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PROVISIONAL REPORT ON THE FAUNAL SUITES
COLLECTED IN THE LOWER MACKENZIE REGION

by
J. R. Armstrong

Room 319, Mackenzie Hall
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1. INTRODUCTION

This report is an attempt to find the significance of fossils in a part of the Lower Mackenzie Region. Fossil collections were made from July 3 to 31, 1968 by an Atlantic Richfield four man surface party. Our party was led by H. C. Raasveldt, and included R. G. McIntosh, G. F. Livraga and myself, J. R. Armstrong. We collected over one hundred samples, from outcrops from 65° to 67° North Latitude, between 126° and 131° West Longitude. The location of collecting sites was marked on Air photographs, which I hope will eventually be listed as a supplement. Samples were listed in four series, according to which of us was in charge of each sampling (see Appendix I). My chief duty in the field at Norman Wells and at Fort Good Hope, was identification of fossils, using as many references as could be gathered before the trip. Of these, Warren & Stelck's (1956) "Devonian Faunas of Western Canada," and an unfinished similar guide book loaned from Dr. D. W. R. Wilson, were especially useful in the field determination. Most of our suites contained fossils from several zones of each of these books. This indicates to me that the exact correlations attempted therein are not valid.

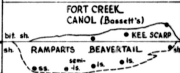
In the weeks since the field trip, I have had to revise my identifications with the flood of new references that became available. This meant discovery of a barrage of synonyms, which I have shown in an alphabetic list of the better known brachiopods and again for the corals. Every year the disputes over taxonomy and nomenclature, with more and more detailed study by specialists, are increasing the confusion. There is a tendency for paleontologists to maintain rigid ideas on stratigraphically correlative zones by separating similar forms from different parts of the section, using taxonomy, without reference to natural variation within a population. Many of my identifications are general, and especially of corals, incorrect, being based on descriptions where these were available, and on photographs. Studies of internal structure are of increasing importance in determining species, so that it is difficult to separate species, especially in corals and stromatoporoids, and even genera, without many months' work. Time does not permit such a thorough review of taxonomy.

The significance of paleontology in the Lower MacKenzie Region has been over-emphasized with regard to relative ages of Devonian formations. Very few useful markers exist.

2. RECOMMENDATIONS

1. Although very few fossils in the Devonian of the Lower MacKenzie Region are good stratigraphic markers, I believe that paleontology can be very useful there in that variation of associations with geography and the presence of recurring zones show environmental influence on the distribution of these ancient organisms. Paleoeecological study of the fossils will show much about the paleogeography. This will give an idea of locations of reefs and other economically important geographic features within the next few years.
2. Paleontology alone would be inconclusive, so lithologic data from other geological studies should also be used.
3. The Geological Survey of Canada reports, resulting from Project Norman will be helpful if they are published soon enough.
4. Microfaunal study, which I will contribute when I take a course in advanced Micropaleontology either this year or next year will provide a check on macrofaunal implications.
5. More exact designation of species which promise to be important to paleoeecological study will be necessary, so in the next few months I will read more references with descriptions of fauna, and will section hundreds of specimens.

Comparison of European and N. American units
and
approximate correlation of formations
in the
Lower Mackenzie region

		EUROPE	NORTH AMERICA	LOWER MACKENZIE REGION
DEVONIAN	UPPER	FAMENNIAN	CONEWANGOAN	IMPERIAL
			CASSADAGAN	
		FRASNIAN	CHEMUNGIAN	
			FINGERLAKIAN	
	MIDDLE	GIVETIAN	TAGHANICAN	 FORT CREEK CANOL (Bossett's) bt. sh. sh. Ramparts Beaver Tail semi. ls. ls. ls. Grandview H. Ramparts Carcajou Goyna HARE INDIAN (shale) Norman R.
			TIOUGHNIOGAN	
		COUVINIAN <i>= Eylesian</i>	CAZENOVIAN	HUME UPPER: rubbly nodular ls., nl. massive ls. LOWER: platy ls.
			ONESQUETHAWIAN	
	LOWER	EMSIAN	DEERPARKIAN	BEAR ROCK (unfossiliferous)
		SIEGENIAN	HELDERBERGIAN	
SILURIAN	U M L	GEDINNIAN		
		LUDLOVIAN	CAYUGAN	FRANKLIN, MT KINDLE, RONNING • (dolomite with silicified fossils)
		WENLOCKIAN	NIAGARAN	
		LLANDOVERIAN	ALEXANDRIAN	

European and North American correlations after Altevogt, and Western Canadian Stratigraphic Atlas

• Fossil Occurrences

4. CORRELATIONS

4.1 SILURIAN

Our three suites of Silurian fauna, from Imperial Anticline, Franklin, and Gibson Ridge show much similarity to the Sandpile Group fauna described by Dr. B. Norford (1962). Other collections from the Mackenzie River Area have been called Niagaran in age. Following Norford's placing of his Northern British Columbia collection around the border of Llandoveryan - Wenlockian, I correlate our fauna as lower Niagaran, as shown in the correlation chart.

4.2 DEVONIAN

Our Devonian collections are from the Middle Devonian but extend possibly into the Frasnian. The Middle-Upper Devonian boundary is under dispute. Our fossils simply add to the problem. We found two-holed crinoid columnals in the Ramparts Formation, near Airport Creek. These are supposed to be restricted to the Lower Devonian. The finding of such a Lower Devonian fossil does not resolve the dispute over the Middle-Upper Devonian boundary, but shows failure of another index fossil.

Spirifer strigosus, an Upper Devonian species, occurs in our R-37 (West Airport Creek) sample of the Ramparts Formation with several apparently Givetian species, including Reticulariopsis franklinii (see synonymies) and Atrypa nasuta.

Allanaria allani, supposedly Frasnian, and Atrypa independensis and A. Clarkei, supposedly Givetian, are together in several of our samples, providing that the identifications are correct.

Calvinaria variabilis variabilis, supposed to be Frasnian, has been found by H. C. Bassett and others, and by ourselves, in a thin bedded marl which we placed in the Hume Formation, on the north flank of Carcajou Ridge. The sample shows affinities to the Hare Indian Formation, but is also very similar to the Lower Hume, as we have defined it, in the Imperial Anticline. Both the Hume and the Hare Indian are undisputed Middle Devonian. Leiorhynchus optimum, described and illustrated by Crickmay (1963), is very close in appearance to Calvinaria. Some of our specimens are similar to Crickmay's species, while others seem to belong to McLaren's C. variabilis variabilis. Leiorhynchus optimum is very similar also to L. awokanak. This sample appears to catch Leiorhynchus and Calvinaria in the act of divergence.

Much detailed correlation has been done, using what were thought to be sharply defined, stratigraphically limited species. Several species may continue their usefulness as stratigraphic guides, but

evolution is not the only variable, as has been assured in setting up the fine zones. The best known guide fossils in this area are now found to have much wider ranges than they were thought to have originally. They restricted geographically rather than stratigraphically.

The associations of faunas also vary with geography as well as stratigraphy, so that a zone defined by a faunal association may well mark the facies more definitely than the stratigraphic position.

Stringocephalus is used to mark the Givetian. We have one occurrence in the Imperial Anticline which is possibly Couvinian. Crickmay's studies of the genus have yielded some nine species, each restricted to thin horizons within the Givetian Beavertail, Kee Scarp and Ramparts Formations and their equivalents (such as the Elk Point). We have collected at least four of Dr. Crickmay's species, finding S. aleskanus and S. astetius very close to his established ranges (1963 and 1968). In the Imperial Anticline, though, we collected S. Axius not only in the Kee Scarp or Ramparts Formation but also in the Lower Hume. If our Lower Hume were Hare Indian, which it resembles too, the range of our S. Axius would come within the Givetian range assumed for Stringocephalus. However, the outcrop position indicates that it is Lower Hume (Couvinian in age).

Leiorhynchus castaneum (see synonymies) was originally used to mark the lower Fort Creek Formation, which was interpreted as Frasnian. The presence of Tentaculites and Styliolina was used to show that it was Upper Devonian. Now, however, these pteropods have been found throughout the Middle Devonian. Most recent interpreters of the Mackenzie area stratigraphy believe C. castaneum to mark the top of the Hume (or base of the Hare Indian), rather than the base of the lower Fort Creek. Bassett (1961) (1968) and Crickmay (1960, 1962) believe that there exist two zones, a lower castaneum zone, and a higher hippocastanea zone, marked by a similar but larger species, Leiorhynchus hippocastanea, whose type locality is in the Ramparts Formation of the Carcajou Ridge. In this they have a number of followers. Storey (1961) shows one zone, in the Lower Fort Creek, as earlier workers had put it, riding a vast unconformity. He claimed that the strata had been misinterpreted as belonging to several formations, but that they represent a facies of the lower Fort Creek. McLaren (1962) claims that L. castaneum and L. hippocastanea are one species, which marks the basal Hare Indian and equivalent Nahanni and Pine Point Formations further south, but which seems to extend stratigraphically higher at Carcajou ridge. I agree with McLaren that they are one species, but have identified that species from material collected in the Ramparts Formation of the Gossage River and Q Creek - Payne Creek, areas northwest of Carcajou Ridge by about 100 miles. Storey's interpretation is ruled out by our finding of L. castaneum in

Upper Hume (M27, M28) and upper Hare Indian Formations (M34) in one section, namely Powell Creek. L. castaneum thus loses its sharp definition as a marker. I believe that it may be useful in determining the paleoecology.

Reticulariopsis franklini (see synonymies) has also been used to mark two fine zones. It often occurs with L. castaneum, but not always. Crickmay (1960, 1962, 1963, 1968a) mentions two zones 600 to 1000 feet apart marked by similar species. R. franklini he believes to mark the approximate Hume - Hare Indian contact and its big brother, R. timetea, a separate zone in the Ramparts Formation of Carcajou Ridge. He states the two species do not occur together. McLaren (1962) claims that the two are one species, such as L. castaneum and L. hippocastanea proved to be. We find the two forms of Reticulariopsis together in both levels, and I agree with McLaren that they are one species.

A few species seem quite well restricted in time, but are also restricted in area. In the northern part of our region, the basal Ramparts Formation and the uppermost Hare Indian Formation are marked by large numbers of Newberria? sp. and Rensselandia laevis (which may be the same species, although less difference in shape separates many brachiopod genera). R. laevis is also present in the Kee Scarp (Ramparts?) Formation at Gayna River. Thus we have R. laevis from Areas 5, 6, 7 and 8 only; and Newberria? sp. only from Areas 6, 7 and 8.

Schuchertella nevadaensis is typical of the lower Hume Formation, wherever the species occurs. We found it in Powell Creek (Area 5) and in the sampled localities of Area 1. The "Atrypa" (see synonymies) which I tentatively identified as "A" cf. bremerensis, occurs throughout the Hume of the "Mosquito" creeks (northeast end of Area 1) and the lower (?) Hume of Powell Creek (Area 5). "Atrypa Arctica" we found only in the upper Hume of: Area 1 (excluding the "Mosquito" creeks); the Mountain River section of Area 4; and the Powell Creek section of Area 5. Elytha undifera we found only in the lower Hume of "Mosquito Creek" and the upper Hume of Powell Creek (Area 5).

The genus Spinatrypa (s.l.) (see synonymies) includes several species which we found only in the Hume, but these have been listed by Crickmay (1967) as having larger ranges, so I will not list them as possible markers.

The corals Billingastrea nevadense and B. verrilli (see synonymies) are generally good Hume Formation markers. They are strange among corals in that they are usually common and easy to recognize. Digonophyllum rectum is a third good Hume Formation index fossil. Certain facies of the Hume apparently do not contain these corals, but most outcrops of definite Hume contain at least some of these species.

Alaiophyllum mackenziense is used by Crickmay (1968a) to separate the Beavertail or Kee Scarp Formation from the Ramparts Formation. We have several specimens which, I believe, belong to this species, all from the Kee Scarp quarry. It might well differentiate the two formations, but I regard its use as limited because it is rare even in the Kee Scarp locality. In other localities, it vanishes in a pile of other species.

Goniatites, which are considered good index fossils have been found in a few scattered outcrops in the region, but are too poorly preserved and too erratic to be useful. Nautiloids, such as Michelinoceras ("Orthoceras") and Gomphoceras, Cyrtogomphoceras and Halloceras? Sp. have large ranges, which restricts their usefulness to paleogeography.

4.3 CONCLUSIONS

1. Our Silurian fauna from the lower Mackenzie Region is equivalent to the Sandpile Group fauna of Northern British Columbia.
2. The boundary of Middle Devonian and Upper Devonian is in or above the Ramparts Formation, but conflicting faunal evidence does not allow exact correlation.
3. We have found a supposed Lower Devonian index fossil (double-holed crinoid columns) in the Middle Devonian, even into the disputed upper boundary.
4. Detailed stratigraphic correlations of the Devonian of the Mackenzie River Region, based on paleontological zonation, are not reliable.
5. Faunal associations in the Middle Devonian (Appendix 2) of the Lower Mackenzie Region vary with geography as well as with stratigraphy, so that delineations of stages in evolution are complicated by paleoecologic influences. The variables governing associations must be studied to solve the significance of the fossils. Some fossils will be more useful in piecing together the paleogeography than they are for the stratigraphy.
6. Usefulness of species as index fossils is limited by conflict as to what constitutes separate species. For example: Leiorhynchus castaneum-L. hippocastaneum; Reticulariopsis franklini - R. timetes. The four species mentioned above were each supposed to mark a zone, but I find two Leiorhynchus species to be one; and the two Reticulariopsis species to be one; so that the zones are unreliable.
7. Stringocephalus seems to have larger range than has been assumed. One species, S. axius we found in apparently Couvinian strata as well as in Givetian.
8. Most species which are restricted in range are restricted very greatly in area.
9. The corals Billingsastrea nevadense, B. verrilli, and Digonophyllum rectum are widely distributed and usually easily recognized in the Hume Formation. They are our best Hume index fossils.

