Historical development of a litho- and biostratigraphic framework for onshore Cretaceous–Paleocene deposits along western Baffin Bay

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Abstract: Cretaceous–Paleogene strata along the eastern coast of Baffin Island, on Bylot Island, and on associated islands north of Cape Dyer, have been known since the early days of exploration of Baffin Bay in the mid-nineteenth century. Studies of these strata in the 1970s–1990s established their clastic nature and revealed details of their stratigraphy, ages, and depositional settings. Onshore strata in the Cape Dyer area accumulated in close association with volcanic deposits related to late-stage rifting in the Late Cretaceous to Early Paleocene that eventually formed Baffin Bay. In contrast, deposits in more northerly areas, such as the Eclipse and North Bylot troughs on Bylot Island, exhibit similar clastic rocks, but lack conspicuous volcanic strata, and have been associated with either the Sverdrup Basin or the Baffin Bay rift. The litho- and biostratigraphy of these deposits are summarized and discussed in terms of differing and contrasting stratigraphic interpretations, age assignments, and depositional environments.

Résumé : Les strates du Crétacé-Paléogène le long de la côte est de l'île de Baffin, dans l'île Bylot et dans les îles voisines au nord du cap Dyer sont connues depuis les premiers jours de l'exploration de la baie de Baffin au milieu du XIXe siècle. Les études portant sur ces strates menées dans les années 1970-1990 ont établi leur nature détritique et révélé des détails sur leur stratigraphie, leur âge et leurs milieux de dépôt. Les strates en milieu terrestre dans la région du cap Dyer se sont accumulées en lien étroit avec les dépôts volcaniques associés aux phases tardives du rifting, au Crétacé tardif et Paléocène précoce, qui a abouti à la formation de la baie de Baffin. En revanche, les dépôts dans les régions plus au nord, comme ceux des cuvettes d'Eclipse et de North Bylot dans l'île Bylot, présentent des lithologies détritiques semblables, mais ne renferment pas de strates volcaniques apparentes, et ont été associés soit au bassin de Sverdrup, soit au rift de la baie de Baffin. La lithostratigraphie et la biostratigraphie de ces dépôts sont résumées et examinées sous l'angle d'interprétations stratigraphiques différentes et contrastantes, des attributions d'âge et des milieux de dépôt.

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INTRODUCTION

Much of the east coast of Baffin Island and adjacent Bylot Island is composed of orthogneiss, metagranite, sedimentary rock, and volcanic rock of ages ranging from Archean to Mesoproterozoic (St-Onge et al., 2009, this volume). Along this rugged, approximately 1000 km coastline, however, younger Mesozoic and Cenozoic sedimentary and volcanic strata outcrop locally, including, from south to north: limited exposures north of Cape Dyer (east-central Baffin Island); small outcrops in the vicinity of Scott Inlet (northeast Baffin Island); an extensive succession in the Eclipse Trough (northern Baffin Island at Salmon River, beneath Tasiujaq (Eclipse Sound), and on southwest Bylot Island); and exposures in the North Bylot Trough (adjacent to Maud Bight, northern Bylot Island) (Fig. 1). These limited exposures provide the only onshore analogues to the accumulations of strata of similar age that are inferred to underlie parts of the continental shelf and slope of western Baffin Bay (*see* MacLean et al., 2014; Dafoe, Dickie, and Williams, this volume), and preserve the most comprehensive stratigraphic evidence of the depositional and tectonic evolution of western Baffin Bay. Related prominent offshore basins north of Cape Dyer, from south to north, include: Scott Graben (with associated offshore oil seeps; *see* Bingham-Koslowski, McCartney, and Bojesen-Koefoed, this volume); Buchan Graben; Lady Ann Basin; and Glacier and North Water basins (the last two not shown on Fig. 1). As well, appreciable thicknesses of Cretaceous and Cenozoic strata are found within Lancaster Sound (Brent et al., 2013) and the Cenozoic Baffin Fan accumulation (Fig. 1; also *see* Fig. 1 of Dafoe, Dickie, and Williams, this volume), the latter of which may contain significant hydrocarbon reserves (Gautier et al., 2009; Harrison et al., 2011).

Most of the onshore successions adjacent to the western Baffin Bay region have been examined only cursorily, with basic stratigraphic understanding of the known local sequences. Early studies documented general localities, lithological characteristics, and broad ages, forming a framework for subsequent studies in the later part of the twentieth century; these were more detailed, but still lacked a comprehensive regional context. In the Cape Dyer area, outcrops of younger sedimentary and volcanic strata, unconformably overlying the Archean rocks that dominate the region, were first recognized by Sutherland (1853), who reported coal at 'Cape Durban' (i.e. Durban Island, now named Aggijjat; Fig. 1) during a traverse of Baffin Bay in an attempt to locate the missing Franklin Expedition. Nearby rocks at Qaqulluit (Cape Searle; Fig. 1) were subsequently described by McMillan (1910, p. 423–424), who reported several hundred metres of volcanic breccia and tuff that he dated as Tertiary; McMillan (1910, p. 458) also assigned a Tertiary date to the strata found at Aggijjat (Durban Island). Kidd (1953) subsequently described the extent of the volcanic rocks in the Qaqulluit (Cape Searle)–Cape Dyer area, noting that they form an outcrop belt 88 km long, but extend inland no more than 8 km from the shoreline, and locally are more than 900 m thick.

