



**GEM**

**New insights into Ordovician stratigraphy, petroleum potential & geo-mapping on Akpatok Island, Nunavut**

**- Highlights from GEM-2 Hudson-Ungava Activity**

**Shunxin Zhang**

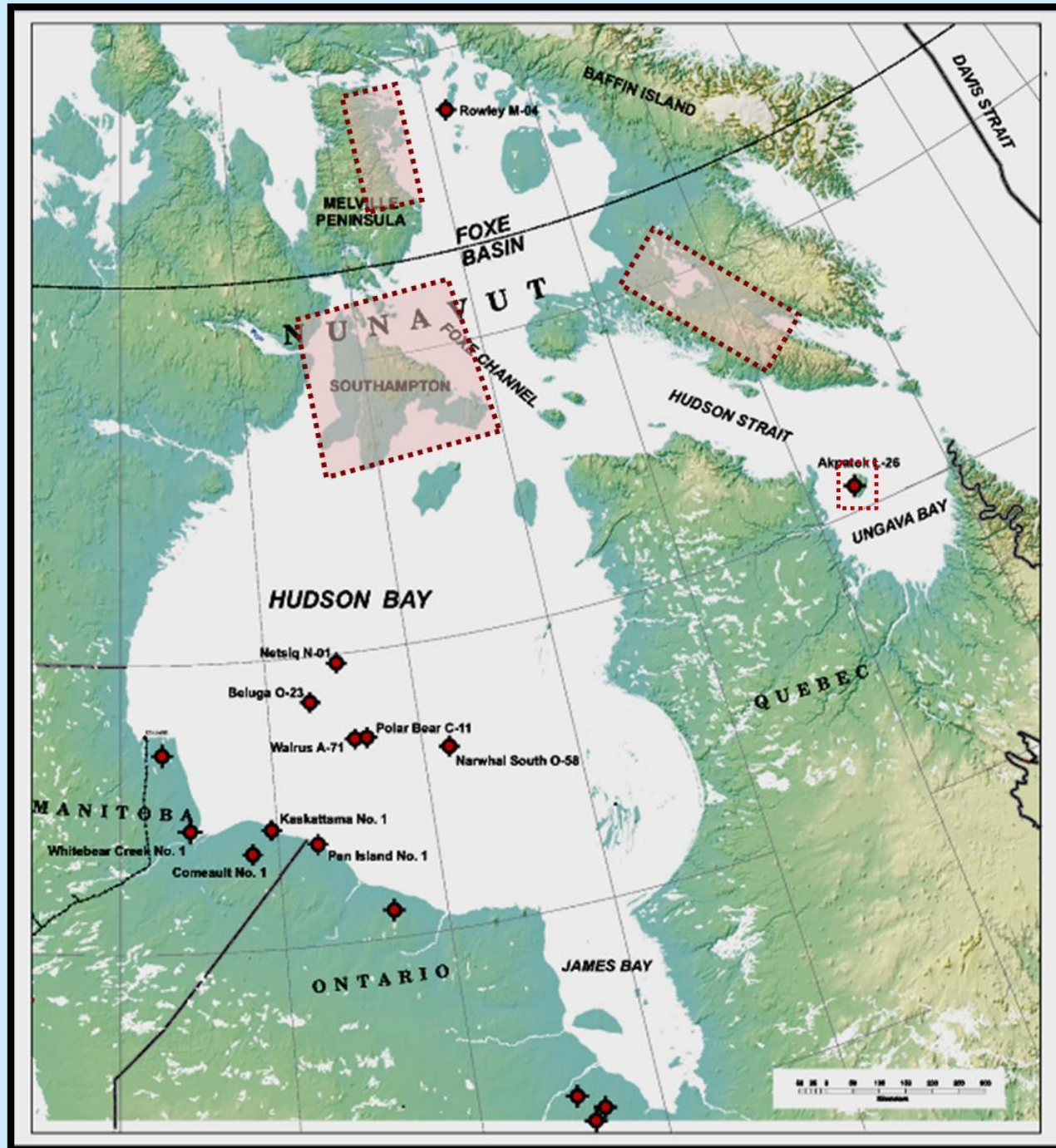
**Canada-Nunavut Geoscience Office, Iqaluit, NU**