10. Alsiophyllum mackenziense, used by Crickmay to differentiate Beavertail (Kee Scarp) and Ramparts, is too rare and thus too difficult to find, to serve as a definite marker.
11. The Goniatites of the Lower Mackenzie Region are too unevenly scattered and too poorly preserved to serve as index fossils here.
12. Nautiloids could be useful in paleoecology.

5. LIST OF SYNONYMIES

5.1 BRACHIOPODS

ATRYPA

Crickmay (1967) states that no Atrypa has been found in North America, according to the classification of the Treatise on Invertebrate Paleontology. This generic name is so widely used that I will not use the more obscure name, Desquamatia, as Dr. Crickmay has done. Dr. Crickmay does not trust the new classification, but would rather retain Atrypa too.

CALVINARIA VARIABILIS VARIABILIS (WHITEAVES)

1891 Eatonia variabilis, Whiteaves, pp. 233-234, figs. 6, 6a, 7, 9, (non) figs. 8, 8a

EMMANUELLA MERISTOIDES (MEEK)

1956 Martinia? meristoides Meek, Warren & Stelck

1961 Ambocoelia meristoides (Meek), Bassett

1963 Ambothyris meristoides (Meek), Crickmay

1967 Emmanuella meristoides (Meek), Crickmay

1967 Emmanuella meristoides (Meek), Caldwell

Wilson, in his unfinished guide book, calls this fossil Ambocoelia meristoides meristoides.

EMMANUELLA SUBLINEATA (MEEK)

1956 Martinia? sublineata Meek, Warren & Stelck

1961 Ambocoelia sublineata (Meek), Bassett

1967 Emmanuella sublineata, Crickmay

1967 E. Sublineata, Caldwell

Wilson, in his guide book, calls this Ambocoelia Meristoides sublineata.

HADRORHYNCHIA SANDERSONI (WARREN)

1867 Rhynchonella - ? Meek p. 95, PXV fig. 4

1944 Pugnoides sandersoni, Warren, pp. 115-116 pl. II figs. 5, 7

1956 Pugnoides sandersoni, Warren & Stelck Pl. VIII figs. 6-21

1956 Pugnoides solon, Warren & Stelck Pl. IX, figs. 20-21

(Pugnoides solon, as used by Warren & Stelck, suggested as synonym by C. H. Crickmay)

1961 Hadrorhynchia sandersoni (Warren), McLaren pp. 3-14, Pl. I, figs. 4, 5; pp. 56-63, Pl. VII - VIII, fig. 15-16.

LEIORHYNCHUS = NUDIROSTRA

Leiorhynchus awokanak McLaren

1940 (?) Leiorhynchus Sp. A. Merriam, Pl. 8, figs. 18, 19

1956 Nudirostra Sp. (Leiorhynchus Sp. A. Merriam, 1940), Warren & Stelck, Pl. IV, figs. 28 - 33

1962 Leiorhynchus awokanak, n. Sp., McLaren pp. 91-95, Pl. XVII figs. 2-7

LEIORHYNCHUS CASTANEUM (MEEK)

- 1867 Rhynchonella castanea Meek, pp. 93-95, Pl. XIII, figs. 9a-c
 1884 Rhynchonella castanea Meek, Walcott, pp. 153 - 155, Pl. XV, figs. 1, la, 4, 4a
 1952a Leiorhynchus castanea Meek, Crickmay, Pl. 70, figs. 6, 7
 1952b Caryorhynchus castanea Meek, Crickmay, Pl.
 1956 Caryorhynchus castanea (Meek), (Var), W4S, Pl. VIII figs. 29-31
Caryorhynchus castanea (Meek) Warren & Stelck, Pl. IX figs. 12-16
 1960 Caryorhynchus hippocastanea, Crickmay, P. 13, Pl. IX figs. 10-17
 1962 Leiorhynchus castanea (Meek), McLaren pp. 83-91, Pl. XIV, figs. 2-7; XV, 1-11; XVI, fig. 1
 1962 Leiorhynchus castanea (Meek), Crickmay
Leiorhynchus hippocastanea, Crickmay
 1968 Caryorhynchus castanea, Crickmay
 1968 C. caryorhynchus hippocastanea, Crickmay
 Hume, 1954, makes reference to Leiorhynchus castanea and/or Hypothyridina castanea mentioned in the Canol Reports. Warren & Stelck mention a Basiliohynchus castanea; this being probably a printing error. In the J. C. Sproule and Associates 1959 report, J. D. Aitken uses the name Hypothyridina? castanea. H. G. Bassett, 1961, speaks of a Nudirostra castanea zone which he places at the base of the Hare Indian Formation and top of Hume. He did not mention the N. hippocastanea described in Crickmay's 1960 paper but set it aside as a separate unnamed species. The dates are confusing here because Crickmay's 1960 paper was published before Bassett's. Therefore, Bassett could not refer to N. hippocastanea in his paper. Crickmay has maintained his belief in two separate species. In 1962 he again referred to two separate zones, but in 1968 he thinks that both species belong to the same zone. We found a continuous range as to shape and size between the two "species", so our findings support McLaren's. McLaren found the large specimens only at Carcajou Ridge, so that he believed that the stratigraphic position of castanea is higher there than elsewhere. We also found variations in size at Mountain River, Powel Creek, Gossage River, Gayna River and Q Creek.
 Lichtenbelt (1960) distinguished two zones, an upper one marked by Hypothyridina? castanea and Nudirostra castanea, and a lower one marked by Leiorhynchus castanea. This indicates that he was confused in the synonyms.
"Nudirostra" was proposed in 1951 by G. Arthur Cooper and Helen M. Muir - Wood, to replace "Leiorhynchus", which they found to be a junior homonym. Paul Sartenaer (1961) apparently has refuted this, so that the objective synonym "Nudirostra" can again be replaced by "Leiorhynchus". The name is still under dispute, some authors using "Nudirostra" and others using "Leiorhynchus". Crickmay continues with "Caryorhynchus".

NEWBERRIA SP.

Newberria laevis of the Canol Reports (U. Ramparts) has apparently been designated as Rensselandia laevis by subsequent workers. Wilson regards it as R. johanni, previously known, and illustrated by Shimer and Shrock. He shows a typical Rensselandia, with shoulders and a taper toward the anterior. This form we found in upper Hare Indian and Lower Upper

Ramparts Formations at the Ramparts. The most common form in the Upper Ramparts there is flat and egg-shaped with its greatest circumference close to the anterior end. This may still be Rensselandia johanni (laevis), but the shape is more similar to Dielasma and Chetwinothyris. For the time being, I am therefore using the generic name applied by the Canol geologist. Ours is, for lack of more exact terms, Newberria sp.

PRODUCTELLA LACHRYMOSA

The photograph of Productella lachrymosa in Wilson is guide book is a reproduction of Productella sp. illustrated on Plate XXIII, Warren & Stelck, 1967. The description in Shimer and Shrock for the N.Y. Chemung species P. lachrymosa matches our specimens and the photographs published by Warren & Stelck and reproduced by Wilson.

PRODUCTELLA SPINICRISTATA

Productella spinicristata is identical to Spinulicosta stainbrookii in Wilson's guide book. This may therefore be Spinulicosta stainbrooke.

PUGNAX SP.

Pugnax sp. may include several species of one or more genera. Small specimens have been thus designated by comparison with photographs.

PUGNOIDES CALVINI

Pugnoides calvini of our collection may be a variety of Hadrorhynchia sandersoni. Our Pugnoides calvini was tentatively identified from photographs, and should be separated from H. Sandersoni, possibly another species of Hadrorhynchia.

RETICULARIOPSIS FRANKLINII (MEEK), INCLUDING R. TIMETEA

Reticulariopsis timetea (Crickmay) was Warrenella timerea, both names being given by C. H. Crickmay. McLaren (1962) regards it as the same species as Warrenella franklinii (Meek), which has also been classed as Warrenella and later as Reticulariopsis by Crickmay. Warren & Stelck, 1965, call these both Martinia?, as in the Canol Reports, but give each a species name, which was not done in the Canol Reports. Martinia? occidentalis Merriam = Reticulariopsis timetea (Crickmay). Martinia? franklinii Meek = Reticulariopsis (Meek).

Crickmay (1968a) shows the recent history of the synonymy on page 8. In 1960a, he used the name Warrenella timetea to replace Martinia? occidentalis Merriam. In 1962, he referred it to the genus Tingella. Now, he regards it as Reticulariopsis timetea (Crickmay), with Tingella being apparently a synonym for Reticulariopsis. He also refers the former Spirifer (Martinia) franklinii Meek (Martinia? franklinii Meek, in Warren & Stelck, 1956), to the genus Reticulariopsis. In 1953, he had renamed it as Warrenella franklinii (Meek) and in 1962, had changed it to Tingella, with R. timetea. Dr. Crickmay (1968a) states that both species appear to be referable to Reticulariopsis, with R. timetea 600 to 1000 feet higher in the section

than R. franklinii. We have now a small R. timetea or average R. franklinii from the "Beavertail" of Carcajou Ridge (the type locality for R. timetea) and a large specimen, referable to R. timetea, from the Hume-Hare Indian contact near the mouth of Sammon's Creek. With it were other "Warrenella" species, including R. franklinii. The similarity between these two species is so great that I believe, as McLaren does, that they are one species. If they turn out to be different, they must surely mark the same zone, for we have both forms in the "Beavertail" - Kee Scarp collections from Carcajou Ridge, and in the Sammon's Creek collection.

SCHIZOPHORIA AMANA

Schizophoria amana, as identified from D.W.R. Wilson's unfinished guide book is apparently the same species which Warren & Stelck, 1956 call S. cf. mcfarlanei (Meek) (Pl. XVIII, figs. 18-21). We collected a number of specimens which I refer to S. amana, from the Hume, Hare Indian and Kee Scarp formations (See Tables). The species is not restricted to one formation. Hence it is not useful in fine stratigraphic correlations. The occurrence shown by Warren & Stelck (1956) is classed as Frasnian. Possibly the species can be used instead in paleoecology.

SPINATRYPA, GENUS

Genus Spinatrypa Stainbrook, 1951, (sensu lato) Type species:

Atrypa aspera var. occidentalis Hall, 1858.

Crickmay (1967), classifying the Atrypae of Western Canada in his Treatise on Invertebrate Paleontology, separates the species formerly referred to as Spinatrypa into three genera: Carinatina Maliukin, 1930; Invertrypa Struve, 1961; and Spinatrypa Stainbrook, 1951. Whether or not we have Carinatina, represented by C. dysmorphostrata from Mountain River, I cannot tell, since I have not seen pictures or descriptions of it besides what Dr. Crickmay's 1967 report gives. We definitely have Spinatrypa (s.s.) and Invertrypa, although they are hard to separate. Therefore, I use the more common name "Spinatrypa" (s.l.) for all the Atrypae with spinose or coarse reticulate ornament.

SPINATRYPA ANDERSONENSIS (WARREN)

1944 Atrypa andersonensis, Warren,

1956 Atrypa andersonensis Warren, Warren & Stelck, Pl. III, figs. 17-19

1961 Spinatrypa andersonensis (Warren), Bassett.

1967 Invertrypa andersonensis (Warren), Crickmay

SPINATRYPA BOREALIS (WARREN), 1944

1956 Atrypa borealis Warren, Warren & Stelck

1961 Spinatrypa two words borealis (Warren), Bassett

1967 Invertrypa borealis (Warren), Crickmay

SPINATRYPA LATA (WARREN)

- 1944 Atrypa borealis var. lata, Warren
1956 Atrypa andersonensis Warren var., Warren & Stelck, Pl. II, figs. 4-6, is called S. lata in Wilson's unfinished guide book from which I identified this species.
1961 S. lata (Warren), Bassett
1967 Invertrypa borealis var. lata (Warren), Crickmay

SPINATRYPA GAYNAENSIS NORRIS

Illustrated by Wilson (unfinished guide), who reproduced the illustration of Atrypa andersonensis Warren var., Warren & Stelck, 1956, Pl. II, figs. 7-10. Unless it is synonymous to Crickmay's S. coriacea, it is not mentioned in his 1967 revision. If it is S. coriacea Crickmay it is a Spinatrypa sensu stricto.

SPINATRYPA ALBERTENSIS (WARREN) 1944

- 1956 Atrypa albertensis Warren, Warren & Stelck, Pl. XII, figs. 26-28

SPINATRYPA MAScula

Wilson's unfinished guide illustrates this species by reproducing Pl. VII, figs. 11-19, of Warren & Stelck, 1956, where it was called Atrypa cf. mascula Stainbrook.

SPIRIFER (MARTINIA) RICHARDSONI MEEK

= Ambocoelia meristoides richardsoni (Meek) of some authors such as Wilson

WARRENELLA? KIRKI (MERRIAM)

= Martinia? kirki Merriam (Warren & Stelck, 1956, Pl. IV, figs. 25-27) Judging from our specimens and from available photographs, this species appears to be merely a large Emmanuella. Further work should reveal its true identity. In the Middle Devonian of Nevada exist a similar form, designated "Martinopsis" kirki by Shimer and Shrock, but its sulcus is deeper and the cardinal area does not appear as high while the beak is more overturned. This species may be the same as ours, or our "Warrenella" kirki could be a species of Emmanuella. McLaren suggests it to be the Martinopsis or Martinia, of Nevada. I will therefore call it "Warrenella?" kirki, and leave the final decision until further evidence is available.

WARRENELLA SP.

Warrenella sp. refers to former Martinia? species which have been placed in Crickmay's (1953) genus Warrenella, and which have not been removed from this genus. Dr. Crickmay himself is now working on the separation of these species. As the photographs show only subtle differences, I will not try to divide the species. We have specimens from several areas which come from several formations, and they do not in most of these cases "belong" in the established zones of these formations.

