										"	"							
[illegible]		"	"	"	"															"	"							
947		Section 15	Coats Island	"	"															Silur.	Ekwan							
946		"	"	"	"															"	"							
[illegible]		"	"	"	"															"	"							
945		"	"	"	"				o	L										"	"							
944		"	"	"	"															"	"							
950		"	"	"	"															"	"							
949		"	"	"	"															"	"							
943		"	"	"	"															"	Severn							
942		"	"	"	"															"	"							
941		"	"	"	"															"	"							