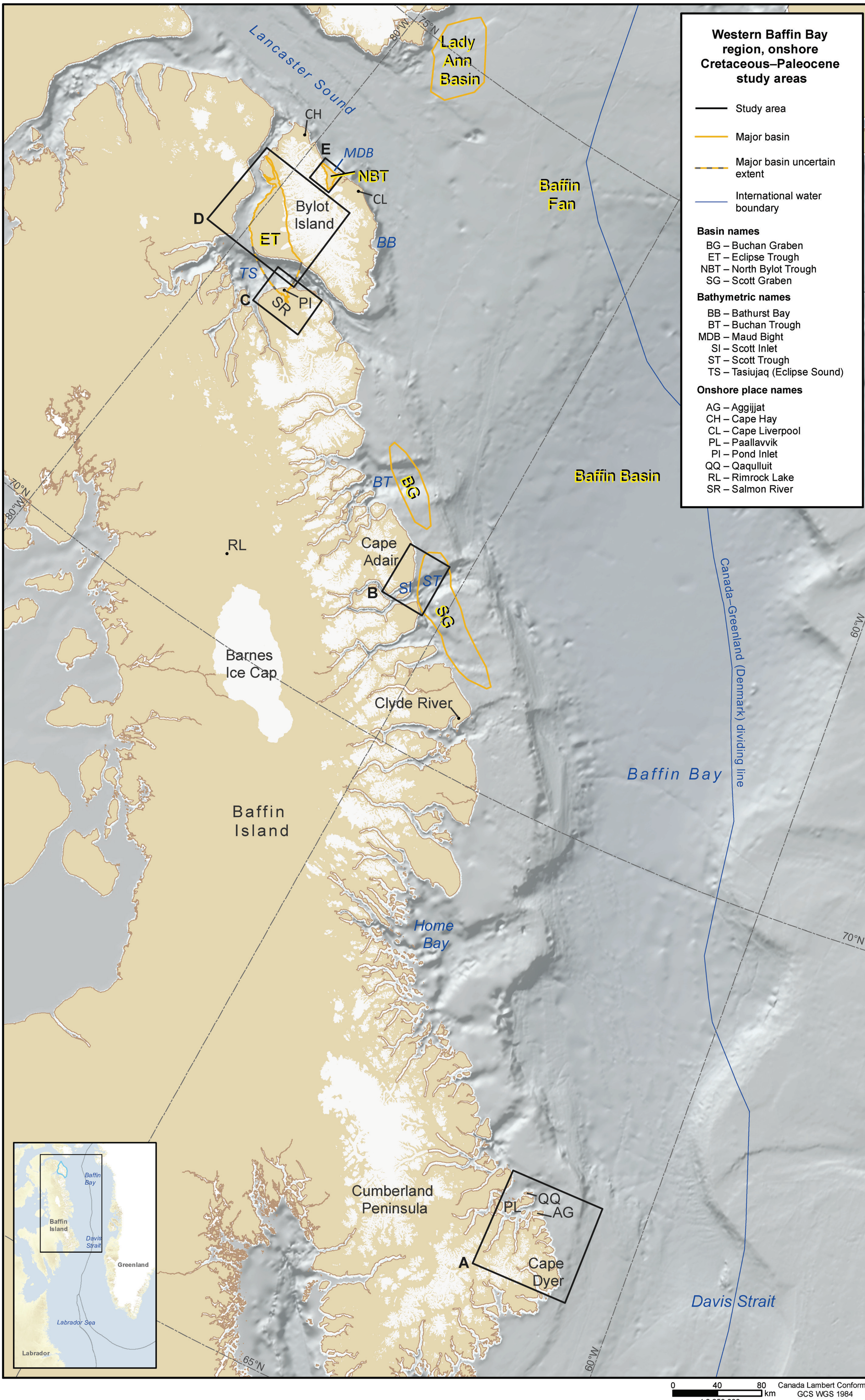
The first geological map showing the rocks of northern Baffin Island and adjacent Bylot Island was prepared by Haughton (1859), based on samples collected by Captain F.L. M'Clintock during several voyages of the *Fox*, also in the search for the remains of the Franklin Expedition. Haughton (1859) considered that "Silurian Limestone" formed the northern two-thirds of Bylot Island and adjacent Borden Peninsula to the west, based presumably on "specimens of brown earthy limestone" collected by M'Clintock at Haughton's locality VII, at "Possession Bay [now Bathurst Bay], south entrance into Lancaster Sound" (Haughton, 1859, p. 382) (Fig. 1). The latitude and longitude provided by Haughton (1859) for this locality plot in the area of Cape Liverpool (Fig. 1) on the north coast of Bylot Island. Paleozoic rocks are not shown on modern geological maps of this general locality, although possible outcrops of Paleozoic strata have been mapped on the north coast of Bylot Island some 100 km to the north and west (e.g. Jackson and Davidson, 1975b). McGregor (D.C. McGregor, unpub. GSC Paleontological Report Fl-21-1980-DCM, 1980) reported fossil scolecodonts (polychaete worm jaw structures) in samples collected from glacial moraine deposits just north of Bathurst Bay, leading him to suggest that possible Ordovician–Devonian rocks could be nearby. Additional samples with scolecodonts collected from west of Maud Bight also suggested the possible presence of Paleozoic strata in that area (D.C. McGregor, unpub. GSC Paleontological Report Fl-9-1972-DCM, 1972; unpub. GSC Paleontological Report Fl-7-1980-DCM, 1980), although Jackson and Davidson (1975a) questioned this interpretation on the basis of lithostratigraphy. Regardless of subsequent findings, Haughton's (1859) geological map was the first to show the presence of younger strata overlying the older "granitoid rocks" that constitute much of Bylot Island and Baffin Island's rugged eastern coast.

Relatively young sedimentary strata in the onshore northern Baffin Bay region were first recognized by Low (1906), commander and geologist on the voyage of the *Neptune* to the Baffin Bay region in 1903–1904. Low (1906) identified strata he assigned to the Tertiary on northern Baffin Island "at Pond's inlet" (i.e. present-day Pond Inlet; Fig. 1), and further reported (p. 229) that "Capt. Adams, of the whaler *Diana*, said that lignite was to be found in similar deposits near Cape Hay, on the east side of Bylot island" (actually on the island's north side; Fig. 1). This latter statement is the earliest suggestion of a stratigraphic outlier adjacent to Maud Bight, approximately 25 km east of Cape Hay. McMillan (1910, p. 458) reiterated that the sandstone and coal units of the Tasiujaq (Eclipse Sound) region should be assigned to the Tertiary. In 1910, the first recorded geological observations of the inferred Tertiary rocks on Bylot Island were made by R.S. Janes, 2nd Officer of the Dominion Government Ship (D.G.S.) *Arctic*, who noted similarities between the rocks near Salmon River with those on Bylot Island to the north, and who recognized that these strata contained fossil trees and buds, as well as coal seams (Appendix No. 6 *in* Bernier, 1911). These rocks are now known to be both Cretaceous and Pliocene (*see* Piraux, 2004; Csank et al., 2013).

It was not until the late 1960s that detailed geological mapping at 1:250 000 scale of these areas of northern Baffin Island and Bylot Island was undertaken (Jackson and Davidson, 1975a, b; Jackson et al., 1975), and broad aspects of the younger stratigraphic successions preserved in these areas became better known, including their Early Cretaceous (Albian) to early Cenozoic age. As a result of these mapping efforts, geological interest arose in the Cretaceous–Cenozoic succession preserved on Bylot Island in particular, and its comparison with successions of similar age in the Sverdrup Basin of the western Canadian Arctic. Reconnaissance mapping and stratigraphic assessments of the Cretaceous–Cenozoic strata by Miall et al. (1980) and Ioannides (1986) described the basic lithostratigraphic succession on Bylot Island and its age, determined by palynology. This interpretive framework was subsequently modified in several theses undertaken by students of Memorial University of Newfoundland in the 1980s to 1990s, which analyzed sections from the Eclipse and North Bylot troughs (Sparkes, 1989; Waterfield, 1989; Wiseman, 1991; Benham, 1991). Similarly, interest in the sedimentary and volcanic strata preserved in the Cape Dyer area, particularly their depositional and tectonic relationships with comparable strata on West Greenland (Henderson et al., 1976), led to detailed litho- and biostratigraphic investigations of these strata during the 1970s and 1980s. Burden and Langille (1990, 1991) provided details of the sedimentary succession preserved locally in the Cape Dyer area and established its Early Cretaceous to Paleocene age. Figure 2 presents a summary of stratigraphic interpretations of the onshore Cretaceous–Paleogene successions along western Baffin Bay, as established by various researchers by the end of the 1990s.