5.2 CORALS

BILLINGSASTREA VERRILLI

Billingsastrea verrilli = Phillipsastrea verrilli
Lenz, 1961, includes in this species several growth forms, which have variously been called Billingsastrea verrilli, Phillipsastrea verrilli, Billingsastrea arachne, and Radiastrea arachne. Common in the Hume Formation.

CATENIPORA SIMPLEX (LAMBE), 1899

- 1899 Halysites catenularia var simplex Lambe, pp. 70, 71, 76, 77
1955 Catenipora simplex (Lambe). Buehler, pp. 47 - 48
1962 Catenipora simplex (Lambe), Norford, pp. 33 - 34

COENITES

Coenites = Cladopora of the Canol Reports

CYSTIHALYSITES MAGNITUBUS (BUEHLER), 1955

- 1955 Halysites magnitubus Buehler, p. 68
1962 Cystihalysites magnitubus (Buehler), Norford, pp. 34 - 35

DIGONOPHYLLUM RECTUM (MEEK)

- 1868 Zaphrentis recta Meek, Trans. Chicago Acad. Sci., Vol. 1
P. 82, Pl. II, fig. 1.
1926 cf. Digonophyllum dohmi Volbrecht, Neues Jahrb. f. Min.,
Geol. u. Palsont., B. -B. 55, Abt. B, p. 269, Pl. 13, fig. 1.
1956 Grypophyllum rectum (Meek), Warren & Stelck, pl. ii
1956 cf. Grypophyllum sp., Warren & Stelck, figs. 2, Pl. I, fig. 6
1961 Digonophyllum (Glossophyllum) rectum, Bassett
1961 Digonophyllum rectum, Lenz, pp. 511-512, Pl. II, fig. 98-90

HEXAGONARIA SP.

= Prismatophyllum of Canol Reports, and possibly Acervularia. Field identification of this and other corals are not sufficient to separate species, and for exact identification even to genus, sectioning is necessary. Crickmay (1968b) has renamed several species formerly called Hexagonaria. Lenz (1961) has plates of sections of a number of similar corals, some of which he calls Hexagonaria.

MICROCYCLUS KIRBYI

"Microcyclus" kirbyi is not a typical Microcyclus, but is of the same family. It apparently includes the Combophyllum cf multiradiatum of Warren & Stelck, 1956, Pl. I, fig. 4. Paleocyclus, the name hesitantly applied by Warren & Stelck to "M." kirbyi, has been replaced by Porpites, according to Shimer & Shrock, and has a known stratigraphic range far lower than Microcyclus, although additional work may show the coral of the Hume formation to this genus. In calling it "Microcyclus" kirbyi, I have followed McLaren (1962), and Bassett (1961), originally using Wilson's unfinished guide.

MICROPLASMA

Microplasma cf. M. fongi Yoh, is based on Lenz (1961). Microplasma is a colonial equivalent to Cystiphyllum, and must therefore include C. aggregatum as used by Shimer & Shrock.

THAMNOPORA LIMITARIS

= Favosites limitaris Rominger of Warren & Stelck (1956), Pl. V, fig. 21

ZAPHRENTIS

Zaphrentis? sp. is used as a form genus for some solitary corals. Zaphrentis was used in the Canol reports, but most of the reports do not refer to it. The study of rugose corals requires much detailed work, using sections, which will take more time than is available now.

5.3 TRILOBITES

PROETUS

Proetus refers to a pygidium shaped much like the one of Dechenella McLaren & Norris's 1962 report. Several genera apparently have been grouped with "Proetus".

SCUTELLUM SP.

Scutellum of which we collected several pygidia and glabellae, is the Goldea of the Canol Reports.

5.4 CLAMS (PELECYPODS)

CORNELLITES SP.

= Actinopteria sp.

= Pterinea sp. (spinose, coarse ribbed reticulate ornament)

LEIOPTERIA SP.

= Pterinea sp. (smooth, fine reticulate)

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APPENDIX I

Revised List Of Fossil Suites, By Sample Number

- | | | |
|-----|--|--|
| R 2 | East Mountain
Hume Fm. | <p>a. Favosites sp. A.
Billingsastrea verrilli
Euomphalus Sp.</p> <p>b. Favosites sp. B. (with fine corallites)
Billingsastrea nevadense
Bellerophon ? sp.</p> |
| R 4 | Carcajou Ridge
Kee Scarp Fm. | <p>a. Leiorhynchus castaneum
Productella belanskii
Stringocephalus sp.
'Atrypa' independensis
Spinatrypa macula
Euomphalus sp.
Paracyclas sp.
Mastigospira alata</p> <p>b. Thamnopora? sp.
Reticulariopsis tinetea
Buchelia tyrelli
Euomphalus sp.</p> |
| R 5 | Carcajou Ridge
Kee Scarp Fm.
Nudirostra sp.
Stromatoporoid with
astrophizae
Bryozoa, encrusting | <p>Thamnopora sp.
Thamnopora polyforata
Coenites sp.
Amplexus?

Cyathophyllum</p> |
| R 6 | Carcajou Ridge | <p>a. Paracyclas elliptica
Nudirostra sp.
Mastigospira alata</p> <p>b. Reticulariopsis timetea
abund Leiorhynchus castaneum
 'Atrypa' sp.
 Mastigospira alata
abund Paracyclas elliptica
common Euomphalus sp.
 "Pterinea"</p> |
| R 7 | Carcajou Ridge ? | <p>Stropheminid
Emmanuella meristoides
Emmanuella sublineata
Spirifer (Martinia) richardsoni
'Warrenella' Kirki</p> |

- R 10 Mountain River
Upper Hume Fm.

Billingsastrea verrilli
Lithostrotion sp. B.
Cystiphyllum sp.
Tabulophyllum? sp.
Digonophyllum rectum

Hederella sp.
Crinoid columnals
- R 11 Kee Scarp Fm.
(locality unknown)
- R 13a Silurian
(Imperial Anticline)
- R 13 Lower Hume
(Imperial Anticline)
- R 14
- R 15
- Productella spinicristata
Spinatrypa borealis
Spinatrypa lata
Spinatrypa gaynaensis
Atrypa arctica
Pugnax sp.
Ambocoelia sp.
'Pterinea' sp.
'Trochus' sp.
Bellerophon sp.
Duomphalus sp.
Favosites sp.
Alveolites sp.
Thamnopora limitaris
Coenites sp.
- Coenites sp.
Thamnopora sp.
Spinatrypa sp.
'Atrypa' sp.
'Atrypa' cf. bentonensis
- Favosites favosus
- Emmanuella meristoides
Emmanuella sublineata
Spirifer (Martinia) richardsoni
Warrenella sp.
Productella spinicristata
Schizophoria amana
Pugnax sp.
Spinatrypa borealis
Leiorhynchus awokanak
Cymostrophia sp.
bryozoan
- 'Warrenella' kirki
Leiorhynchus castaneum
Cymostrophia sp.
Camarotoechia sp.
Atrypa clarkei
Trilobite glabellum
- Leiorhynchus castaneum
'Warrenella?' kirki
Pteriid
Placoderm bone

N. Sil. Anticline
Lower H. fm.
Imperial Bay

- | | | |
|-------|--|---|
| R 23 | Silurian
Franklin Anticline | Catenipora simplex
Favosites discoideus
Heliolites cf. H. Megastoma
Favistella sp.
Lithostrotion sp. A.
Cyathophyllum sp.
Algae or strom |
| R 24 | Lower Hume
Franklin Anticline | Productella spinicristata
Favosites sp. A. |
| R 27 | Silurian
Gibson Ridge | Huroneilla sp.
Entelophyllum?
Syringopora sp. A.
Favosites sp.
Heliolites cf. H. megastoma
Cyathophyllum
Catenipora simplex
Cystihalysites magnitabus
Halysites occidens
Favistella sp.
Lithostrotion sp. A. |
| R 30b | The Ramparts
Middle of Black Shale
between Units 3 and 4 | Alveolites sp.
Coenites sp.
Amplexus? sp.
Cystiphyllum sp.
Thamnopora cervicornis |
| R 30c | Top of black shale
The Ramparts | Tabular stromatoporoid
algal mat |
| R 31 | Payne Ck.
(Ramparts Fm.) | 'Newberria'
Rensselandia laevis
Productella belanskii
Productella spiricristata
Cyrtina sp.
Atrypa gregeri
Cymostrophia sp.
Ambocoelia sp.
Proetus
Euomphalus sp.
'Trochus' sp.
Amphipora
Siphonophrentis?
Macgeea?
Coenites sp.
Encrusting bryozoan |

- | | | |
|------|--|--|
| R 32 | <p>Gossage River
(Ramparts Fm.)</p> <p>Warrenella sp.
Cyrtina sp.
Allanaria allani?
Emmanuella meristoides
Eleutherokomma sp.
Atrypa cf. gigantea
Atrypa cf. independensis
Atrypa clarkei
Atrypa cf. owenersis
Athyris sp.</p> | <p>Algae
Stachyodes
Amphipora
Hederella
Encrusting bryozoan
Few Crinoid columnals
Proetus
Thamnopora cervicornis
Coenites sp.
Alveolites sp.
Cystiphyllum
Amplexus?
Goniatite?</p> |
| R 33 | <p>Gossage River
(Ramparts sandstone)</p> | <p>Leiorhynchus castaneum
Leiorhynchus awokanak
Emmanuella meristoides
Emmanuella sublineata
Spirifer (Martinia) richardsoni
Buchelia tyrrelli</p> |
| R 35 | <p>Q Creek (N. of Payne Ck.)
U. Ramparts
Spirifer euryteines?
Eleutherokomma impehnis
Atrypa clarkei
Atrypa gregeri
Atrypa independensis
Atrypa cf. gigantea</p> | <p>Abund. Leiorhynchus castaneum
Abund. Leiorhynchus awokanak
Abund. Emmanuella meristoides
Emmanuella sublineata
'Warrenella' kirkii
Spirifer (Martinia) richardsoni
Productella lachrymosa
Cyrtina sp.
Allanaria? allani
Paracyclas elliptica
Spinatrypa albertensis
Fish bone
Proetus</p> |
| R 36 | <p>Tieda Ck.
Stratified I.S. below
Ramparts I.S.</p> | <p>Rensselandia laevis
'Newberria'
Atrypa cf. hackberryensis
Spinatrypa sp.
Thamnopora cervicornis
Coenites sp.</p> |

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|------|--|--|
| R 37 | <p>West Airport Ci.
(Mackenzie R.) Ramparts Fm.</p> <p>Spirifer strigosus
Reticulariopsis franklinii
Cranaena sp.
Leiorhynchus sp.
Schizophoria sp.
Emmanuella meristoides</p> | <p>Thamnopora limitaris
Thamnopora cervicornis
Hexagonaria sp.
Favosites sp. A.
Siphonophrentis?
Amplexus?
Cystiphyllum
Euomphalus sp.
'Trochus' sp.
Newberria
Rensselandia laevis
Stringocephalus burtini
Atrypa cf. pechiensis
Atrypa cf. hackberryensis
Atrypa cf. clarkei
Atrypa nasuta
Spinatrypa lata</p> |
| R 38 | <p>Mackenzie River,
East of Airport Ck.
(Ramparts Fm.)</p> | <p>Tentaculites
Encrusting bryozoa
Monticulipora?
Spirorbis
Stringocephalus burtini
Atrypa cf. hackberryensis
Atrypa devoniahara</p> |
| M 1 | <p>East Mountain
Landing Port</p> | <p>Coenites sp.
Thamnopora polyforata
Amphipora
Gastropods</p> |
| M 2 | <p>Carcajou Ridge
(Beavertail Fm.)</p> <p>Hypothyridina cameroni
Allanaria allani?
Mytilid
Hederella
Scutellum sp.</p> | <p>Spinatrypa sp.
Stringocephalus sp.
Productella belanskii
Stelckia galearius
Schizophoria Mcfarlanei
Reticulariopsis franklinii
'Warrenella' kirki
Leiothyynchus castaneum
Cyrtina sp.
Emmanuella meristoides
Emmanuella sublineata
Spirifer (Martinia) richardsoni
Eleutherozouma leducensis
Pugnax sp.
Pugnoides calvini</p> |

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|---|---|
| <p>M 3 Carcajou Ridge
Kee Scarp Fm.</p> <p>Euomphalus sp.
Trilobite glabellaum
Stromatoporoid
Bryozoan</p> | <p>Cyathophyllum
Coenites sp.
Thamnopora polyforata
Thamnopora limitaris
Thamnopora cervicornis
Macgeea sp.
Aulopora sp.
Tabulophyllum? sp.
Atrypa devoniana var.
Atrypa cf. owenensis
Atrypa cf. hackberryensis
Schizophoria amana</p> |
| <p>M 4 Kee Scarp Quarry
(A 14)</p> | <p>Gastropods
Atrypa sp.</p> |
| <p>M 5 Carcajou Ridge
(Kee Scarp Fm.)</p> <p>In Sh. above I.S. -
Two small brachiopods,
maybe Douvillina</p> | <p>Paracyclas elliptica
Euomphalus sp.
Buchelia tyrrelli
Atrypa independensis
Atrypa cf. hackberryensis
Atrypa cf. owenensis
Stringocephalus sp.
Cyrtina sp.
Hadrorhynchia sandersoni</p> |
| <p>M 7 Carcajou Ridge
(Kee Scarp Fm.)</p> | <p>Ambocoelia sp.
Douvillina sp.
Warrenella sp.</p> |
| <p>M 9 (Same locality as R 4)
Carcajou Ridge
Kee Scarp Fm.
Hadrorhynchia sandersoni
Reticulariopsis timetea
(franklinii)
Schizophoria allani
Schizophoria lata
Loxonema altivolvis
Unident gastropod
Paracyclas elliptica
Coenites sp.
Thamnopora limitaris
Thamnopora sp.
Alveolites sp.</p> | <p>Atrypa cf. gregeri
Spinatrypa mascula
Spinatrypa sp.
Nervostrophia calvini
Leiorhynchus castaneum