# Paleozoic study areas in Hudson & southeast Arctic platforms during GEM 1 and 2

 **GEM 1 study area**

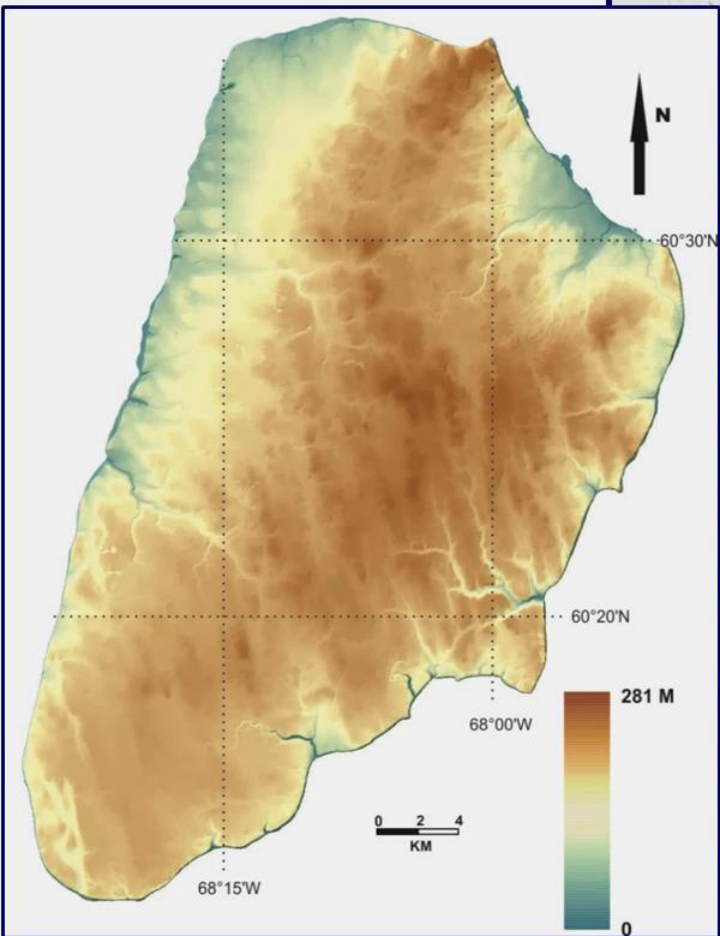
 **GEM 2 study area**

 **Well drillings (1960s-1980s)**



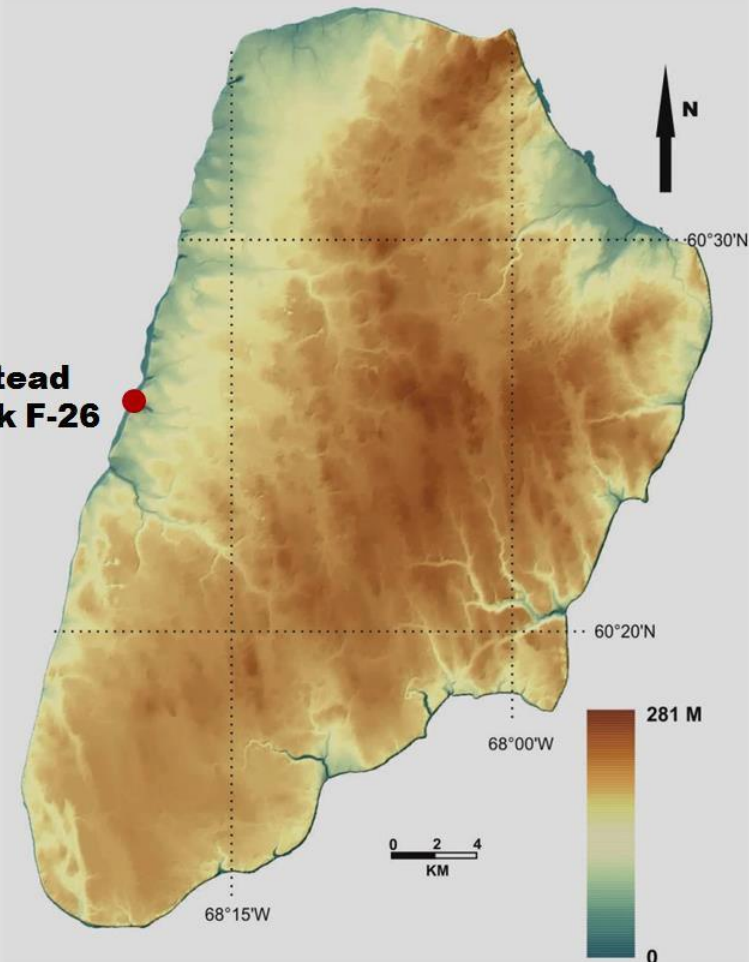


# Where is Akpatok Island? Why is it important?

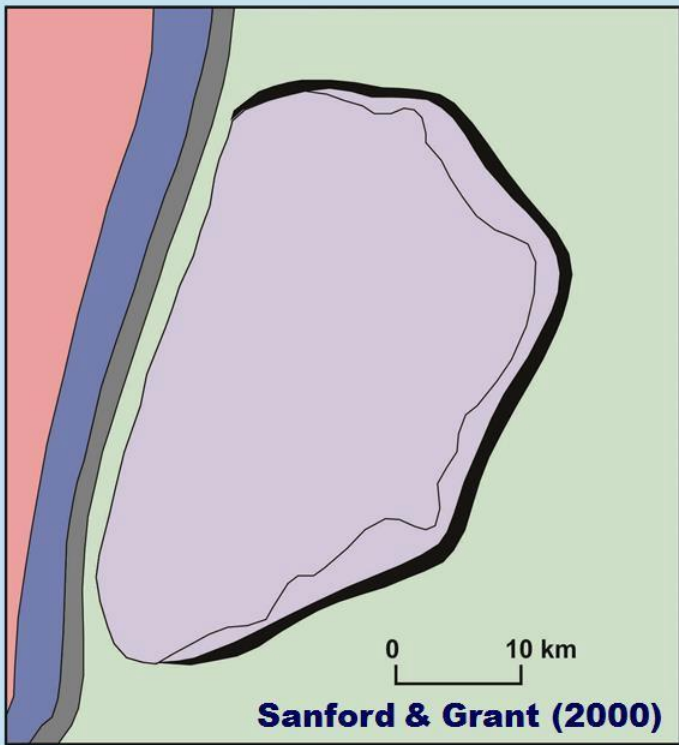


- **Early studies on geology of Akpatok Island during late 1800s and early 1900s**
- **A hydrocarbon test hole (Premium Homestead Akpatok F-26) was drilled on east coast in 1969.**

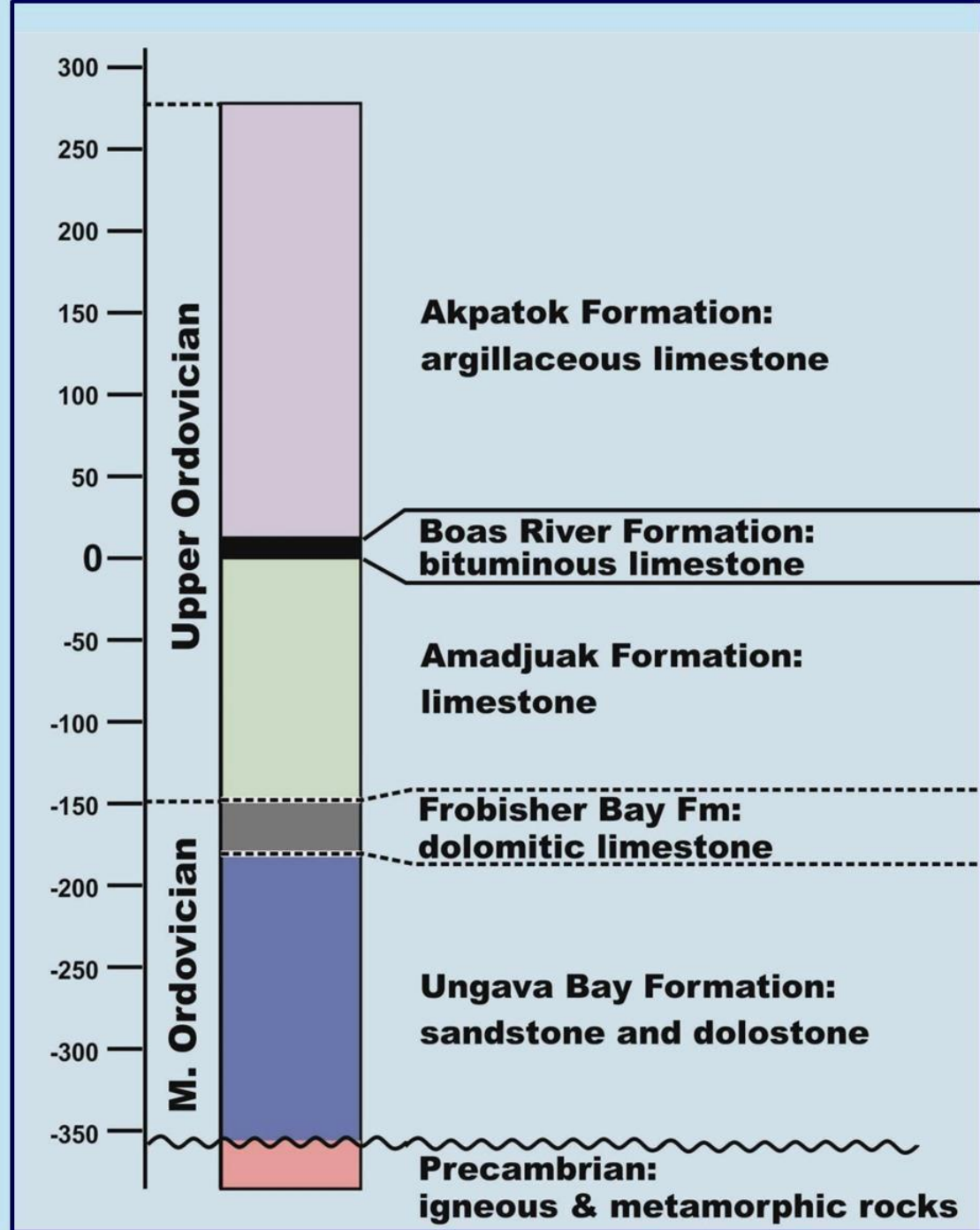
**Homestead  
Akpatok F-26**







**Stratigraphy below sea level was revealed by a hydrocarbon test hole in 1969, summarized by Workum et al. (1976); that above sea level was inferred by Sanford & Grant (2000) without field observation.**





**Carbonate rocks exposed on high cliffs that enclose Akpatok Island, which make it almost impossible to measure sections and collect samples.**