More recently, the Geological Survey of Canada's GEM (Geomapping for Energy and Minerals) program undertook detailed field studies of the Cretaceous–Paleogene outcrop succession of northeastern Baffin Island and Bylot Island between 2009 and 2018 in order to better understand the stratigraphy of the succession, its age limits, depositional environments, and provenance, and to assess how these strata may serve as an analogue for the succession preserved below the offshore continental shelf and slope of western Baffin Bay and in Lancaster Sound. Numerous samples were collected during this fieldwork, with analyses and research activities still underway (Haggart et al., 2017, 2018). Accordingly, this contribution presents a compilation of existing stratigraphic data and interpretations to provide a context for the field investigations undertaken during the GEM program. The present study provides a historical review of the assessments of the Cretaceous–Paleogene successions of Baffin and Bylot islands by geographic region, progressing from south to north, with a focus on the studies undertaken between the 1970s and 1990s.

Figure 1. Location map of northern Baffin Bay showing principal places discussed in text. Insets refer to subsequent figures in text. Onshore basin outlines *modified from* Miall et al. (1980), offshore basin outlines are *from* Keen et al. (this volume). Inset A is shown in Figure 3, inset B in Figure 6, inset C in Figure 8, inset D in Figure 9, and inset E in Figure 10. Additional projection information: Central Meridian = 60°W; Standard Parallels = 65, 75°W; Latitude of Origin = 65°N.



Western Baffin Bay region, onshore Cretaceous–Paleocene study areas
Study area
Major basin
Major basin uncertain extent
International water boundary
Basin names
BG – Buchan Graben
ET – Eclipse Trough
NBT – North Bylot Trough
SG – Scott Graben
Bathymetric names
BB – Bathurst Bay
BT – Buchan Trough
MDB – Maud Bight
SI – Scott Inlet
ST – Scott Trough
TS – Tasiujaq (Eclipse Sound)
Onshore place names
AG – Aggijjat
CH – Cape Hay
CL – Cape Liverpool
PL – Paallavvik
PI – Pond Inlet
QQ – Qaqulluit
RL – Rimrock Lake
SR – Salmon River
Lancaster Sound
Lady Ann Basin
Baffin Fan
Baffin Basin
Bylot Island
Cape Adair
Clyde River
Barnes Ice Cap
Baffin Island
Home Bay
Baffin Bay
Canada–Greenland (Denmark) dividing line
Cumberland Peninsula
Cape Dyer
Davis Strait
A
B
C
D
E
70°N
80°W
75°N
65°N
60°W
Greenland
Labrador Sea
Labrador
0 40 80 km
1:3 250 000
Canada Lambert Conformal
GCS WGS 1984

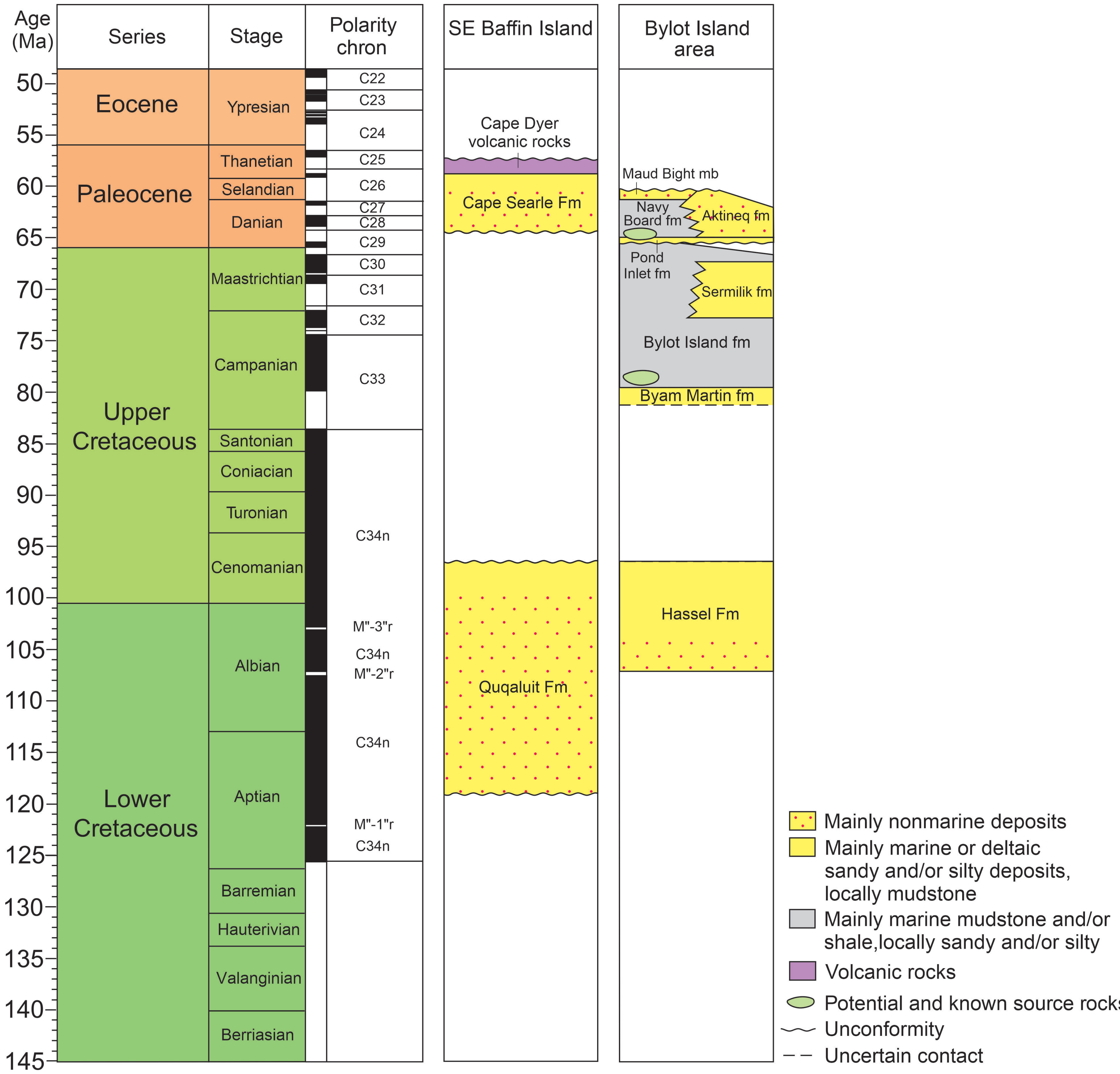


Figure 2. Summary of the onshore Cretaceous–Paleogene stratigraphic successions of the western Baffin Bay region based on research reviewed in text. Formal and informal stratigraphic names are included. Details of the stratigraphic successions of both the Cape Dyer and Bylot Island regions are presented in successive sections of this contribution. The Cape Dyer stratigraphy is *modified from* Gregersen et al. (2013) and Nøhr-Hansen et al. (2016) and based on the original work of Burden and Langille (1990, 1991). The stratigraphy of Bylot Island is *modified from* Gregersen et al. (2013) and Nøhr-Hansen et al. (2016), and includes information from the studies by McWhae et al. (1979), Miall (1986), Waterfield (1989), Harrison et al. (1999), and Haggart et al. (2011). Age limits of Bylot Island strata are based on the authors' consensus assessment of the work of various researchers (Ioannides, 1986; Sparkes, 1989; Waterfield, 1989; Wiseman, 1991; Benham, 1991). Radiometric age dates *after* Cohen et al. (2021).