Leiorhynchus sp.
Productella belanskii
Productella sp.
Stringocephalus
Spirifer sp.
Spirifer (Martinia) richardsoni
Emmanuella meristoides
Emmanuella sublineata
'Warrenella' kirki</p> |

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|------|--|--|
| M 10 | North Flank of
Carcajou Ridge
(Beavertail Fm.) | <i>Emmanuella meristoides</i>

<i>Emmanuella sublineata</i>
<i>Spirifer (Martinia) richardsoni</i>
<i>Nervostrophia calvini</i>
<i>Cleiothyridina</i> sp.?
<i>Schizophoria</i> sp.
<i>Productella?</i> sp.
<i>Productella belanskii</i>
<i>Atrypa nasuta</i>
<i>Atrypa</i> sp.
<i>Atrypa</i> cf. <i>owenensis</i> |
| | <i>Loxonema altivolvis</i>
<i>Euomphalus</i> sp.
Keeled <i>Bellerophon</i> sp.
' <i>Proetus</i> '
<i>Coenites</i> sp.
<i>Hexagonaria</i> sp.
<i>Cyathophyllum kobehense</i>
Possibly some other solitary corals | |
| M 11 | Hume Fm.
Location? | <i>Atrypa</i> cf. <i>tenuicosta</i> |
| M 12 | Hume Fm.
N. Carcajou? | <i>Cyrtina</i> sp. or <i>Allanaria allani</i>
<i>Productella</i> sp.
<i>Echinocoelia</i> sp.
<i>Emmanuella meristoides</i>
<i>Emmanuella sublineata</i>
<i>Leiorhynchus optimum</i>
<i>Calvinaria variabilis variabilis</i>
<i>Atrypa</i> cf. <i>gigantea</i>
<i>Spinatrypa</i> sp.
<i>Paracyclas elliptica</i> |
| M 13 | (?)
Hume Fm. | <i>Favosites</i>
<i>Thamnopora</i> sp.
<i>Cystiphyllum</i> sp.
<i>Schuchertella nevadaensis</i>
<i>Spinatrypa</i> sp.
<i>Tentaculites</i> sp. |
| M 14 | (?)
Hume Fm. | <i>Paracyclas elliptica</i>
Unident. pelecypod
Unident. trochoid snail
<i>Digonophyllum rectum</i>
<i>Cystiphyllum</i> sp.
<i>Cyathophyllum Kobehense</i>
<i>Thamnopora</i> sp.
<i>Coenites</i> sp.
<i>Alveolites</i> sp.
<i>Atrypa</i> cf. <i>nasuta</i> |

- | | | |
|------|--|---|
| M 15 | Lower Hume | Euomphalus sp.
Leptodesma sp.
Paracyclas elliptica
Pelecypod
Cystiphyllum
Productella spinicristata |
| | Atrypa clarkei
Atrypa sp.
Spiriferid
Schuchertella nevadensis | |
| M 16 | Favosites sp. A.
Thamnopora sp.
Coenites sp. | Schizophoria? sp.
Crinoid columnals |
| M 17 | L. Hume ?

Atrypa ("Antatrypa")
Spinatrypa borealis
Trochoid snail | Coenites sp.
Zaphrentis? sp.
Cornellites sp.
Leiopteria sp.
Schuchertella nevadaensis |
| M 18 | Lower Upper Hume

Schizophoria amana
Atrypa ("Antatrypa") | Microplasma cf. fong.
Edmondia
Paracyclas elliptica
Trochoid snail
Productella sp. |
| M 20 | Imperial Anticline
Silurian | Crinoids, brachs,
Stroms, tabulate corals,
Too poorly preserved to specify. |
| M 21 | Lower Hume
Imperial Anticline

Stringocephalus axisus | Placoderm bones
Schizophoria amana
Leiorhynchus optimum
Productella spinicristata
Productella belanskii
Emmanuella sublineata
Emmanuella meristoides
Echinocoelia sp.
Pugnax sp.
Douvillinaria variabilis
'Proetus'
Crinoid bracts |
| M 24 | Upper Hume
Imperial Anticline | Coenites sp.
Amphipora sp. |

M 25 Kee Scarp Fm.
Imperial Anticline

'Warrenella' Kirki
Amphipora sp.
'Proetus'
Goniaticites

Thamnopora limitaris
Thamnopora polyforata
Coenites sp.
Amplexus? sp.
Stringocephalus axis
Stringocephalus burtini
Atrypa devonianavar
Atrypa independensis
Spinatrypa sr.
Schizothoria amana

M 26 Hume Fm.
Powell Ck.

'Microcyclus' Kirby
Digonophyllum rectum
Cystiphyllum?
Thamnopora sp.
Two-holed crinoids
Other crinoids
'Proetus'

Spinatrypa andersonensis
Spinatrypa gayraensis
Atrypa cf. bremerensis
Atrypa sp.
Productella spinicristata
Schuchertella nevadaensis
Cymostrophia sp.
Leiopteria sp.
Paracyclas elliptica
Undetermined clam
Euomphalus sp.
Goniaticite?
Michelinoceras sp.
Tentaculites sp.

M 27 Upper Hume
Powell Ck.

Spinatrypa andersomensis
Spinatrypa borealis
Atrypa arctica
Atrypa ("Antatrypa")
'Elytha undifera'
Leiorhynchus castaneum
Schizophoria sp.
Camarotoechia sp.
Proetus
Short spined pygidium
Crinoid columnals
Two-holed crinoids

Helopora
Fenestrellina bryozoan
Encrusting bryozoa
Euomphalids sp.
Trochoid snail
Belierophon
Large Tentaculites
Favosites sp. A.
Alveolites sp.
'Microcyclus' Kirby
Coenites sp.
Cystiphyllum sp.
Digonophyllum rectum
Billingsastrea verrilli

- | | | |
|------|--|--|
| M 28 | Uppermost Hume
(Castanea zone)
Powell Creek
Stelckia sp.
Tentaculites sp.
Styliolina fissurella | Abund. Leiorhynchus castaneum
Camarotoechia sp.
'Warrenella' kirki

Hadrorhynchia sandersoni
Productella spinicristata
Stropheodonta sp. |
| M 30 | Top of Hare Indian Fm.
Powell Creek | Schizophoria amana
Atrypa cf. Independensis
Emmanuella sublineata
'Warrenella' kirki
Solitary coral |
| M 32 | Basal Ft. Ck. Fm.
Powell Creek | Atrypa independensis
Hadrorhynchia sandersoni |
| M 33 | N. Powell Ck.
Hare Indian Fm. | Spinatrypa mascual
Atrypa cf. bentonensis
Atrypa sp.
Schizophoria amana
Productella sp.
Productella belanskii
Stropheodonta umborata
Douvillanaria variabilis
Stropheminid (undetermined)
Thamnopora sp.
Amplexus?
Goniatite?
Paracyclas elliptica |
| M 34 | Top of Hare Indian &
Base of Kee Scarp
N. Powell Creek | Common Productella belanskii
Atrypa cf. bentonensis
Spinatrypa mascual
Leiorhynchus castaneum
Stringocephalus? sp.
Thamnopora cervicornis
Thamnopora polyforata
Zaphrentis? |
| M 35 | Top of Hare Indian
Powell Creek
(Same as M 30)

Schizophoria of athabascensis | 'Warrenella' Kirki
Gypidula comis
Spinatrypa sp.
Atrypa cf. devoniana |

- M 36 Mosquito Ck. I.
Upper Hume Fm.
Spinatrypa lata
Atrypa cf. bremerensis
Billingsastrea verrilli
'Trochus' sp.
Euomphalus sp.
- M 37 Lower Hume or
L. Upper Hume
Mosquito Ck. I.
Paracyclas elliptica
Leiopteria sp.
Cornellites sp.
Euomphalus sp.
Pleurotamarid
Stromatoporoids
Syringopora sp. B.
Alveolites sp.
Favosites sp. A
Billingsastrea verrilli
Billingsastrea nevadense
Trilobite glabellum
Long-spined pygidium
Proetus
Sphaerospongia sp.
Stropheodonta sp.
Productella spinicristata
Emmanuella meristoides
Schuchertella nevadaensis
'Elytha undifera'
- M 39 Lower Upper Hume
Downstream,
Mosq. Ck. I.
Coenites sp.
Favosites sp.
Solitary coral
- M 40 Upper Hume
Downstream Mosq. Ck. I
Large Euomphalus
Large undetermined tower shell
Cyrtogomphoceras sp.
Michelinoceras sp.
Paracyclas elliptica
Hederella sp.
Spinatrypa and ersonensis
Aulopora sp.
Coenites sp.
Diaphyllum sp.
Hexagonaria sp.
Cystiphyllum sp.
Solitary coral (Atelophyllum)

- | | | |
|------|---|---|
| M 41 | Lower Hume
Mosquito Creek No. 2

Crinoid discs
Trilobite fragments | Schuchertella nevadaensis
Stropheodonta sp.
Emmanuella sublineata
Mytilid clam
Paracyclas elliptica
Other clams
Actinocentrid
Michelinoceras sp.
Mormotoma? |
| M 42 | Lower Upper Hume
Mosquito Ck. 2

Atrypa cf. bremerensis
Spinatrypa gaynaensis | Bucheliatyrrelli
Euomphalus sp.
Proetus
Coenites sp.
Alveolites sp.
Favosites sp. A
Billingsastrea nevadense |
| M 43 | Lower Hume
Mosquito Ck. 3

Crinoid discs | Atrypa sp.
Solitary corals
Flytha undifera
Proetus |
| M 44 | Upper Hume
Mosquito Ck. 3

Hederella sp.
Proetus
'Trochus' sp. | Atrypa clarke
Favosites spiti
Crinoid stems
Paracyclas elliptica
Cornellites
Leiopteria |
| M 45 | Ramparts Fm.
The Ramparts

Atrypa cf. independensis
'Trochus' sp.
Loxonema altivolvis
Paracyclas elliptica
Cyrtogomphoceras sp.
Proetus | a Large Thamnopora limitaris
Large Thamnopora polyforata
Hexagonaria sp.
Macgea sp.
Nervostrophia? sp.
Stringo cephalus asteius
Spinatrypa mascula
Spinatrypa albertensis
Rensselandia laevis
Atrypa cf. clarkei |

M 45

- b Lumpy massive strom
Stringocephalus asteius
Rensselandia laevis
Rensselandia cordiforme
Newberria
Paracyclaselliptica
- c Stachyodes
Amphipora
Massive or tabular strom
Hexagonaria sp.
Large Thamnopora limitaris
Coenites sp.
Siphonophrentis?
Emmanuella sublimeata
Rensselandia laevis
Newberria
Atrypa cf. hackberryensis
Atrypa cf. independensis
Spinatrypa albertensis
Spinatrypa mascula
Stringocephalus sp.
Stringocephalus asteius
Halloceras?

Henri has divided the limestones at the Ramparts into 5 units which are separable on air photographs.

M 45 represents unit (1); M 46 had no exposure of (1).

- M 46 Bedrock channel of former (2) Lumpy strom
course of the Mackenzie, Tabular strom
The Ramparts Calc algae
Ramparts and Kee Scarp Fms. Alveolites
Thamnopora polyforata
Thamnopora limitaris or cervicornis
Cyathophyllum
Stringocephalus burtini
Undetermined brach.
- (3) Abund. tabular strom
Cystiphyllum
Cyathophyllum?
Common Alveolites
Coenites
Stachyodes
Crinoid columnals
Calc algae
Stringocephalus

Units (4) and (5) are thought to be Kee Scarp Fm. (3) and (4) are separated by black shale in less accessible areas, but contact is covered where the samples could be taken.

M 46

- (4) Amphipora
Stachyodes
Lumpy tabular strom
Tabula: Strom, some brecciated
Bulbous strom
Calc. algae

(5)

or

- (4) 'Trochus' sp.
Amphipora
Brecciated calc. algae

M 47 Hare Indian Fm.
12 mi. downstream from
Ft. Good Hope

Schuchertella sp.
Douvilliraria variabilis
Calc algae, encrusting
Astartella?
Few Crinoid columnals

Gayna River, Mackenzie Mountain Front

L 1	Upper Hume Nodular Pugnax sp. Spinatrypa andersonensis Spinatrypa borealis	L.S. Zaphrentis? sp. Crinoid stems Trochoid gastropods
L 1	U. Uppermost beds	Leiorhynchus castaneum Ambocoelia? sp.
L 2	Paracyclas elliptica? Basal Hare Indian Shale	Lingula sp. A
L 3	Leiorhynchus castaneum Elliptical pelecypods Basal HI	Productella sp.
L 4	Hare Indian Shale Amboecoelia sp.	Abund. Lingula sp. A Abund. Leiorhynchus castaneum Schizophoria? sp.
L 5	Hare Indian Shale	Coquina of Leiorhynchus Castaneum Emmanuella meristoides Spirifer. (Martinia) richardsoni Camarotoechia sp. Pugnax sp. Reticulariopsis franklinii
L 7	Hare Indian Shale Alveolites sp. Coenites sp. Thamnopora? sp.	Hadorrhynchia sandersoni Cyrtina sp. Spinatrypa sp. Atrypa cf. clarkii Schizophoria cf. athabascensis
L 8	Hare Indian Shale	Stromatoporoid with included Coenites sp. Billingsastrea Nevadaense? Peneckiella tiecherti

	Below Kee Scarp	Loxonema altivolvis Gomphoceras sp. Zaphrentis? sp. Coenites sp.
	Kee Scarp	Hexagonaria sp. Rensselandia laevis Schizophoria sp. Atrypa et. bentonensis Atrypa independensis Spinatrypa borealis
L 9	Kee Scarp	Microplasma of fongi yoh
A 1	Bosworth Ck. Lower Hume	Billingsastrea verrilli Favosites sp. A. Aulopora Alveolites Crinoid columnals Rod-Shaped bryozoan?
A 2	Bosworth Creek Lower Hume	Atrypa masuta Atrypa sp. Schuchertella nevadaensis
A 3	Bosworth Ck. Lower Hume Thamnopora Microcyclus? Kirby Favosites sp. A.	Schuchertella nevadaensis Spinatrypa lata Cornellites sp. Coenites sp. Digonophyllum sp. Billingsastrea verrilli Tentaculites
A 4	Bosworth Ck. L. Hume	Mastigospira alata Spinatrypa sp. Maybe some Thamnopora
A 5	Bosworth Ck. Basal Hare Indian Shale	Styliolina fissurella Tentaculites sp. Buchiola cf. retirostriata Bachites? sp. Bilobed orthid brachiopod Lingula sp. A. Other brachiopods not determined

- | | | |
|------|---|--|
| A 6 | Bosworth Ck.
Nodular Upper Hume. | Alveolites sp.
Atelophyllum fultum Hill |
| A 7 | Bosworth Ck.
Marly limestone at Contact
of Hume - H.I.
Hare Indian Fm.
Warrenella? sp.
Atrypa cf. hackberryensis
Atrypa arctica | Proetus
Fenestrellina
Tentaculites sp.
Styliolina fissurella
Schizophoria sp.
Productella sp.
Spinatrypa andersonensis
Crinoid columnals
Pecten-like pelecypod |
| A 8 | Hare Indian Fm.
Nodule | Lingula sp. A
Other brachs, unidentified
Michelinoceras
Goniatites |
| A 9 | Schooner Creek
Lower Hume Fm.