**Because of heavy erosion,  
most surface area is  
covered by rubble.**

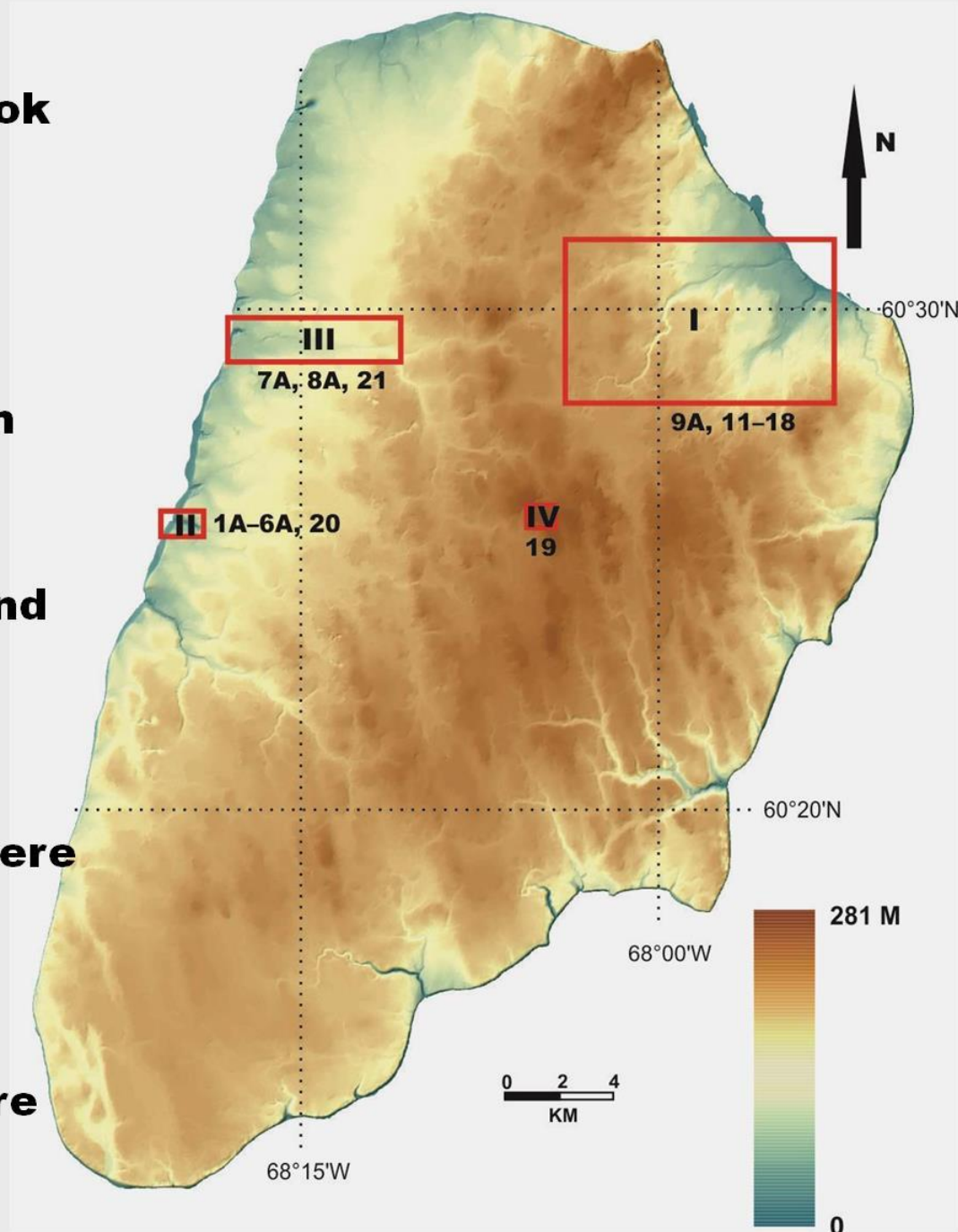


**Rare outcrops are  
scattered along streams  
on the island, which  
allow measuring sections  
and collecting samples,  
and eventually piecing up  
a complete stratigraphic  
column above sea level.**



## Field investigations on Akpatok Island in 2014 & 2015:

- **Focused in four areas, covering almost all stratigraphic intervals from coast to top of the island**
- **Sections were measured and samples were collected at over 20 localities**
- **Nearly 100 3 kg samples were collected for conodont microfossils**
- **Over 20 000 conodonts were recovered**

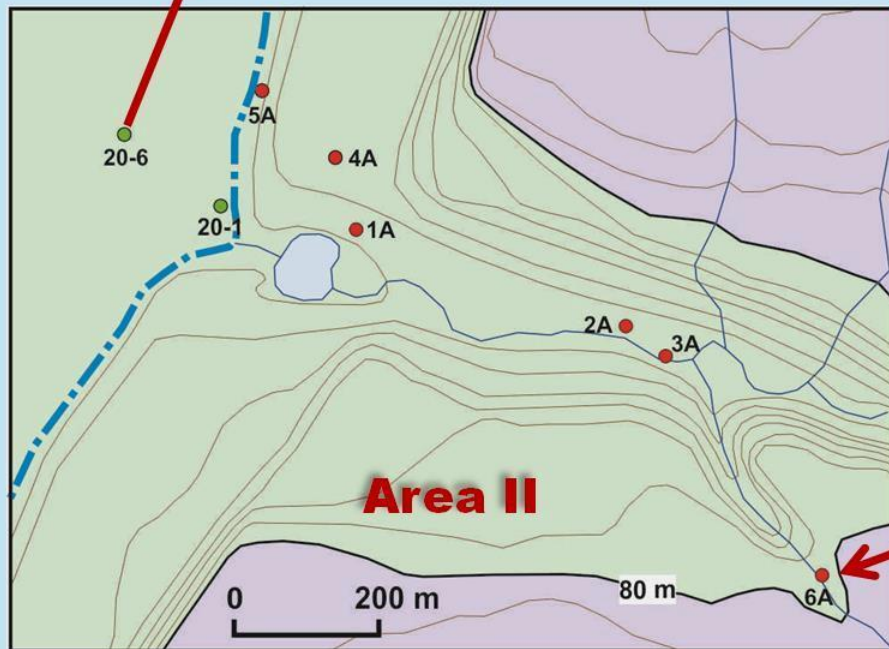
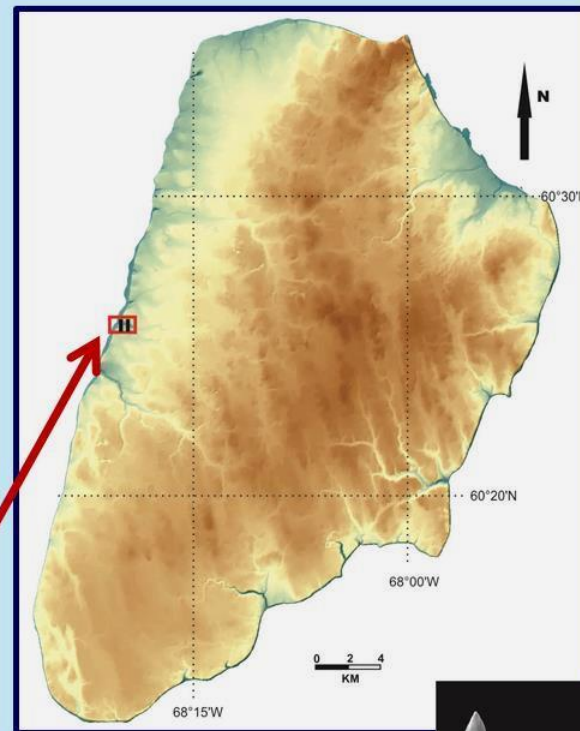
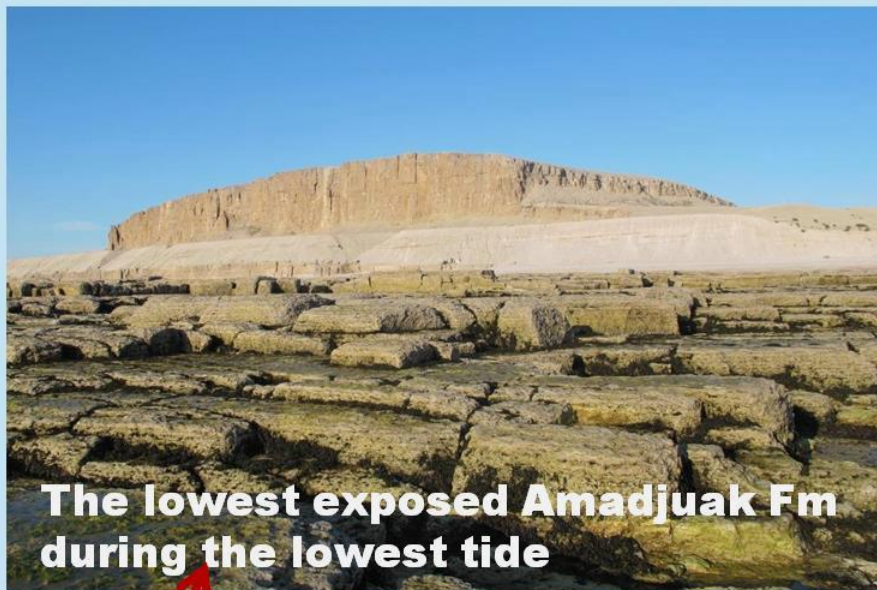