CAPE DYER REGION

Details of the Cretaceous–Cenozoic sedimentary and volcanic succession preserved in the Cape Dyer area (Fig. 3, 4) were first provided by Kidd (1953). He recognized a thicker succession of basaltic flows at Padloping Island (now Paallavvik), underlain by cross-stratified agglomerate units and flat-lying grey tuff units, to which he ascribed a submarine origin. At the base of the volcanic succession on Padloping Island, and also at Durban Island (now Aggijjat), Kidd (1953) identified interstratified semiconsolidated sandstone and shale with local coal seams up to 25 cm thick; however, he was not able to confidently assess the stratigraphic relationships with the volcanic rocks. Kidd (1953) also recognized that mafic dykes penetrated at least the lower part of the volcanic pile in the area.

Lithostratigraphic succession

Clarke and Upton (1971) undertook the first detailed assessment of the sedimentary and volcanic strata preserved in the Cape Dyer to Cape Searle region (Fig. 3). They recognized units of underlying "pre-volcanic sediments" and overlying "Tertiary volcanics." The former consisted of unconsolidated white quartz sand and associated sandstone, shale, minor coal, and conglomerate, all considered terrestrial in origin. Fossil plants found within the strata were identified by W.A. Bell (*in* Clarke and Upton, 1971) as typical forms found in lower Paleocene strata of the Nuussuaq Peninsula region of West Greenland. Clarke and Upton (1971) noted that cross-stratification in the sedimentary beds suggested northeast-directed paleocurrents. They also noted that the thickness of sedimentary units across the Cape Dyer–Cape Searle region varies appreciably, with associated local variations in lithology.

Clarke and Upton (1971) provided significant detail on the stratigraphic succession and composition of the Cenozoic volcanic strata of the Cape Dyer–Cape Searle belt, recognizing both breccia facies, with giant "cross-stratification" exhibiting southwesterly dips, and flow facies, as well as numerous basaltic dykes crosscutting sedimentary strata at Cape Searle and Padloping Island (= Paallavvik). Based on a lack of inland sources for the volcanic strata, the limited geographic extent of observed dykes, and the southwesterly dip of the breccia units, Clarke and Upton (1971) posited that the volcanic rocks had a source to the northeast and were originally associated with the West Greenland basalt province (Noe-Nygaard, 1942; Clarke, 1968;

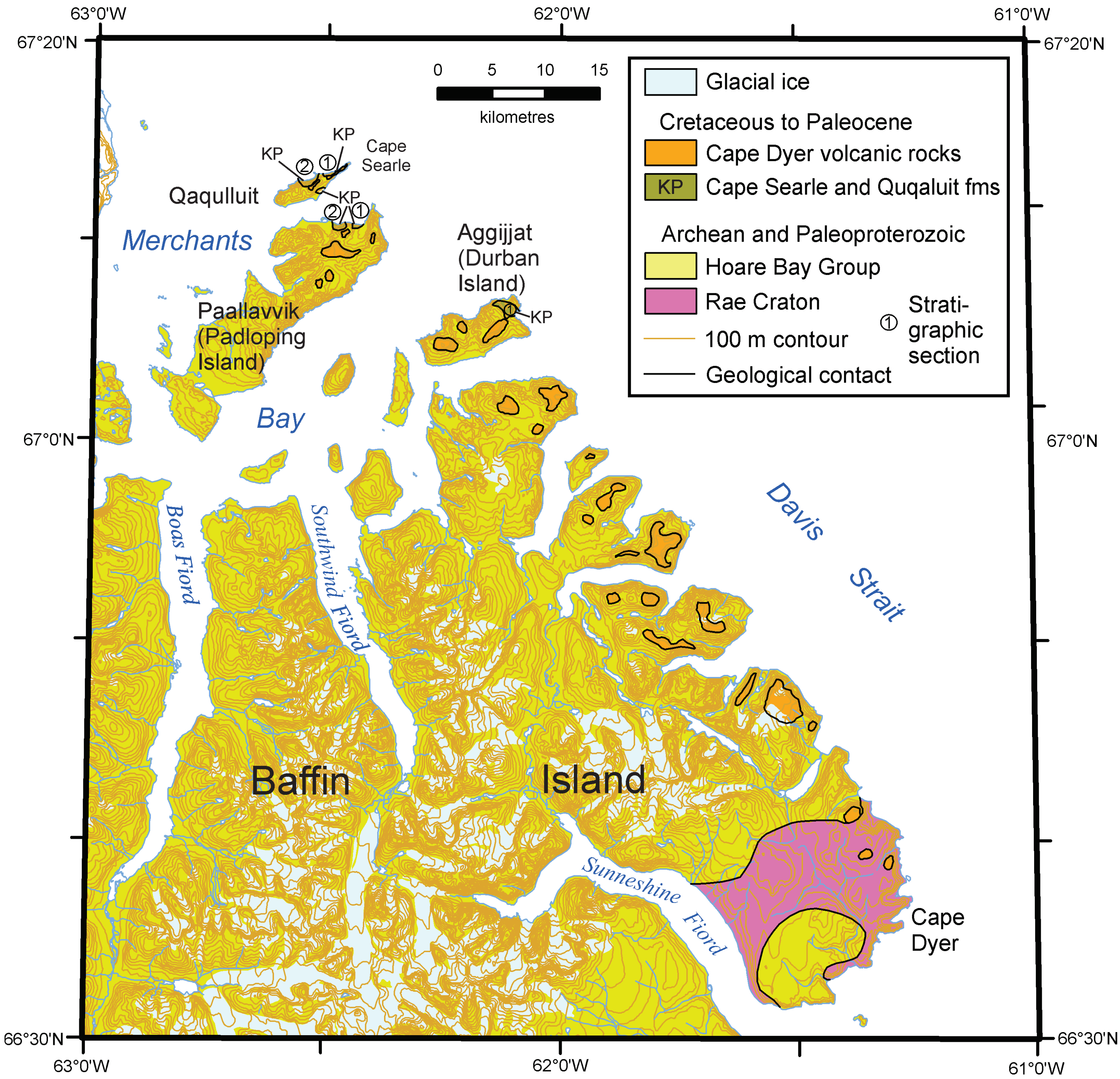


Figure 3. Generalized geological map of the Cape Dyer area, Baffin Island (inset A of Fig. 1). Based on data presented in Burden and Langille (1990), Jackson (1998), St-Onge et al. (2006), Sanborn-Barrie and Young (2013), and Sanborn-Barrie et al. (2013).

now West Greenland Basalt Group), and represented the early stages of rifting of the Baffin Bay region. MacLean et al. (1978) described basalt units sampled in rock drill cores from adjacent offshore areas and noted their similarities with the onshore exposures found on both eastern Baffin Island and West Greenland. They also observed a lack of glass in the offshore basalt samples and suggested this was evidence for eruption in a subaerial setting, in contrast with some of the onshore basalt units on both sides of Baffin Bay. Dafoe, DesRoches, and Williams (this volume) present an updated view on these volcanic rocks and link the breccia units to the 'lava delta' component of a volcanic margin, while Keen et al. (this volume) further describe the volcanic margins of the region in the context of plate reconstructions, showing the linkages between these rocks and those of West Greenland Basalt Group.