Emmanuella sublineata
Schuchertella nevadaensis | Mastigospira alata
Cystiphyllum sp.
Coenites sp.
Favosites sp. A
Small undetermined solitary coral
Digonophyllum sp.
Digonophyllum rectum
Crinoid columnals |
| A 10 | Schooner Creek
Hume Fm., L. or L.Upper

Microcyclus Kirby
Bryozoan
Crinoid columnals
Paracyclaspeliptica
Edmondia sp.
Cornellites sp. | Productella sp.
Atrypa sp.
Atrypa of gigantes
Billingsostrea nevaderse
Favosites sp A
Syringopora sp.
Cystiphyllum sp.
Coenites sp.
Undetermined disc. |
| A 11 | Below Kee Scarp
Kee Scarp Fm. | Coenites sp.
Thamnopora polyforata
Amphipora
Tabular Stromatoporoids
Crinoid columnals |

- | | | |
|------|---|---|
| A 12 | Below Kee Scarp
Kee Scarp Formation | Amphipora
Byozoa?
Coenitessp
Stromatoporoids
Algae?
Alalophyllum?
Crinoid Columnals (skel calcarenite) |
| A 13 | Top of Kee Scarp
near road (K.S. Fm.) | Amphipora
Crinoid columnals
Schizophoria sp. |
| A 14 | Kee Scarp Quarry
Mucgea
Alalophyllum Mackenziense?
Atrypa sp.
Schizophoria sp.
Productella sp.
Ostracods?
Undetermined trochoid snails | Amphipora
Stachyodes
Stromatoporoids
Calcareous algae
Crinoid stems
Bryozoa
Euomphalus sp.
'Trochus' sp. |
| A 15 | Bosworth Ck. landing place
Nodular Upper Hume
Alveolites sp.
'Microcycylus' Kirbyi
Zaphrentis? sp.
Trochoid snails
Observed at Ck. level: | Leiorhynchus?
Atrypa arctica
Spinatrypa borealis
Spinatrypa andersonensis
Productella spinicristata

Hexagonaria sp.
Cystiphyllum sp.
Columnaria rhenana
Zaphrentis? sp.
Bulbous
Stromatoporoids |
| A 16 | Bosworth Ck. above A 15
at same location
'Castanea' zone

a is marly horizon
2 - 6 inches thick

b = 2 - 3 inch shale bed
overlying a | a
Leiorhynchus castaneum
Emmanuella sublineata
Alveolites with overgrowth
Pleurotamaria sp.
Euomphalus sp.
Leptodesma sp.

b
Leiorhynchus castaneum
Crushed Leiorhynchids throughout |

- | | | |
|------|--|--|
| A 17 | Two foot marly i.s.
above A 16 | Productella sp.
Lingula sp. B
Leptodesma sp. |
| 17 a | Leiorhynchus castaneum

Uneven band of i.s.
at contact | Eumphalus sp.
'Trochus' sp.
Proetus pygidium & glabellum
Leiopteria sp. |
| A 18 | Black sh. and sandy i.s.
at contact with A 17
Hare indian Fm.
Bosworth Ck. | Fish bone
Tentaculites sp.
Styliolina fissurella
Atrypa arctica
Productella sp. |
| A 19 | Outcrop upstream
from A 15 - A 18,
Bosworth Ck.

in 2 inch marly i.s.
Leiorhynchus castaneum
Emmanuella sublineata | Nodular Upper Hume:
Spinatrypa borealis
Spinatrypa andersonensis
Atrypa cf. pechiensis
Atrypa arctica
Productella spinicristata
Productella cf. belanskii
'Proetus' sp.
Leptodesma sp. |
| A 20 | Bosworth Ck.,
Same place as A 8:
Basal Hare Indian | |
| | A. In Nodule: | Goniatites
Lingula sp. A.
Undetermined brachs
Tentaculites sp.
Styliolina fissurella |
| | B. In two-foot marly i.s. | Cornellites sp.
Leptodesma
Pecten-Like clam
'Proetus'
Productella cf. belanskii |
| | C. In shale of castanea
zone:

Paracyclas elliptica
occidentalis | Lingula sp. A.
Internal molds of Leiorhynchus
Castaneum
Strophomenid cast. |
| | D. In marly layer of
castanea zone:
Leiorhynchus castaneum
- Spirifer (martinia)
richardsoni | Euomphalus sp.
Sphenotus sp.
Tabulophyllum? sp.
Productella sp.
Pugnax sp. |

A 21 Bosworth Ck.
 Same as A 5

A 22 The Ramparts
 Hare Indian Fm.

 Crinoid Columnals
 Proetus pygidium
 Thamnopora cervicornis
 Heliophyllum?
 Hederella
 Michelinoceras
 Leaf-like casts
 (Worm-burrows?)

Rensselandia laevis
Rensselandia cordiforme
Newberria
Spirifer (Martinia) richardsoni
Emmanuella meristoides
Emmanuella sublineata
Cyrtina sp.
Douvillinaria variabilis
Atrypa independensis
Atrypa cf. independensis
Atrypa clarkei
Atrypa cf. gigantea
Spinatrypa mascula

APPENDIX II

List Of Numbered Fossils (See Enclosure I): By Area And Formation

AREA 1 - NORMAN RIDGE - 'MOSQUITO CREEKS'

Kee Scarp Formation: 18, 51, 60, 84, 92, 122, 130, 132, 133, 135, 136, 140, 141, 142, 147, 167

Hare Indian Formation: 22, 39, 51, 145, 146, 151, 160, 163, 172, 173

Upper Hume Formation: 4, 6, 12, 17, 35, 39, 40, 42, 44, 47, 50, 51, 60, 64, 65, 67, 70, 79, 83, 85, 87, 88, 89, 90, 92, 93, 97, 99, 104, 109, 114, 115, 116, 118, 119, 124, 126, 127, 135, 137, 141, 142, 144, 147, 149, 152, 153, 154, 155, 157, 158, 161, 167, 168, 173

Lower Hume Formation: 10, 15, 18, 33, 34, 35, 50, 51, 61, 66, 67, 70, 80, 85, 88, 89, 90, 92, 98, 104, 114, 115, 118, 123, 124, 125, 129, 130, 131, 135, 137, 141, 144, 146, 148, 152, 153, 154, 156, 157, 159, 166, 167, 168, 170, 173

AREA 2 - CARCAJOU RIDGE

Kee Scarp Formation: 2, 9, 11, 12, 14, 16, 18, 27, 28, 34, 35, 37, 42, 44, 45, 48, 55, 56, 58, 68, 69, 70, 71, 78, 82, 83, 86, 88, 92, 94, 113, 119, 120, 121, 122, 123, 125, 129, 134, 140, 141, 143, 157

"Beavertail" Formation: 5, 18, 23, 26, 31, 34, 35, 38, 42, 45, 48, 51, 52, 55, 59, 60, 69, 70, 73, 78, 82, 92, 109, 119, 139, 141, 143, 156, 167, 168, 171

Hume? Formation: 20, 21, 29, 43

AREA 3 - EAST MOUNTAIN

"Beavertail" Formation: 132

Hume Formation: 89, 90, 104, 105, 139, 141

AREA 4 - IMPERIAL ANTICLINE - MOUNTAIN RIVER - SAMMON'S CREEK

Kee Scarp Formation: 5, 9, 14, 18, 69, 76, 77, 86, 92,
121, 122, 123, 132, 163, 168

Hare Indian Formation: 55, 56, 82

Upper Hume Formation: 2, 4, 34, 50, 65, 66, 67, 85, 89,
90, 92, 94, 97, 98, 104, 111, 119,
121, 127, 132, 139, 141, 149, 152,
167

Lower Hume Formation: 27, 29, 34, 41, 48, 50, 56, 76, 89,
162, 168, 172

AREA 5 - POWELL CREEK - GAYNA RIVER

Port Creek Formation: 14, 37

Kee Scarp Formation: 5, 109, 115

Hare Indian Formation: 5, 7, 9, 13, 18, 22, 26, 27, 28, 35,
36, 37, 39, 42, 48, 50, 51, 54, 53,
56, 57, 60, 65, 68, 69, 70, 78, 79,
80, 81, 82, 83, 85, 89, 92, 116, 120,
122, 123, 124, 131, 135, 143, 157,
162

Upper Hume Formation: 4, 6, 19, 22, 33, 34, 42, 60, 64, 65,
85, 90, 92, 97, 98, 104, 114, 126,
129, 139, 141, 145, 146, 147, 153, 166,
167, 168, 169

Lower Hume Formation: 15, 18, 25, 50, 61, 64, 66, 97, 98, 114,
123, 141, 146, 152, 154, 157, 163, 166,
167, 168, 173

AREA 6 - THE RAMPARTS

Kee Scarp (Beavertail) Formation: 132

Ramparts Formation: 7, 12, 13, 35, 46, 53, 54, 63, 68, 75,
79, 85, 86, 92, 94, 97, 109, 113, 116,
120, 121, 122, 132, 133, 135, 136, 143,
147, 157, 161, 164, 167, 168

Hare Indian Formation: 8, 10, 13, 14, 26, 27, 34, 35, 46, 53,
54, 68, 70, 120, 127, 167, 168

AREA 7 - RAMPARTS PLATEAU - Tieda Creek, Airport Creek and 12 miles
downstream from Fort Good Hope

Ramparts Formation: 8, 9, 12, 15, 17, 24, 34, 35, 44, 46,
54, 55, 60, 67, 70, 72, 74, 86, 92,
109, 116, 121, 128, 129, 138, 141,
147, 166, 167

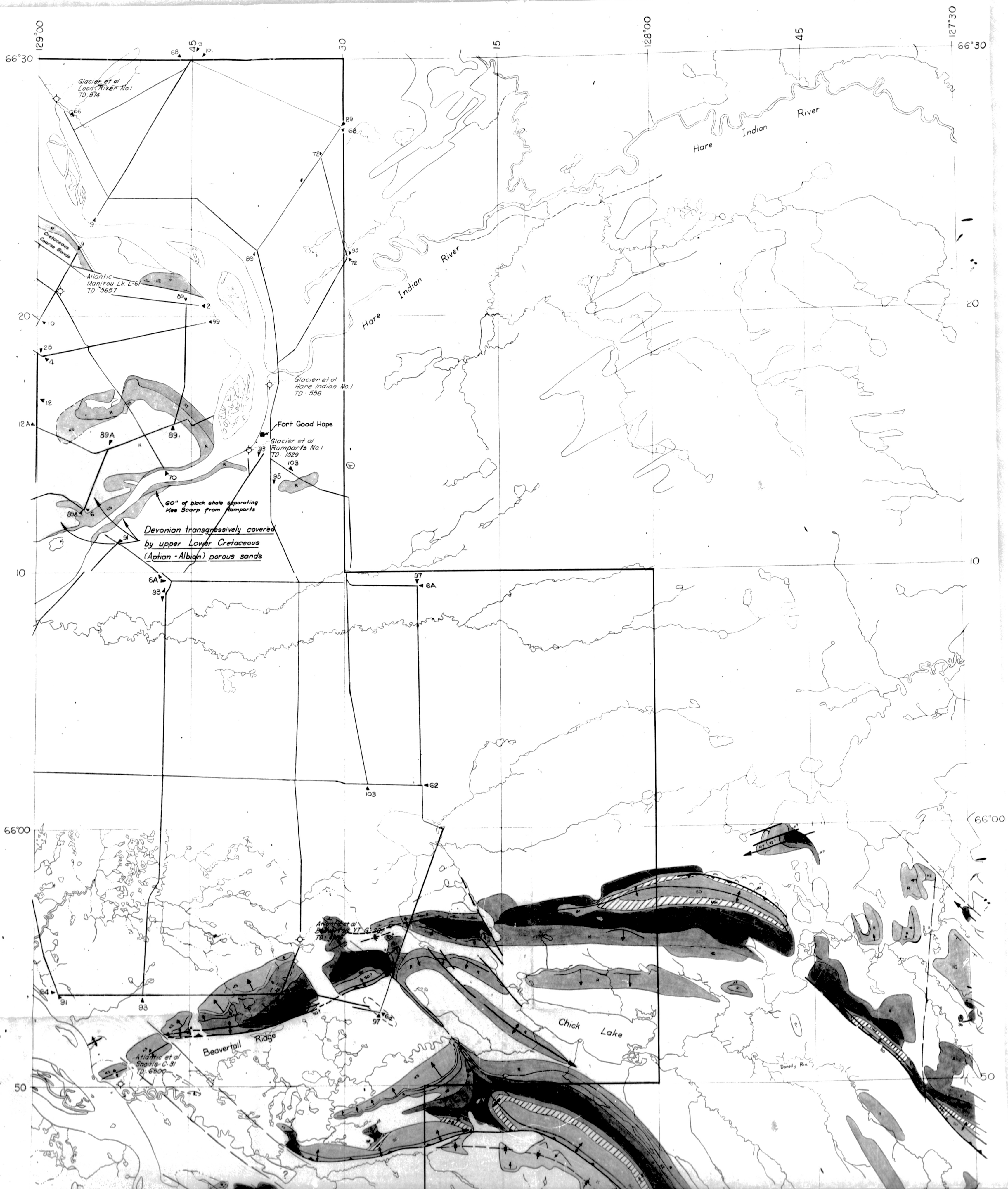
Hare Indian Formation: 12, 46, 54, 62, 69, 136, 150, 167