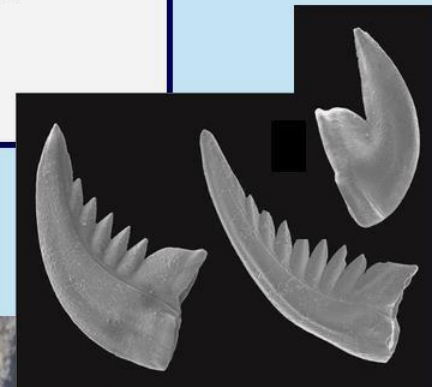
**The rocks exposed on Akpatok Island are almost horizontally distributed; therefore, contour lines on GIS map can be used in estimating thickness of different rock units.**







Geological map in area II

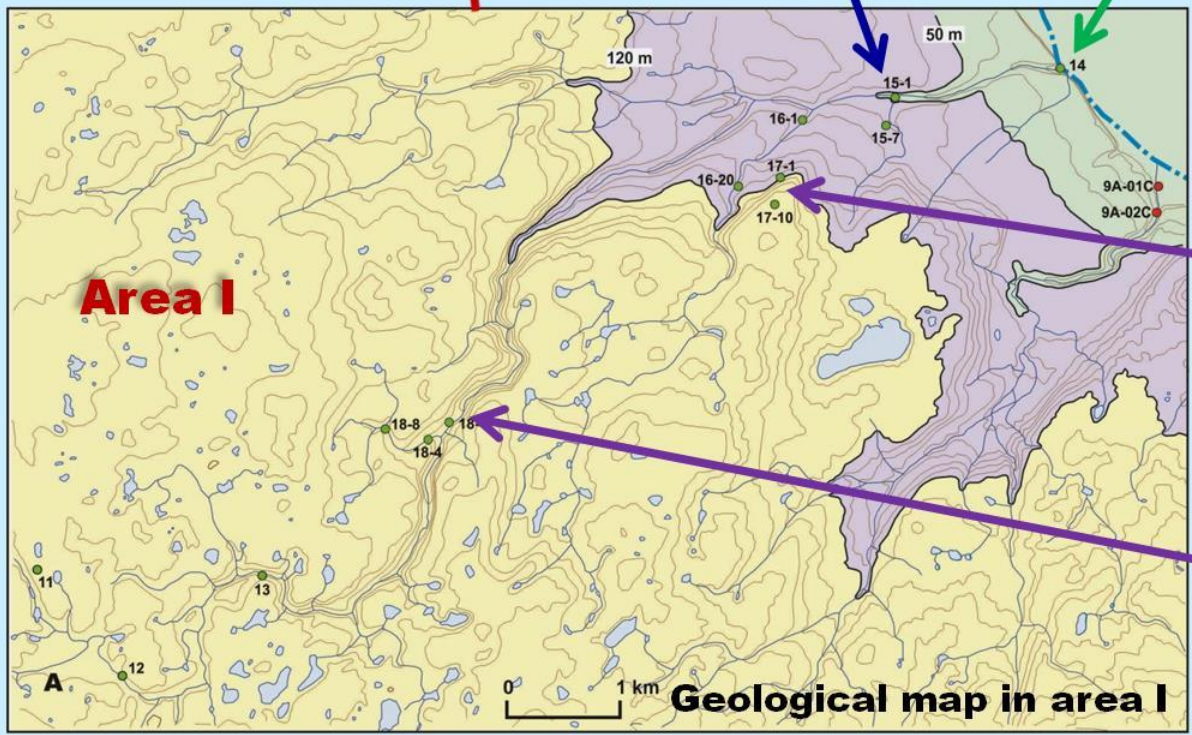
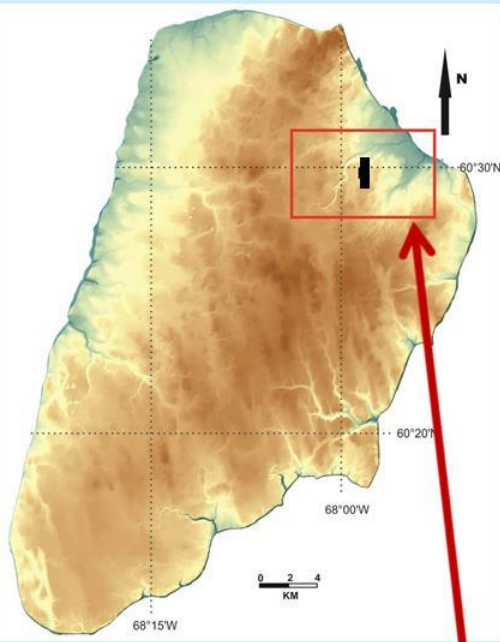