In several initial surveys of the stratigraphy preserved at Aggijjat (Durban Island), Paallavvik (Padloping Island), and Qaqulluit (island; also Quqaluit Island of previous workers) in the Cape Dyer area (Fig. 3), Sears (1986), Langille et al. (1986), and Langille (1987) measured and described the clastic strata preserved between small fault blocks (half-grabens) within the gneiss units (Fig. 4, 5). At Qaqulluit (island), they measured nearly 120 m of generally coarsening-upward section, including shale and sandstone beds, locally with tabular cross-stratification, shale rip-up clasts, and ironstone concretions in finer grained facies. This section rests on a highly weathered surface of granitoid basement rocks. Volcanic breccia and interbedded sandstone overlie the top of the section, presumably transitional to the overlying Cape Dyer volcanic rocks. At Paallavvik, Langille et al. (1986) and Langille (1987) constructed a composite stratigraphic section about 180 m thick, including many of the same lithologies and facies present in the Qaqulluit section. The Paallavvik section includes more abundant fine-grained lithologies, common *Metasequoia* plant fossils and permineralized logs, and local coal beds. Finally, they measured nearly 120 m of strata exposed on Aggijjat, consisting of similar lithologies to those at Qaqulluit and Paallavvik, but also including a 78 m thick interval of slumped sandstone deposits ("poorly exposed" interval shown on Fig. 5). Based on palynology, including spores, pollen, and dinoflagellate cysts (or dinocysts), Langille et al. (1986) and Langille (1987) concluded that the strata exposed on the three islands represent principally nonmarine, deltaic, and possibly shallow-shelf environments, of likely Albian–Cenomanian age, although they did not rule out the possibility of recycled Cretaceous palynomorphs within younger deposits. Sears (1986) further concluded, based on stratigraphic and facies relationships, that the exposures on the three islands represent the same deltaic complex, which likely accumulated in a rift setting; but the mid-Cretaceous age was appreciably earlier than generally accepted at the time for the onset of rifting in this part of the Labrador–Baffin Seaway.

Burden and Langille (1990) subsequently refined their interpretation of the stratigraphy present on the small islands north of Cape Dyer, proposing a formal nomenclature and updating the age of the succession (Fig. 2, 3). They assigned the basal strata resting nonconformably on the Archean–Paleoproterozoic gneissic basement rocks to the Quqaluit Formation, composed of coarse clastic deposits that accumulated in a northwest-flowing, braided-river complex in the Aptian to early Cenomanian. This formation was correlated, based on its age and lithology, with the Upernivik Næs Formation of onshore West Greenland and the Hassel Formation of the Bylot Island region and the Canadian Arctic Islands, although the sandstone units of the Quqaluit Formation are noticeably less arenaceous and more immature than those of the Hassel Formation. Building upon this interpretation of the Quqaluit Formation, Burden and Langille (1991) described a lower, Neocomian to Aptian white sandstone that was deposited in a braided-river setting, with an overlying upper Albian–Cenomanian yellow sandstone related to anastomosing or meandering river deposits. The uppermost part of this unit, however, was inferred to have