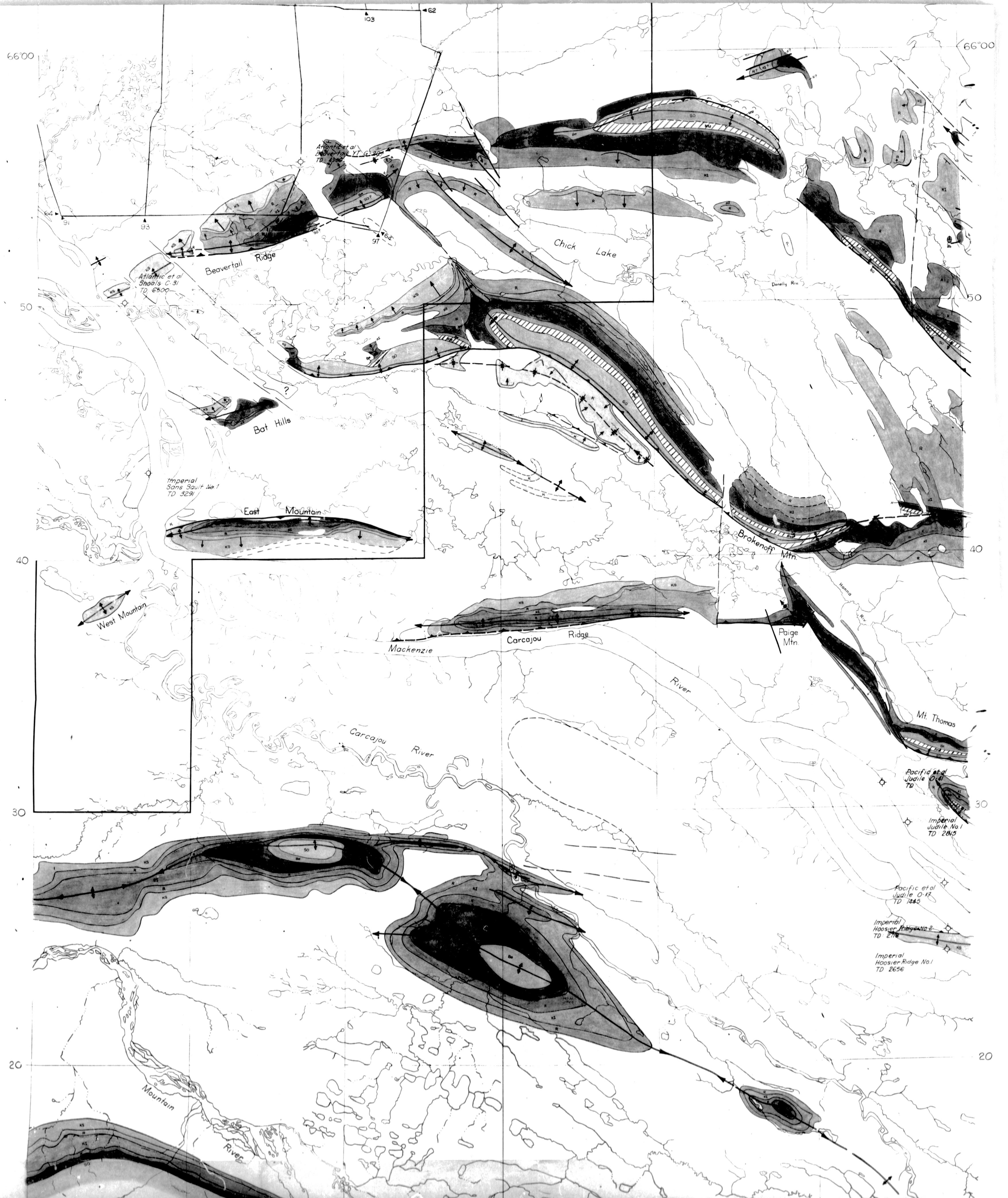
AREA 8 - Q CREEK - PAYNE CREEK

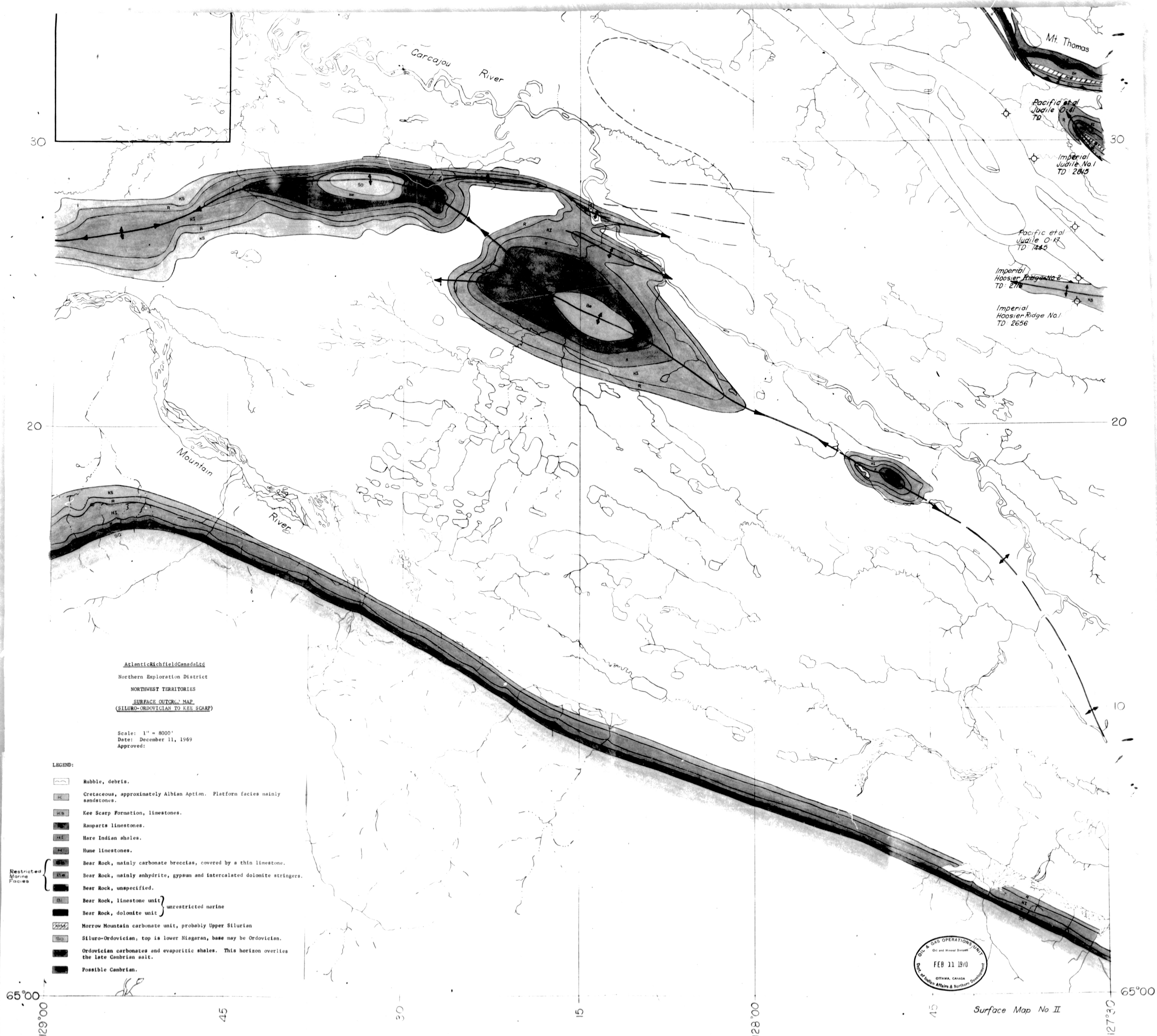
Ramparts Formation: 1, 8, 10, 11, 26, 30, 34, 35, 41, 42,
48, 49, 63, 70, 82, 157, 168, 172

AREA 9 - GOSSAGE RIVER

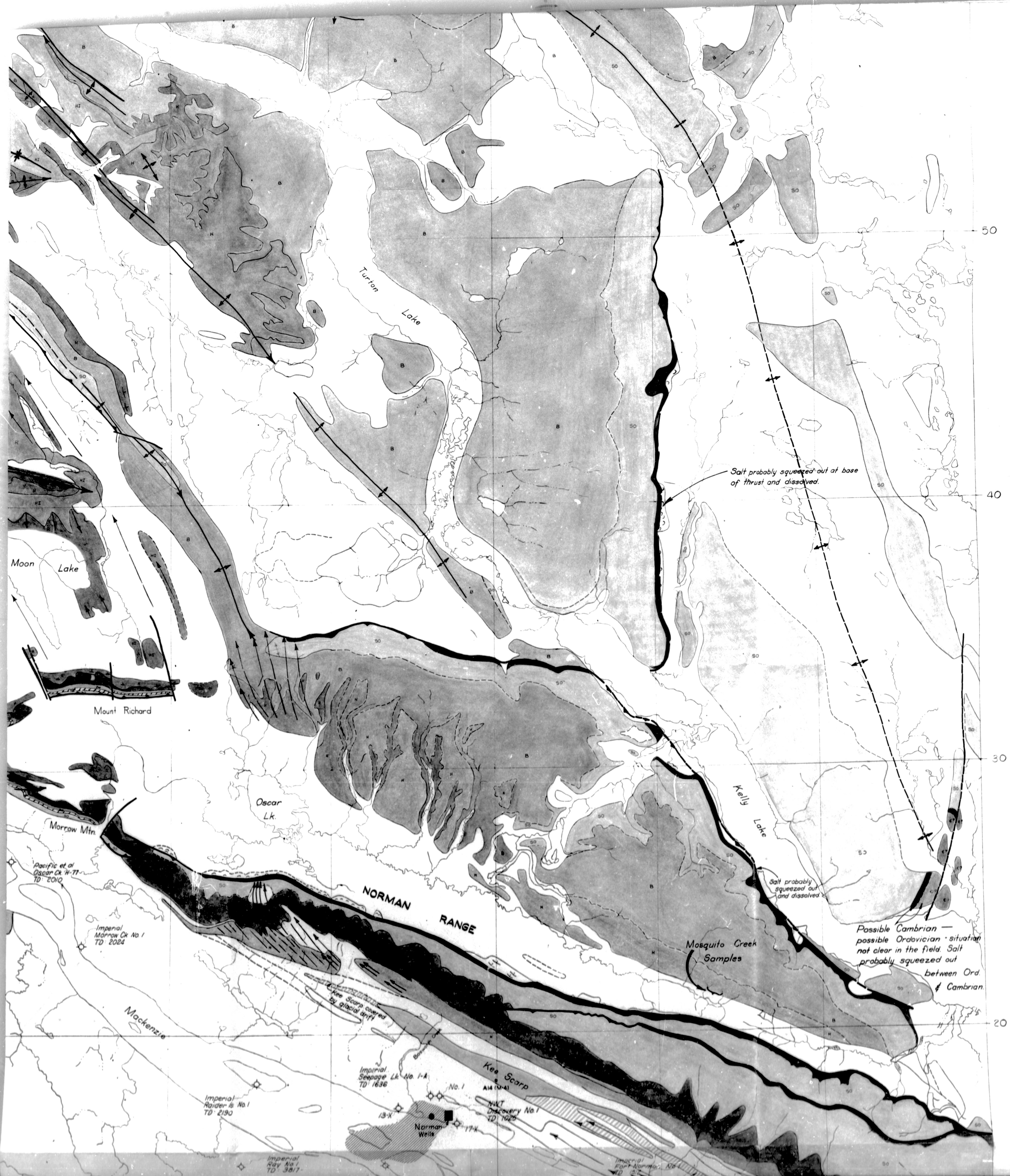
Ramparts Formation: 1, 2, 3, 8, 10, 13, 16, 25, 26, 32,
34, 35, 41, 42, 46, 48, 50, 54, 70, 83,
85, 86, 92, 97, 113, 116, 120, 127, 129,
132, 133, 136, 140, 141, 147, 163, 167,
168