*Belodina confluens*  
Taxon-range Zone

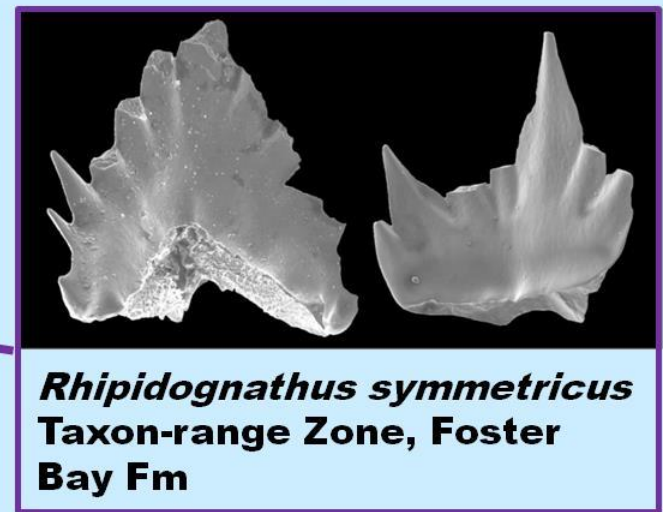
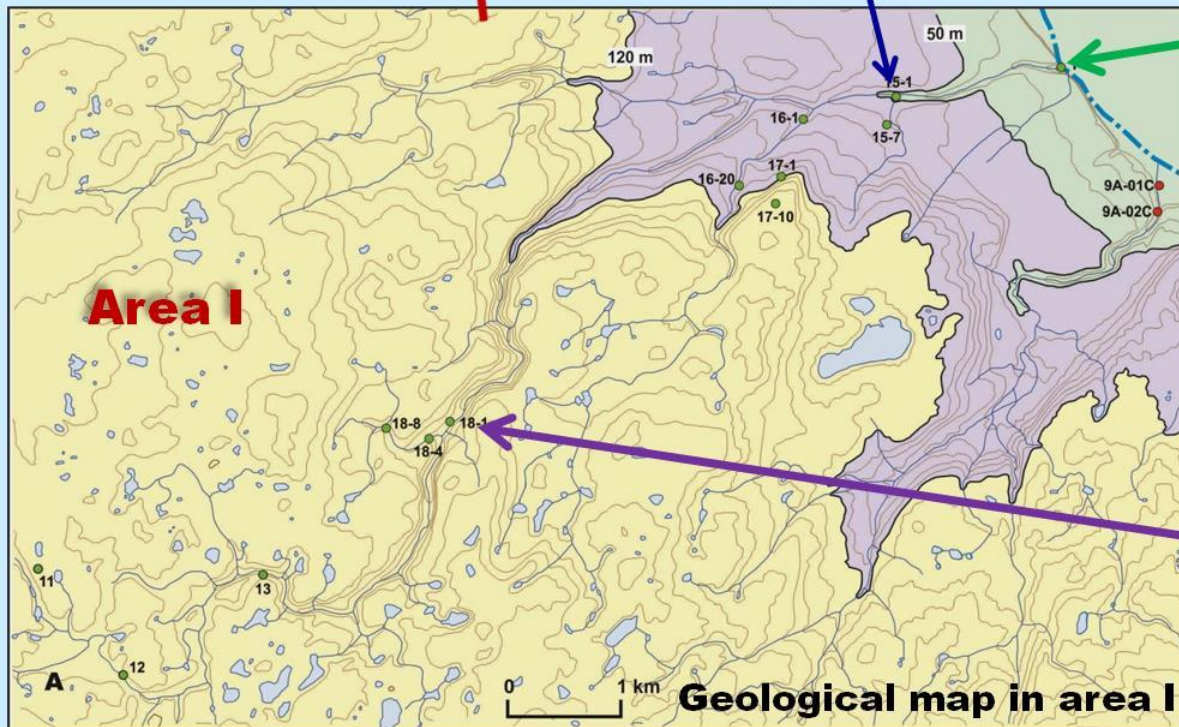
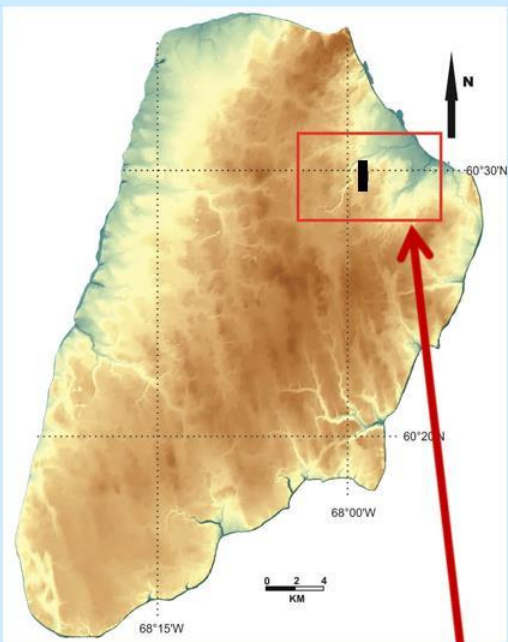


*Maclurites* sp.