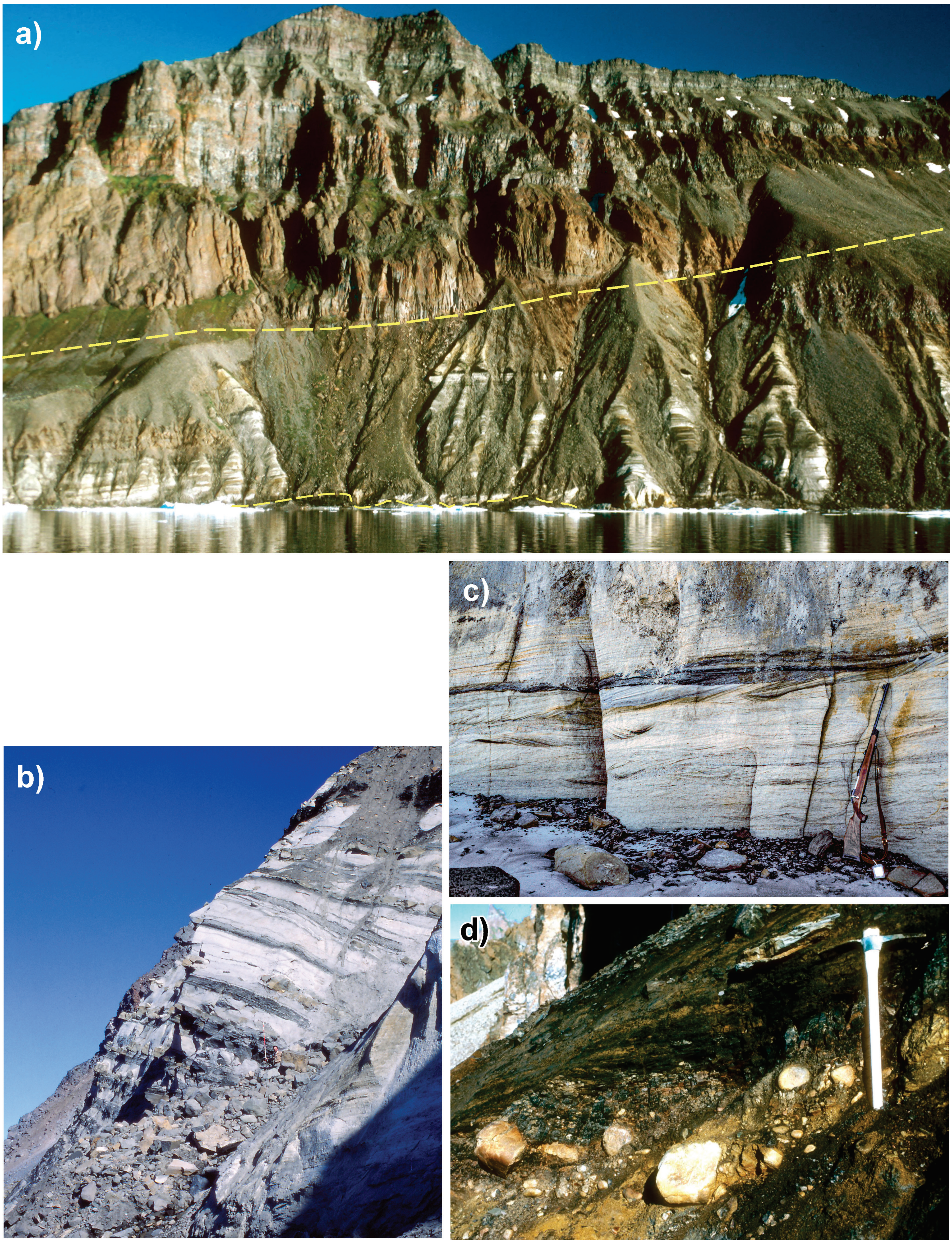


Figure 4. Photographs showing Cretaceous–Paleocene strata preserved in the Cape Dyer area of Baffin Island (inset A of Fig. 1). **a)** Quqaluit Formation type locality, Qaqulluit (island); lower yellow line just above water level shows contact of basal strata of formation unconformably overlying Archean Hoare Bay Group. Approximately 100 m of light-coloured clastic deposits make up the formation and are themselves overlain (contact shown by upper dashed yellow line) by basalt layers of the Cape Dyer volcanic rocks, comprising most of the stratigraphic section here. NRCan photo 2021-199. **b)** Massive to cross-stratified sandstone interbedded with dark mudstone with coal laminae and detritus, Quqaluit Formation, Paallavvik (Padloping Island); person with 1.5 m stick for scale. NRCan photo 2021-200. **c)** Planar- and trough-cross-stratified sandstone with pebble beds, Quqaluit Formation, Paallavvik. Rifle is 0.9 m long. NRCan photo 2021-201. **d)** Cobble- to small boulder conglomerate within carbonaceous mudstone, Cape Searle Formation, Cape Searle, Qaqulluit. Pick is 0.85 m long. NRCan photo 2021-202. *See* Figure 3 for locations. All photographs by E.T. Burden.

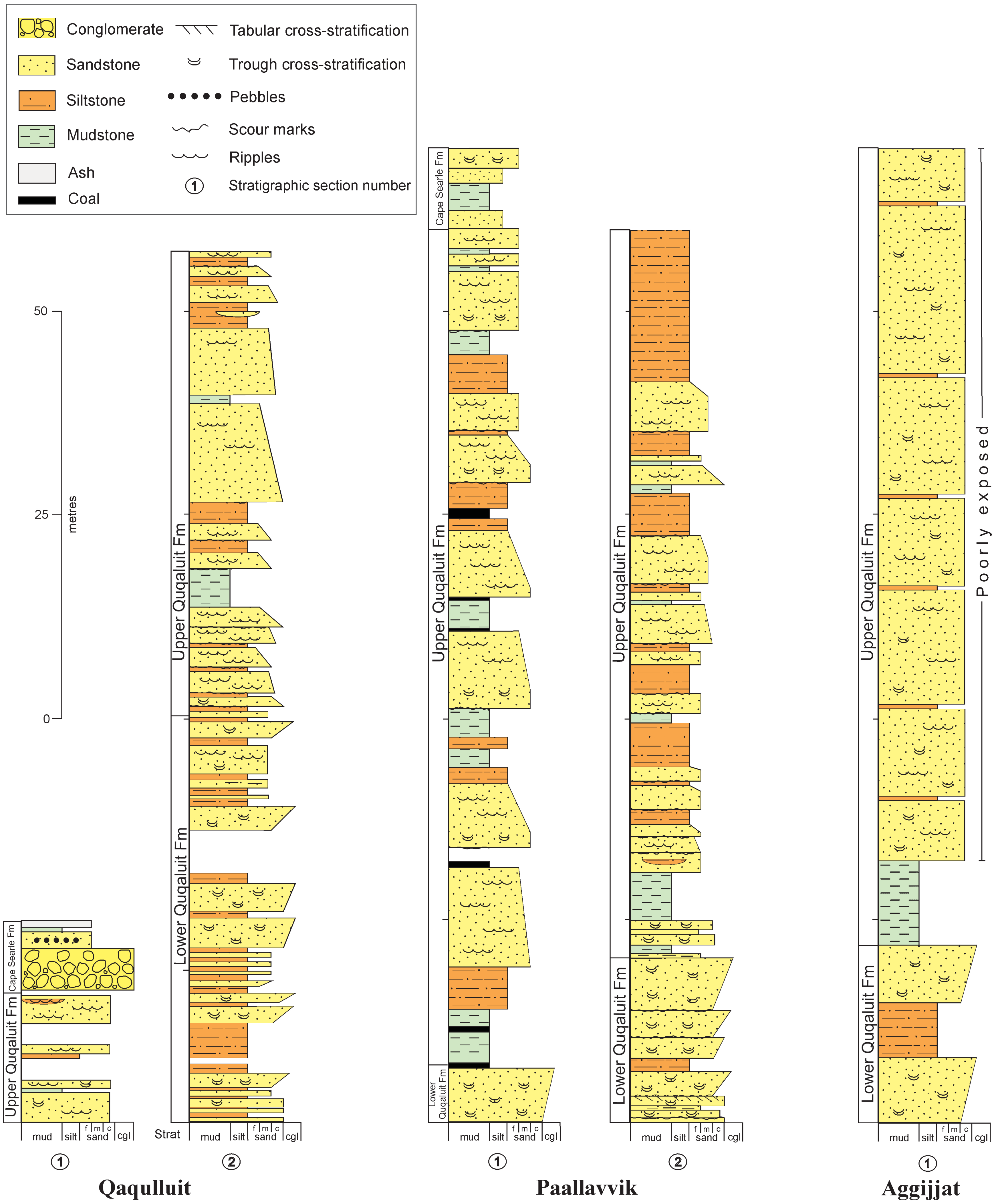


Figure 5. Summary stratigraphic sections of Cretaceous–Paleocene strata preserved in the Cape Dyer area (inset A of Fig. 1) of Baffin Island, (*modified from* Burden and Langille, 1990, 1991). Locations of measured stratigraphic sections are keyed to the map of Figure 3. c = coarse; cgl = conglomerate; f = fine; m = medium.

accumulated under brackish, marginal marine conditions, based on the presence of rare dinocysts and acritarchs. Strata overlying the Quqaluit Formation were assigned to the lower to middle Paleocene Cape Searle Formation, including sandstone, siltstone, mudstone, and conglomerate units interpreted to rest unconformably over the Quqaluit Formation, and representing rapidly deposited fluvial and debris-flow deposits interstratified with volcanic ash, all preceding the onset of late Paleocene deposition of the overlying Cape Dyer basalt units (Burden and Langille, 1990, 1991).