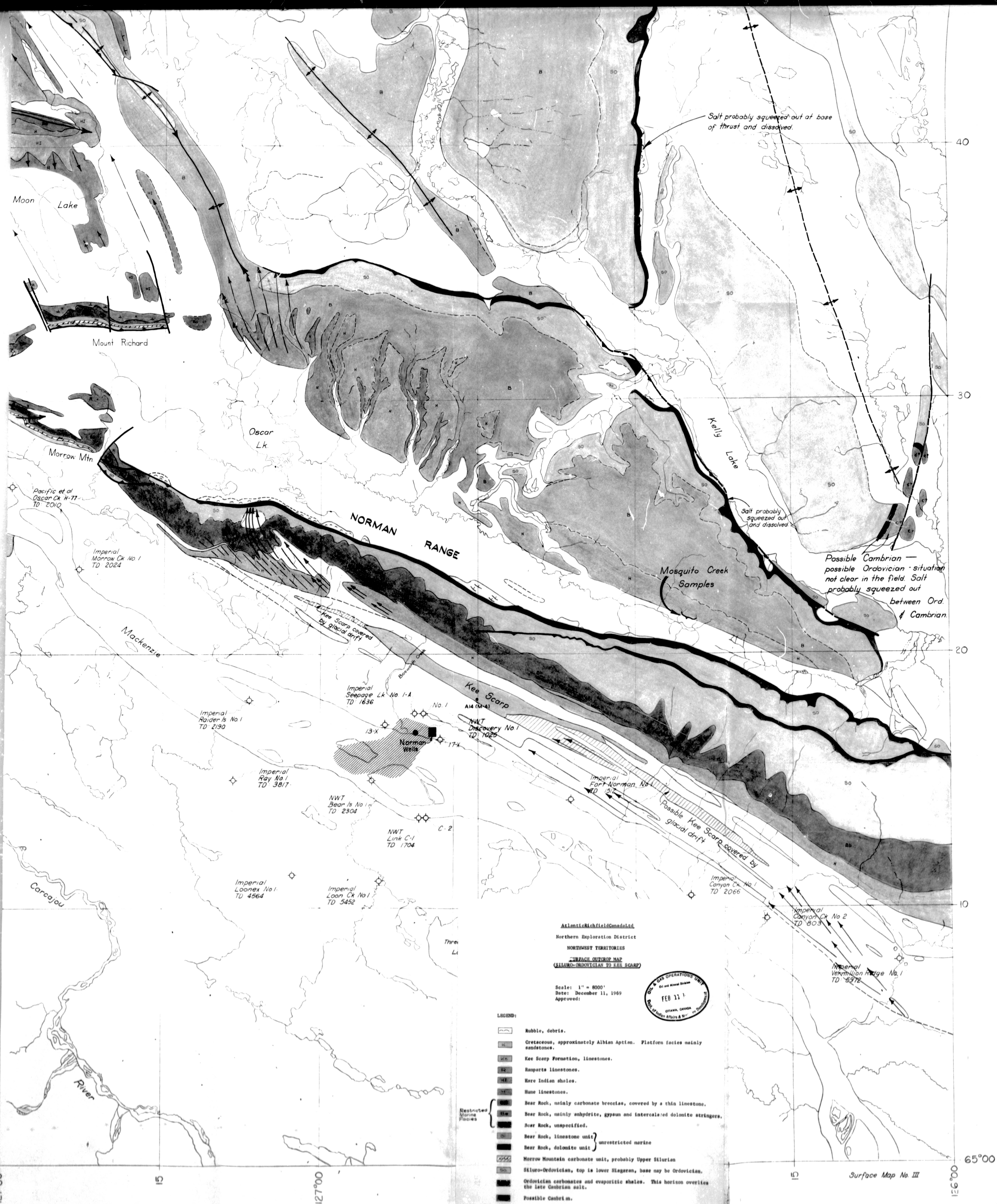


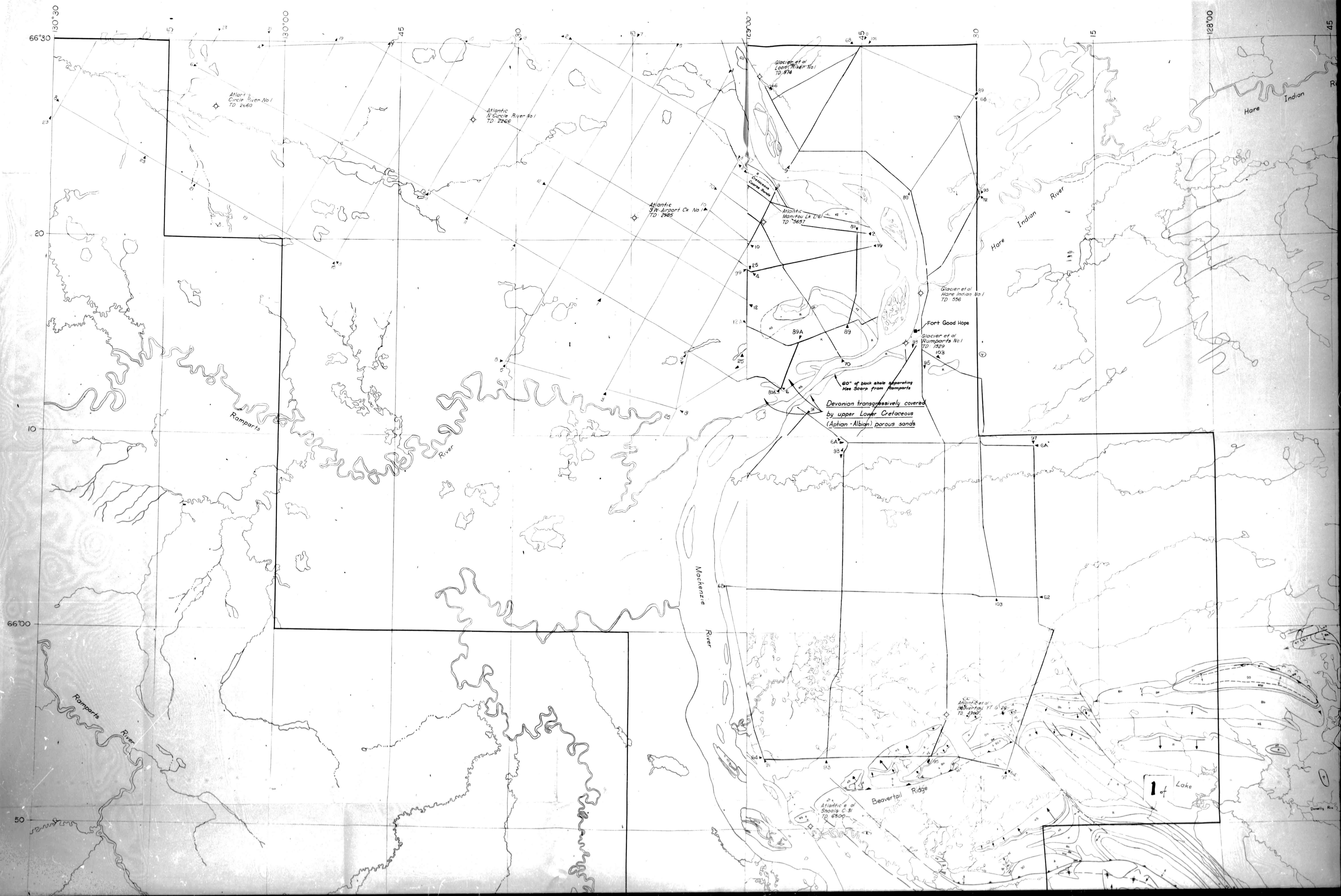


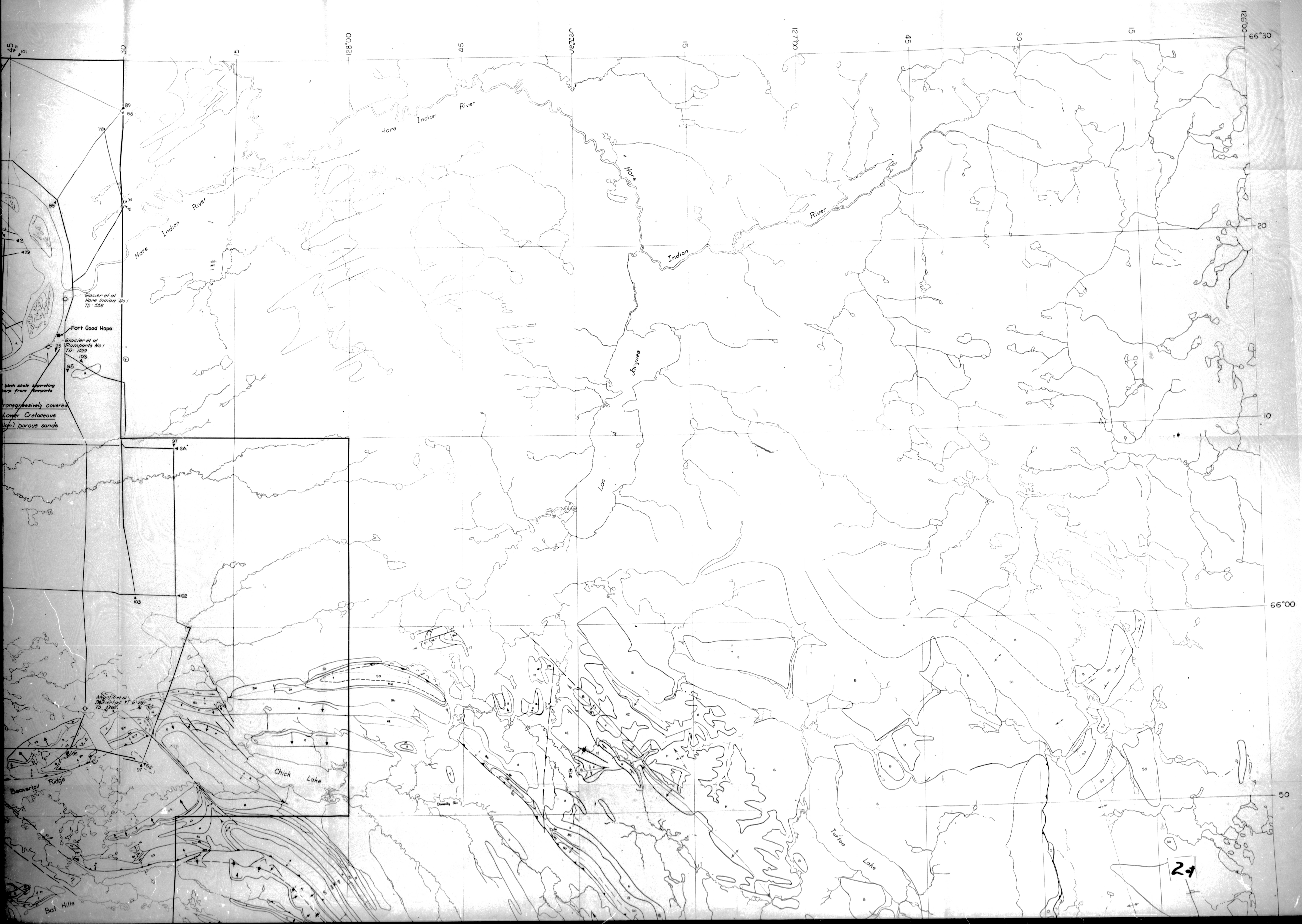


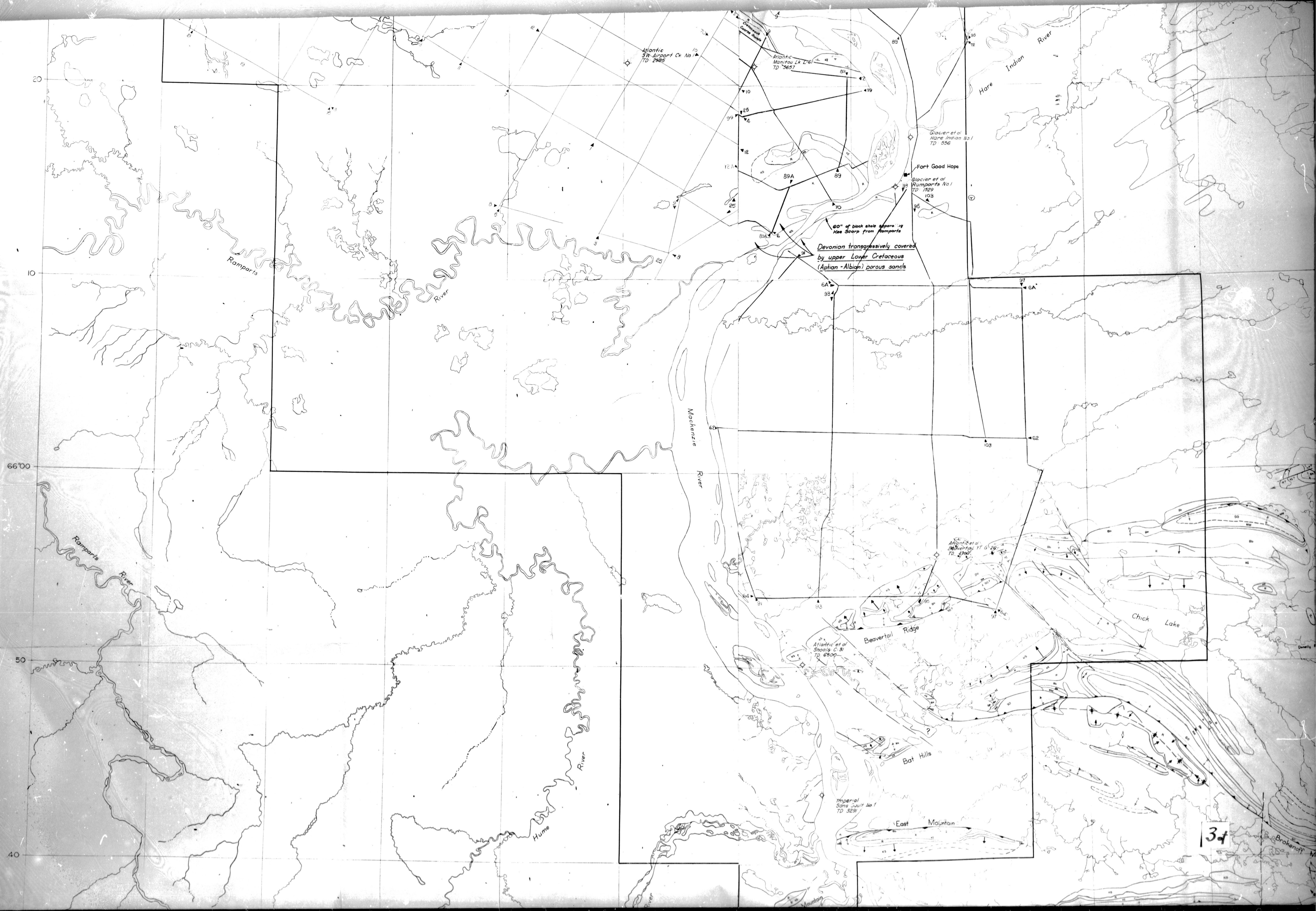












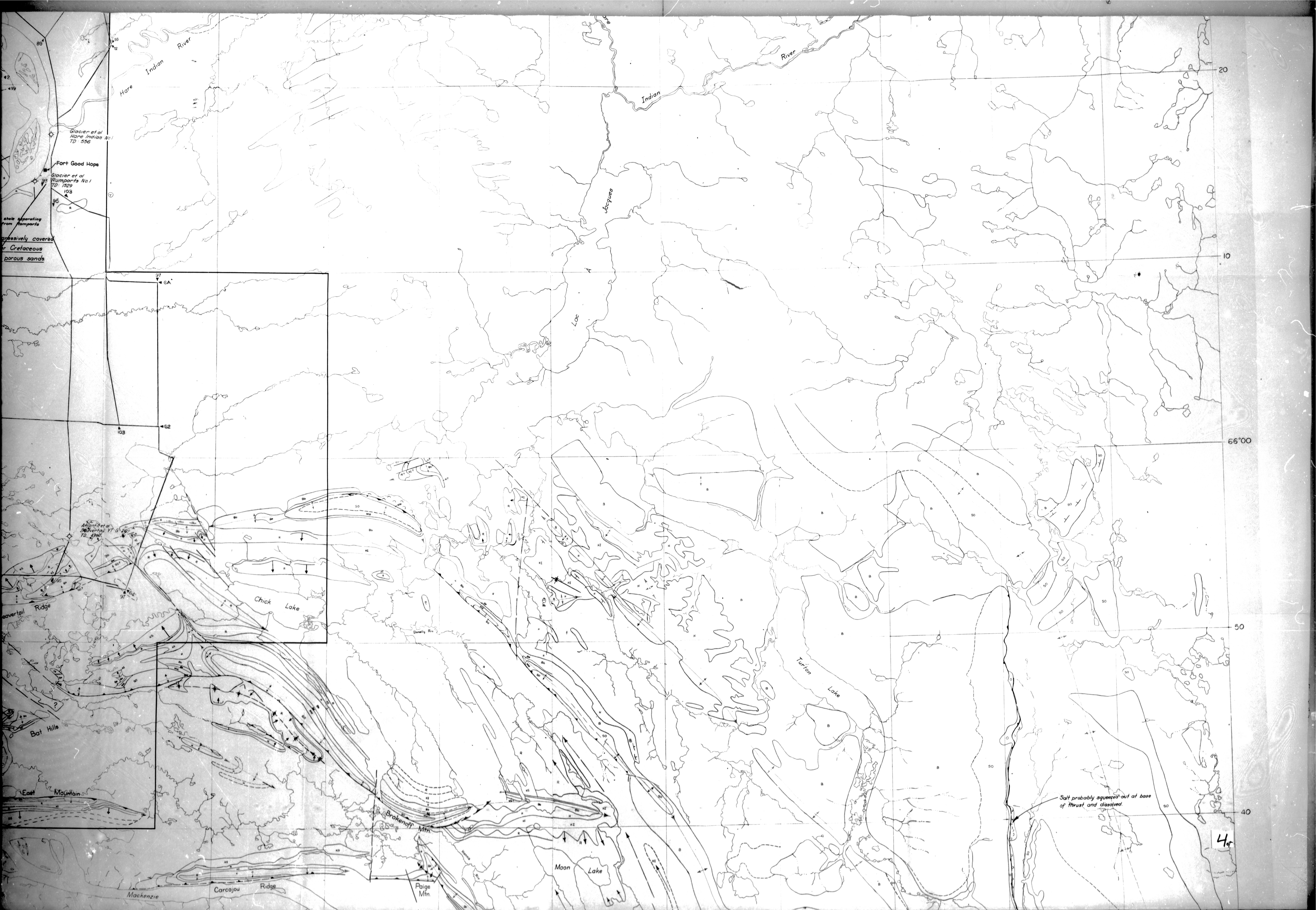
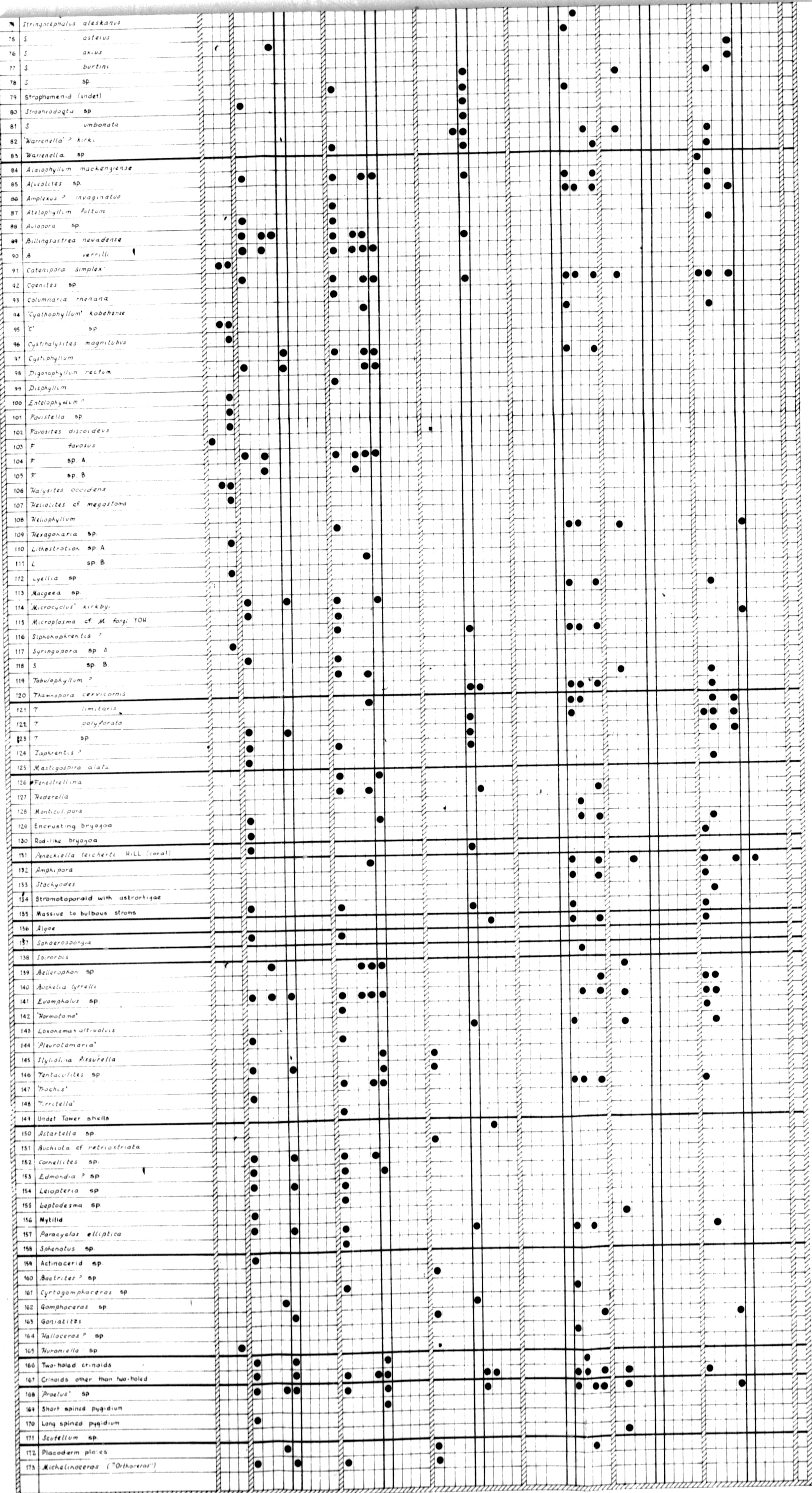


TABLE OF FOSSILS

Formations		SILURIAN		LOWER HUME		UPPER HUME		HARE INDIAN		RAMPARTS		BEAVERTAIL		KEE SCARP		FORT CREEK	
OCCURRENCE		Fossil Areas															
No.	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	<i>Allanaria allani</i>																
2	<i>Ambocoelia</i> sp.																
3	<i>Athyris</i> sp.																
4	<i>Atrypa</i> arctica (<i>Atrypa</i> Desquamata of Treat)																
5	<i>A</i> cf. bentonensis																
6	<i>A</i> cf. bremerensis																
7	<i>A</i> cf. clarkii																
8	<i>A</i> clarkii																
9	<i>A</i> devoniana (var)																
10	<i>A</i> cf. gigantea																
11	<i>A</i> gregori																
12	<i>A</i> cf. hackberryensis																
13	<i>A</i> cf. independensis																
14	<i>A</i> independensis																
15	<i>A</i> rasula																
16	<i>A</i> cf. owenensis																
17	<i>A</i> cf. pechenensis																
18	<i>A</i> sp. undet.																
19	<i>A</i> sp. (<i>Atrypa</i>)																
20	<i>A</i> cf. tenuicosta																
21	<i>Calvinaria variabilis variabilis</i>																
22	<i>Camarotoechia</i> sp.																
23	<i>Cleiothyridina</i> sp.																
24	<i>Cranaena</i> sp.																
25	<i>Cymatophoria</i> sp.																
26	<i>Cyrtina</i> sp.																
27	<i>Davulinaria variabilis</i>																
28	<i>Davulina</i> sp.																
29	<i>Echinocoelia</i> sp.																
30	<i>Eleutherokomma impennis</i>																
31	<i>E.</i> leducensis																
32	<i>E.</i> sp.																
33	<i>Elula undifera</i>																
34	<i>Emmanuella meristoides</i>																
35	<i>E.</i> sublineata																
36	<i>Gypidula comis</i>																
37	<i>Nadorrhynchia sandersoni</i>																
38	<i>Xyothyridina cameroni</i>																
39	<i>Lingula</i> sp. A.																
40	<i>L.</i> sp. B.																
41	<i>Leiorhynchus owatanki</i> (<i>Leiorhynchus</i> <i>Nadorrhynchus</i>)																
42	<i>L.</i> costaneum																
43	<i>L.</i> sp. m.																
44	<i>L.</i> sp.																
45	<i>Nervostrophia calvini</i>																
46	<i>Newberrya</i> sp.																
47	<i>Productella</i> cf. belanskii																
48	<i>P.</i> belanskii																
49	<i>P.</i> lachrymosa																