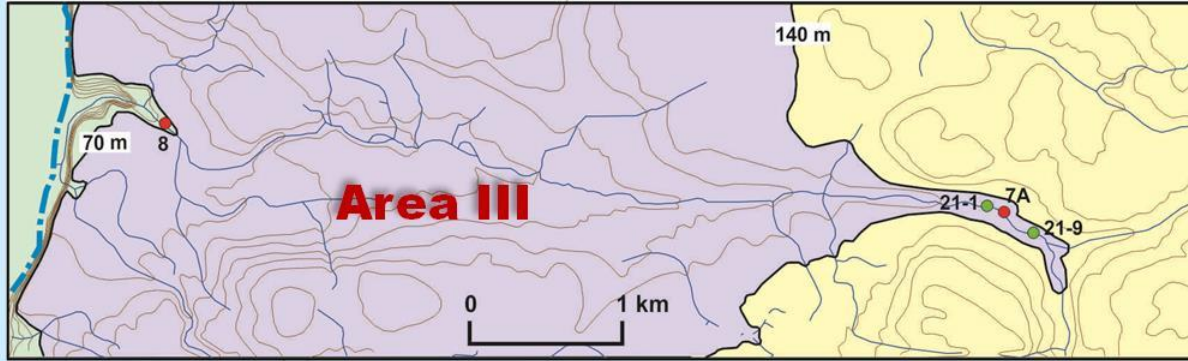




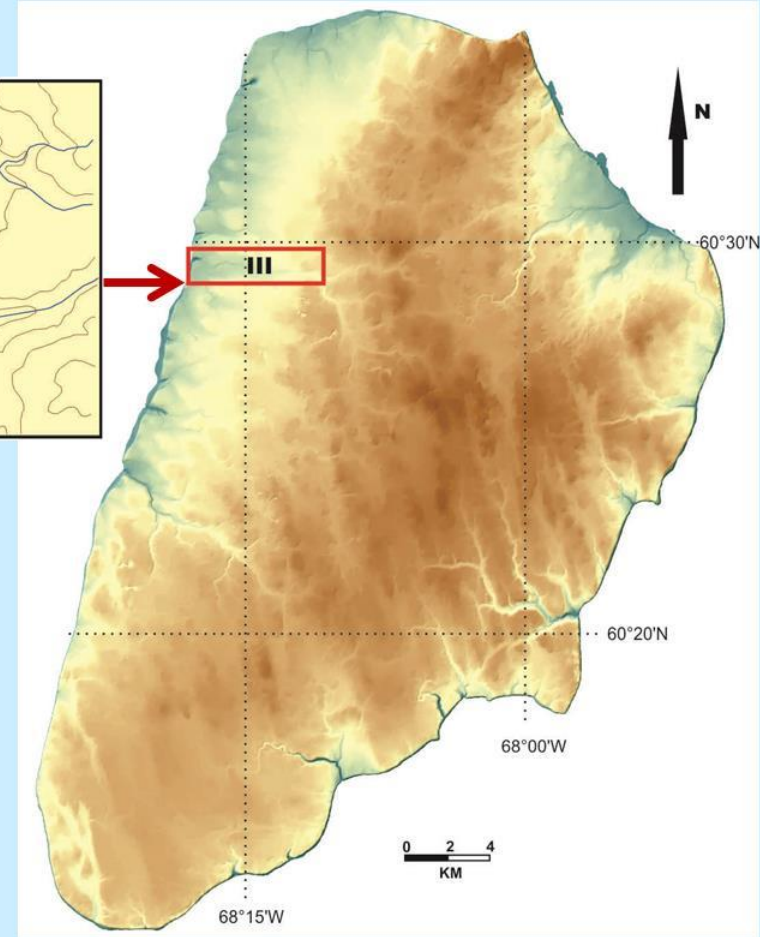


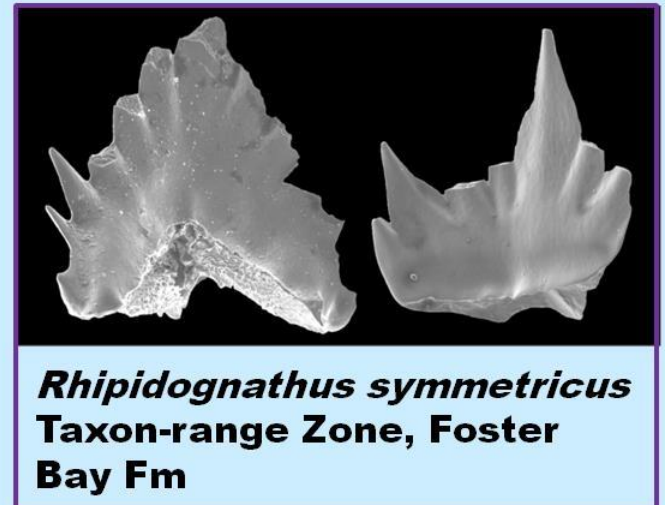
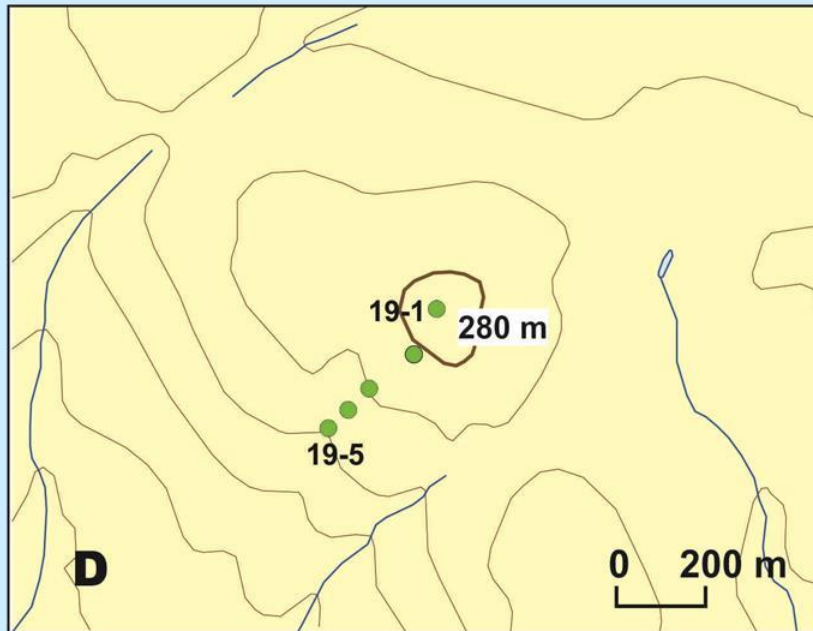
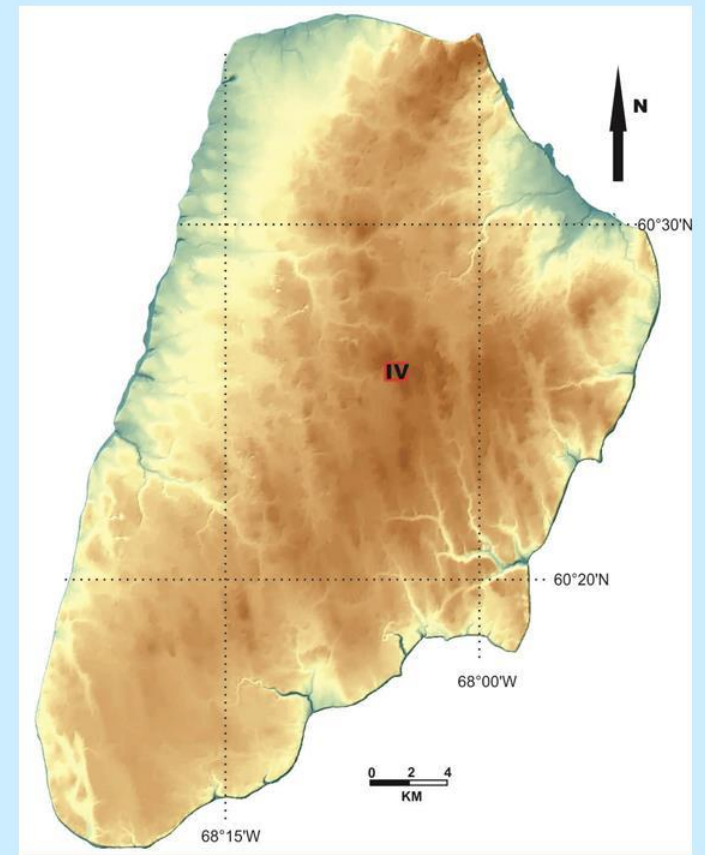
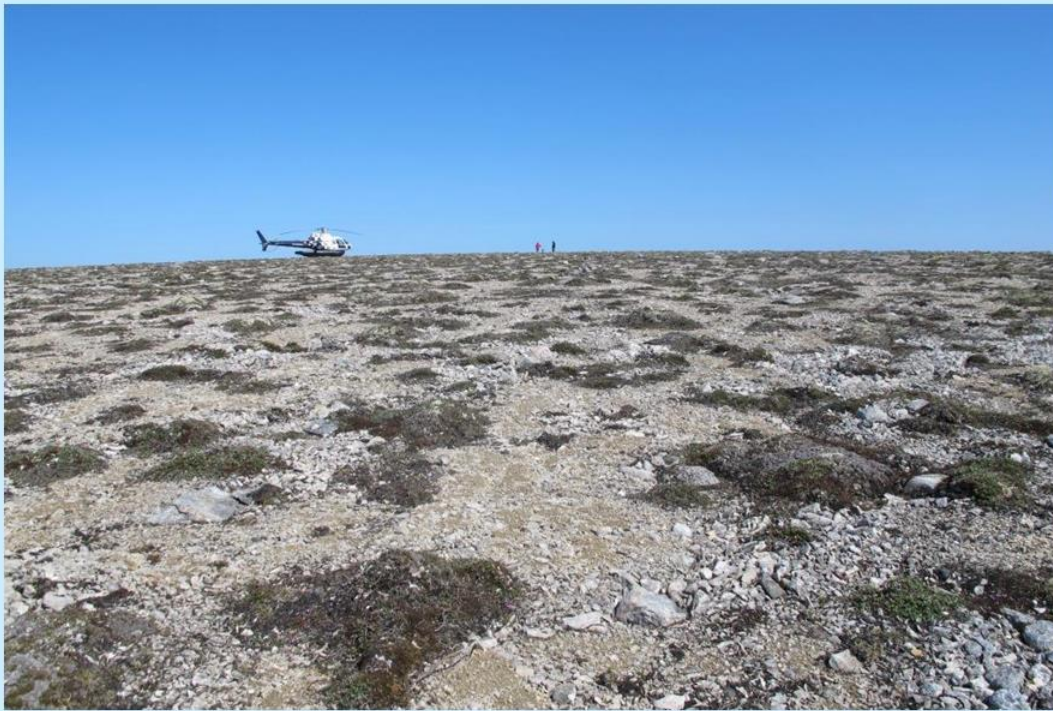




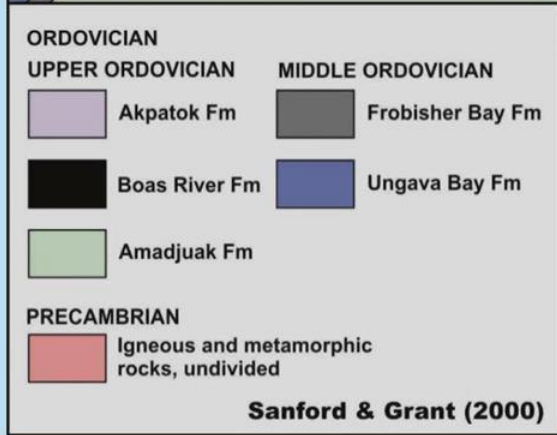
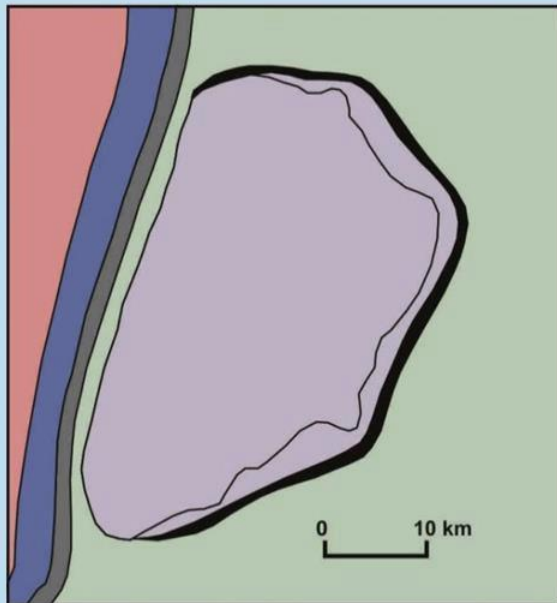