Biostratigraphy

Several palynological studies undertaken in the 1980s refined the age of the sedimentary rocks associated with the onshore volcanic strata of the Cape Dyer region. Holloway (1984) studied sedimentary strata on Aggijjat, Paallavvik, and at Cape Searle (Fig. 3), and recovered Cretaceous palynological assemblages from all three localities. From Aggijjat, Holloway (1984) recognized common, typically long-ranging Mesozoic forms such as *Alisporites bilateralis*, *Cedripites canadensis*, *Parvisaccites radiatus*, *Pityosporites* sp. cf. *P. constrictus*,*Podocarpidites multesimus*, and *Podocarpidites canadensis*, associated with biostratigraphically important *Densoisporites microrugulatus*, *Klukisporites foveolatus*, and *Lycopodiacidites canaliculatus*, suggesting to him a middle to late Albian age. At Paallavvik, Holloway (1984) reported the species *Appendicisporites matesovai*, *Biretisporites potoniaei*, *Cicatricosisporites annulatus*, *Cicatricosisporites australiensis* (now *Ruffordiaspora australiensis*), *Cicatricosisporites hallei*, *Cicatricosisporites auritus*, *Clavifera* sp. cf. *rudis*, *Concavissimisporites parkinii*, *Concavissimisporites* sp. cf. *C. penolaensis*, *Concavissimisporites* sp. cf. *C. punctatus*, *Densoisporites microrugulatus*, *Foveogleicheniidites confossus*, *Impardecispora apiverrucata*, *Impardecispora marylandensis*, *Klukisporites foveolatus*, *Pristinuspollenites* sp. cf. *P. microsaccus*, *Retitriletes* *marginatus*, and *Tigrisporites scurrandus*; he considered this assemblage to indicate an Albian age. Finally, he sampled the strata at Cape Searle and interpreted the assemblage of *Foveosporites canalis*, *Alisporites bilateralis*, *Alisporites grandis*, *Cicatricosisporites* sp., *Deltoidospora hallii*, and *Retitriletes* sp. as suggesting a possible age range of Berriasian to Albian (Holloway, 1984, his Table 1). The assemblages present from Aggijjat, Paallavvik, and Cape Searle, contain pollen and spores exclusively, with no marine elements, leading Holloway (1984) to conclude that the strata from all three localities have a terrestrial origin.

Burden and Langille (1991) revisited the palynology of the exposures preserved north of Cape Dyer. They identified two palynological assemblages present in the strata of the Quqaluit and Cape Searle formations, which they named the *Gemmatriletes clavatus–Cicatricosisporites potomacensis* Zone and the *Trivestibulopollenites betuloides–Pesavis parva* Zone (Table 1). According to Burden and Langille (1991), the lower part of the *Gemmatriletes clavatus–Cicatricosisporites potomacensis* Zone, from the lower part of the Quqaluit Formation, contains a low-diversity palynological assemblage of long-ranging spores and gymnosperm pollen suggesting an age of late Neocomian and Aptian. Strata in the upper part of the *Gemmatriletes clavatus–Cicatricosisporites potomacensis* Zone, in the upper part of the Quqaluit Formation, have a diverse assemblage of spores and pollen, indicating a late Albian to Cenomanian age. In the overlying Cape Searle Formation, Burden and Langille (1991) identified an appreciably younger early to middle Paleocene palynological assemblage (*Trivestibulopollenites betuloides–Pesavis parva* Zone), thus implying that a significant disconformity exists within the succession.

For the sedimentary units in the Cape Dyer region, the lithostratigraphic and biostratigraphic interpretations of Burden and Langille (1990, 1991) form a reasonable framework, with good correlation to units sampled from the nearby offshore, and their interpretation of a dominantly nonmarine setting with some shallow-marine intervals agrees with multiple other studies (*see* Dafoe, Dickie, and Williams, this volume). The overlying Cape Dyer volcanic rocks studied by Clarke and Upton (1971) can be better described as submarine breccia units and likely subaerial flows, based on more recent understanding of their formation (*see* Dafoe, DesRoches, and Williams, this volume).

In the offshore Davis Strait and northern Labrador Sea region, Fenton and Pardon (2007) undertook a comprehensive review of the litho- and biostratigraphy of strata preserved in a number of wells, both in central Davis Strait and along both margins of the seaway. This work also examined onshore exposures in the Cape Dyer area discussed above, particularly those on the islands of Qaqulluit, Paallavvik, and Aggijjat (Fig. 3). The biostratigraphic age data presented by Fenton and Pardon (2007) for these onshore successions are in reasonable agreement with those of Burden and Langille (1990, 1991), although Fenton and Pardon (2007) preferred a general Paleocene age, either early or late, for the Cape Searle Formation, and were able to constrain the age of the lower, white sandstone succession of the Quqaluit Formation as generally Aptian–Albian, in contrast to Burden and Langille (1991), who suggested a late Neocomian to Aptian age for the unit.

SCOTT INLET LOWLAND

Oil slicks were first noted off Scott Inlet and in Buchan Gulf, northeast Baffin Island, in the mid-1970s (Loncarevic and Falconer, 1977; Levy, 1978; Levy and Ehrhardt, 1981), and these observations spurred interest in associated onshore sedimentary outcrops as a possible source of the slicks. A belt of clastic deposits is preserved both on the southeastern side of Scott Inlet at Cape Come Again (informally called 'Cape Smith' by Miller et al., 1977 and 'Smith Point' by others), and also for about 25 km to the northwest of the inlet in an area referred to herein as the Scott Inlet lowland (Fig. 6).

Lithostratigraphy

Exposures of sedimentary clastic strata in the Scott Inlet lowland (Fig. 7) are associated closely with widespread Quaternary glacial features, and whether older strata are present has never been confirmed. Jackson et al. (1979) mapped poorly consolidated quartzose clastic strata in the Scott Inlet lowland region from aerial reconnaissance and assigned them a (?)Cretaceous–(?)Paleogene age, presumably based on their lithological similarity with strata of that age exposed several hundred kilometres to the northwest on Bylot Island and adjacent areas of northern Baffin Island. Jackson et al. (1979) were possibly unaware that Miller et al. (1977) had previously dated mollusk shells from 'Cape Smith' at about 45 200 BP (^{14}C and amino acid racemization dating). Subsequent compilation-scale mapping of sedimentary deposits in the Scott Inlet lowland by Scott and de Kemp (1998) assigned stream-cut exposures interpreted to sit beneath overlying Quaternary deposits to the "Cretaceous to Tertiary Eclipse Group."

Table 1. Palynological zones and important taxa for onshore Cretaceous–Paleocene strata of the Cape Dyer region, western Baffin Bay.

Early and Middle Paleocene	***Trivestibulopollenites betuloides–Pesavis parva* Zone**
	Carpinipites ancipites
	Paraalnipollenites alterniporus
	Pesavis parva
	Polyvestibulopollenites verus
	Quercoidites microhenrica
	Rhoipites crassus
	Triatriopollenites granilabratus
	Tricolpites hians
	Tricolporopollenites cingulum
	Trivestibulopollenites betuloides
	***Gemmatriletes clavatus–Cicatricosisporites potomacensis* Zone**
Late Albian to Cenomanian	Upper part of zone
	Appendicisporites matesovae
	Camarozonotriletes ambigens
	Cicatricosisporites crassiterminatus
	Foveogleicheniidites confossus
	Foveotricolpites sphaeroides
	Retitricolpites sp.
	Rousea sp. cf. *R. georgensis*
	Tappanispora sp. cf. *Tigrisporites verrucatus*
	Tricolpites sagax
Late Neocomian and Aptian	Lower part of zone
	Low diversity assemblage of spores and pollen
After Burden and Langille (1990).	