50	<i>P.</i> spinicristata																
51	<i>P.</i> sp.																
52	<i>Rugoides calvini</i>																
53	<i>Rensselaeria cordiforme</i>																
54	<i>R.</i> laevis																
55	<i>Reticulariopsis franklini</i> (NEEK)																
56	<i>Schizophoria amara</i>																
57	<i>S.</i> cf. athabascensis																
58	<i>S.</i> lata																
59	<i>S.</i> mcFarlanei																
60	<i>S.</i> sp.																
61	<i>Schuchertella nevadensis</i>																
62	<i>S.</i> sp.																
63	<i>Spinatrypa albertensis</i>																
64	<i>S.</i> (<i>Invertypa</i>) andersonensis																
65	<i>S.</i> (<i>Invertypa</i>) borealis																
66	<i>S.</i> gwynensis																
67	<i>S.</i> lata																
68	<i>S.</i> mascula																
69	<i>S.</i> sp.																
70	<i>Spinifer</i> (<i>Martini</i>) richardsoni NEEK																
71	<i>S.</i> sp.																
72	<i>S.</i> strigosus																
73	<i>Stelkia galeatus</i> CRICKMAY																
74	<i>Stringocephalus alaskanus</i>																
75	<i>S.</i> asellus																
76	<i>S.</i> axius																
77	<i>S.</i> burtini																
78	<i>S.</i> sp.																
79	<i>Strophomenid</i> (undet.)																
80	<i>Strophodonta</i> sp.																
81	<i>S.</i> umbonata																
82	<i>Warrenella</i> sp. kirk.																
83	<i>Warrenella</i> sp.																
84	<i>Atelaphyllum machengense</i>																
85	<i>Alveolites</i> sp.																
86	<i>Amplexus</i> sp. invaginate																
87	<i>Atelaphyllum fullum</i>																
88	<i>Aulopora</i> sp.																
89	<i>Billingstrea nevadense</i>																
90	<i>A.</i> varrilli																
91	<i>Catenipora simplex</i>																
92	<i>Ctenites</i> sp.																
93	<i>Calumnaria rhenana</i>																
94	<i>Cyathophyllum kobeense</i>																
95	<i>C.</i> sp.																
96	<i>Cyathophyllum magnitubus</i>																
97	<i>Cyathophyllum</i>																
98	<i>Digonophyllum rectum</i>																
99	<i>Disphyllum</i>																
100	<i>Entelaphyllum</i> sp.																
101	<i>Favosites</i> sp.																
102	<i>Favosites discoides</i>																
103	<i>F.</i> favosus																
104	<i>F.</i> sp. A.																
105	<i>F.</i> sp. B.																
106	<i>Hyalites occident</i>																
107	<i>Helicites</i> cf. megastoma																



N.B. • Includes Mountain River and Sammons Creek.
• With Tieda Creek and Airport Creek.