**Geological map in area III**

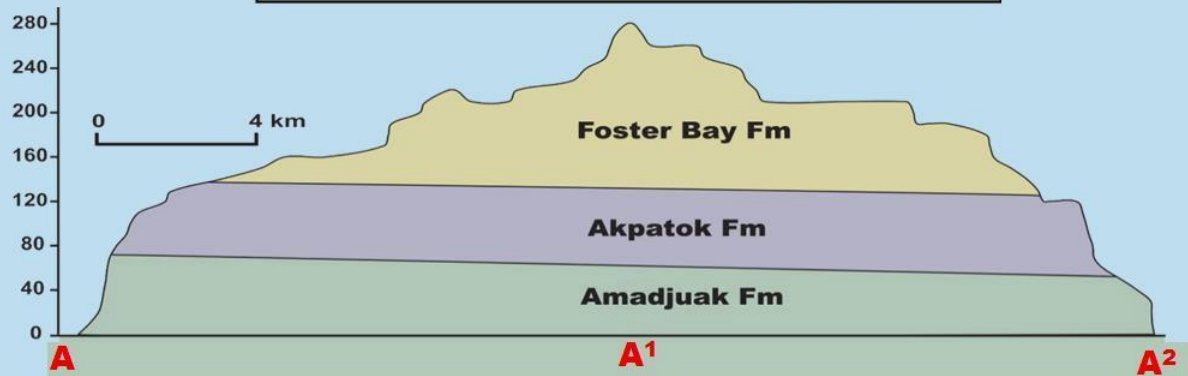
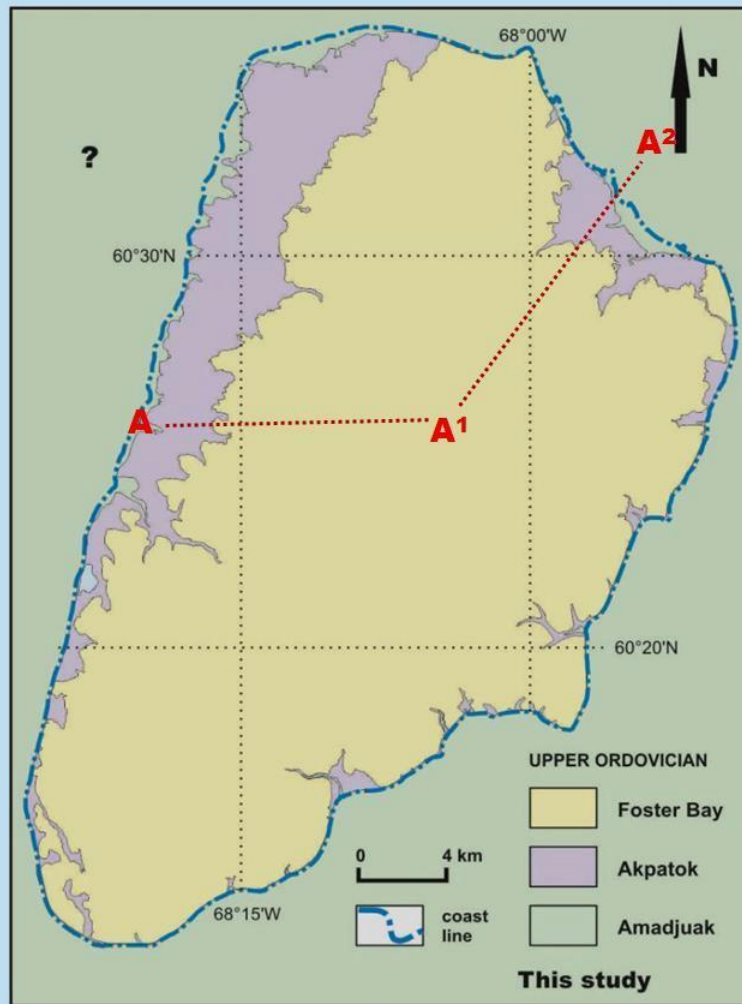


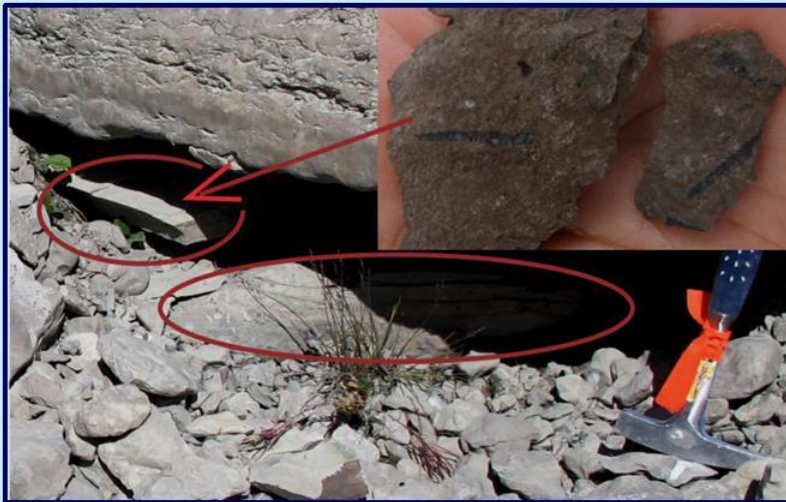
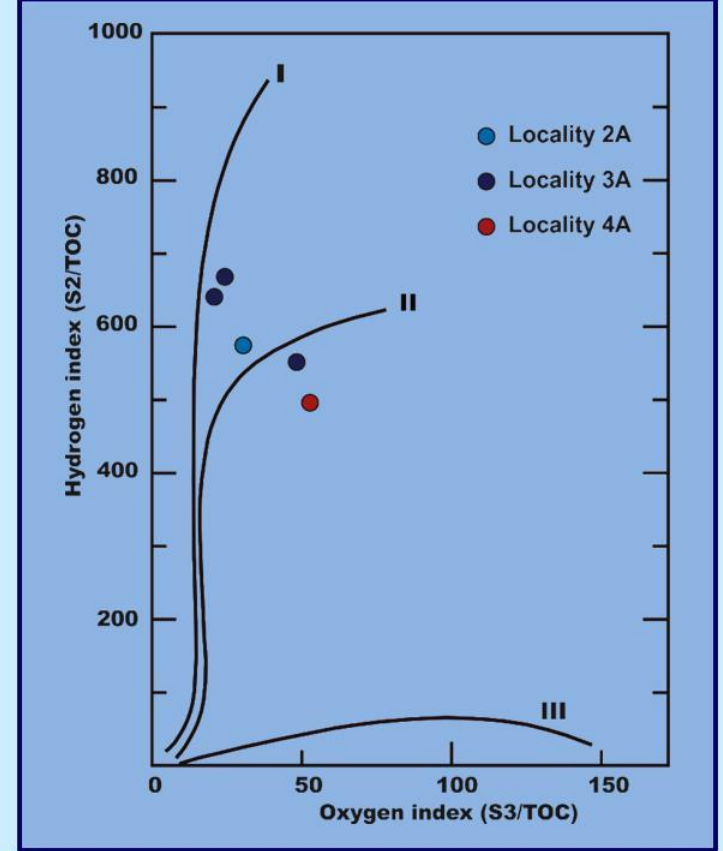
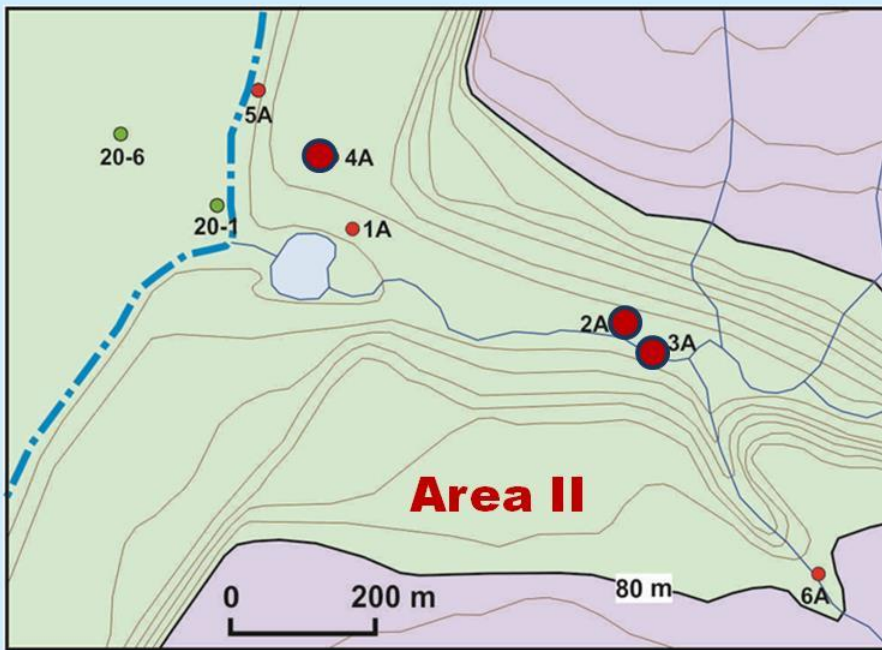






# Geological map of Akpatok Island

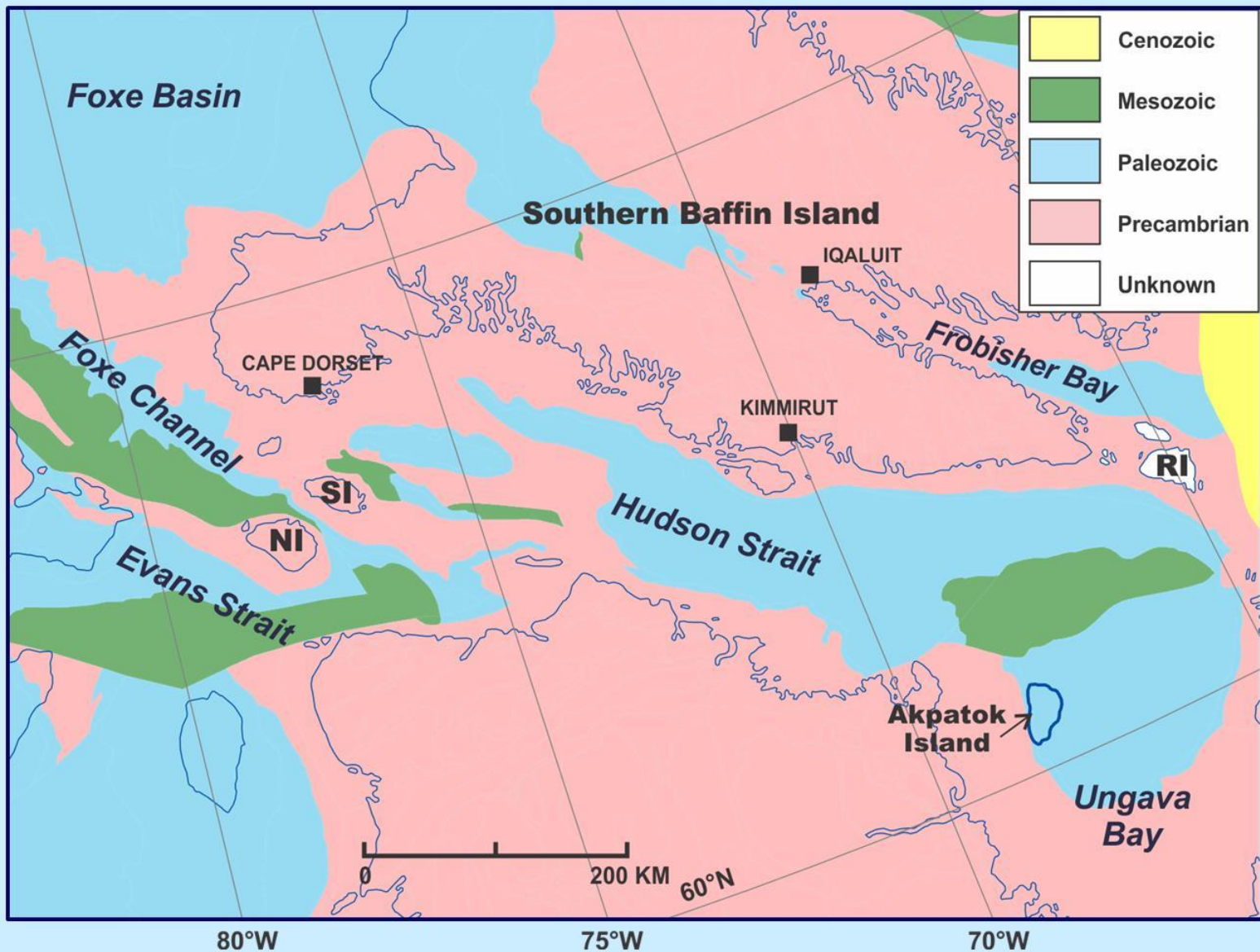




Sample	PI	T <sub>max</sub>	TOC
SZ14-02A-02R	0.02	426	1.52
SZ14-03A-01R	0.04	423	4.13
SZ14-03A-02R	0.03	426	3.53
SZ14-03A-03R	0.03	426	4.19
SZ14-04A-01R	0.02	424	2.18
Average	0.03	425	3.11

**Organic-rich, bituminous argillaceous limestone on Akpatok Island**





**Organic-rich rocks on Akpatok Island provide information about petroleum potential in Hudson Strait**

## **SUMMARY**

- Strata exposed on Akpatok Island are newly recognized as Upper Ordovician upper Amadjuak, Akpatok and Foster Bay Fms, rather than just one Akpatok Formation.**
- Conodont microfossils discovered from three formations strongly support this newly established stratigraphic division.**
- Field observation, paleontological data and stratigraphic analysis on Akpatok Island combined with GIS technology enable substantially revising geological map of Akpatok Island.**
- Ordovician petroleum source rocks discovered on Akpatok Island provide important information about petroleum potential in Hudson Strait and Ungava Bay; Mesozoic rocks that cover Paleozoic rocks in this region might create enough pressure to generate oil from Ordovician source rocks.**



## **ACKNOWLEDGEMENTS**

- ❑ This study is part of Hudson-Ungava Project under Natural Resource Canada (NRCan), Earth Science Sector's (ESS) Geo-mapping for Energy and Mineral Program 2 (GEM 2)**
- ❑ Financial support from both GEM 2 and Canada-Nunavut Geoscience Office (CNGO)**
- ❑ Logistic support in the field was provided by Polar Continental Shelf Project**
- ❑ D. Lavoie organized and participated in fieldwork**
- ❑ Inuit from Kuujuaq, northern Quebec, provided field assistance**
- ❑ H. Taylor and L. Tingley processed conodont samples**
- ❑ P. Hunt took scanning electron microscopy photos for conodonts**