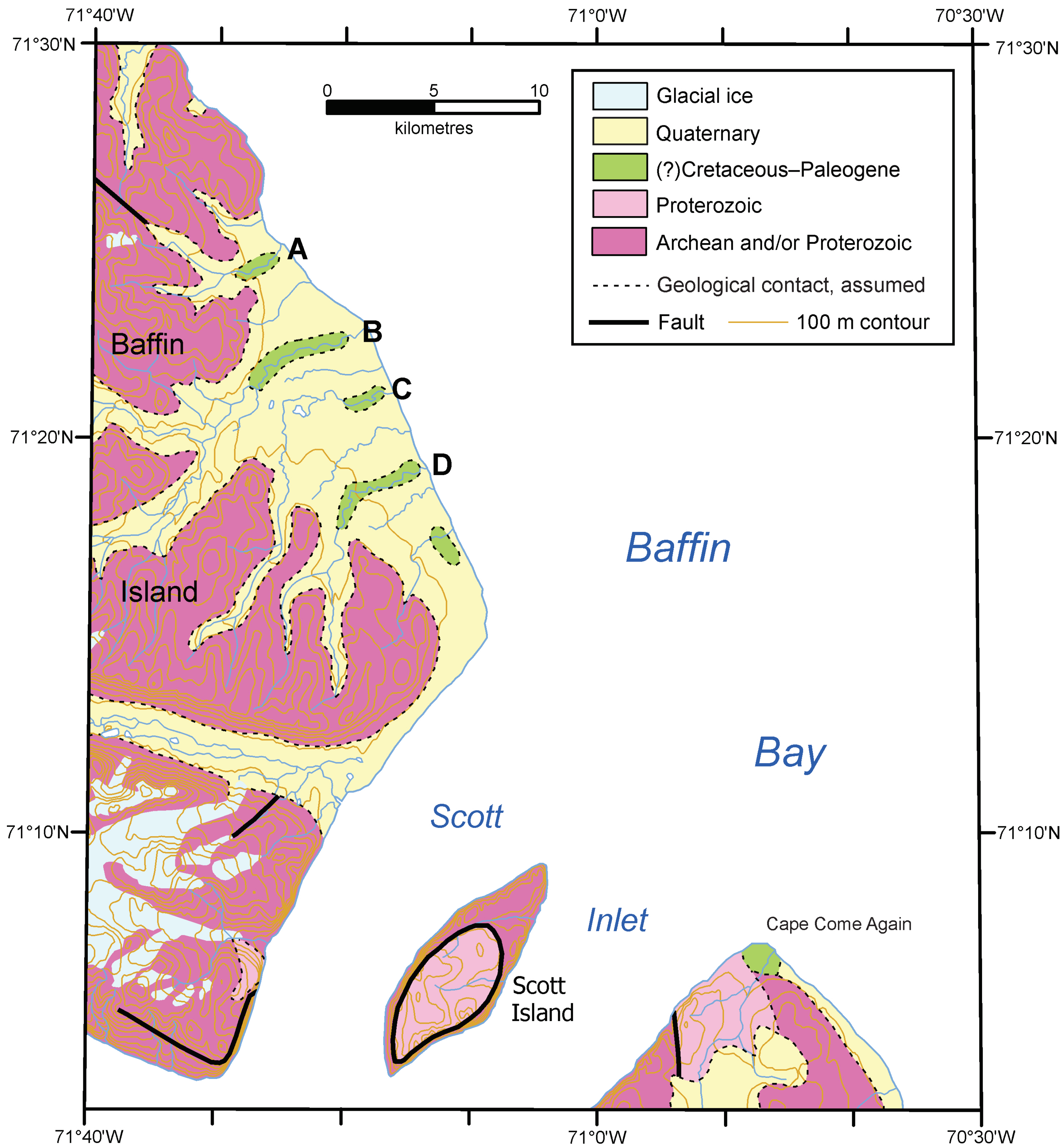


Figure 6. Generalized geological map of the Scott Inlet lowland area (inset B of Fig. 1), Baffin Island, northeast Nunavut (inset B of Fig. 1). *Modified from* Jackson et al. (1979) and Newman (1987). Letters A–D show locations of stratigraphic sections of Newman (1987).

Biostratigraphy, age, and depositional environments

Holloway (1984) examined two samples of feldspathic sand and peat units exposed along streams from the Scott Inlet lowland and identified marine dinocysts in one of them, which was assigned a late Albian–middle Cenomanian age. Burden and Holloway (1985) and Newman (1987) subsequently re-examined these samples, as well as others collected in the area, and recognized mid- to Late Cretaceous marine dinocysts, as well as a diverse assemblage of nonmarine Quaternary diatoms. They therefore suggested a Quaternary origin, but with reworked detritus derived from Cretaceous strata, possibly originating from shallow offshore sources exposed due to postglacial rebound. Based on this work, Jackson (2000) correlated the outcrop at 'Smith Point' (i.e. Cape Come Again), on the southeastern side of Scott Inlet, with the Pleistocene Clyde Foreland Formation of Feyling-Hanssen (1976), and also accepted the Quaternary interpretation of Burden and Holloway (1985) and Newman (1987) for the strata exposed northwest of Scott Inlet, suggesting these rocks may also be correlative with the Clyde Foreland Formation.

The available evidence suggests that the limited exposures of clastic strata found in the Scott Inlet lowland area, at the southeast point of the inlet and to its northwest, are of Quaternary age, but possibly sourced in part from pre-existing Cretaceous strata, and best correlated with the Clyde Foreland Formation; however, E.T. Burden, one of the present authors, has visited the area and noted that the published surveys analyzed onshore exposures restricted to within a few kilometres of the shoreline (e.g. Fig. 7a), leaving open the possibility that older strata may be present farther inland.

Rimrock Lake Inlier

Andrews et al. (1972) described a very restricted exposure of carbonate strata that they called the "Rimrock Bed" (Rimrock Lake), found at relatively high elevation (about 730 m a.s.l.) approximately 150 km west of Scott Inlet and north of the Barnes Ice Cap (*see* location in Fig. 1), and assigned it a Paleogene age based on palynomorphs. Jackson and Morgan (1978) correlated this limited exposure with Paleogene strata of the Eclipse Group preserved farther to the north; however, Refsnider et al. (2012), using uranium-series dating, subsequently demonstrated that these strata are actually late Quaternary subglacial carbonate deposits. More recent geological mapping in this area has only recognized Archean rocks with Quaternary cover (Skipton et al., 2020).

BYLOT ISLAND REGION

Structural setting

The mountainous part of Bylot Island was referred to as the "Byam Martin High" by Kerr (1980) and subdivided into the Liverpool and Central Bylot structural highs by Harrison et al. (2011). These highs

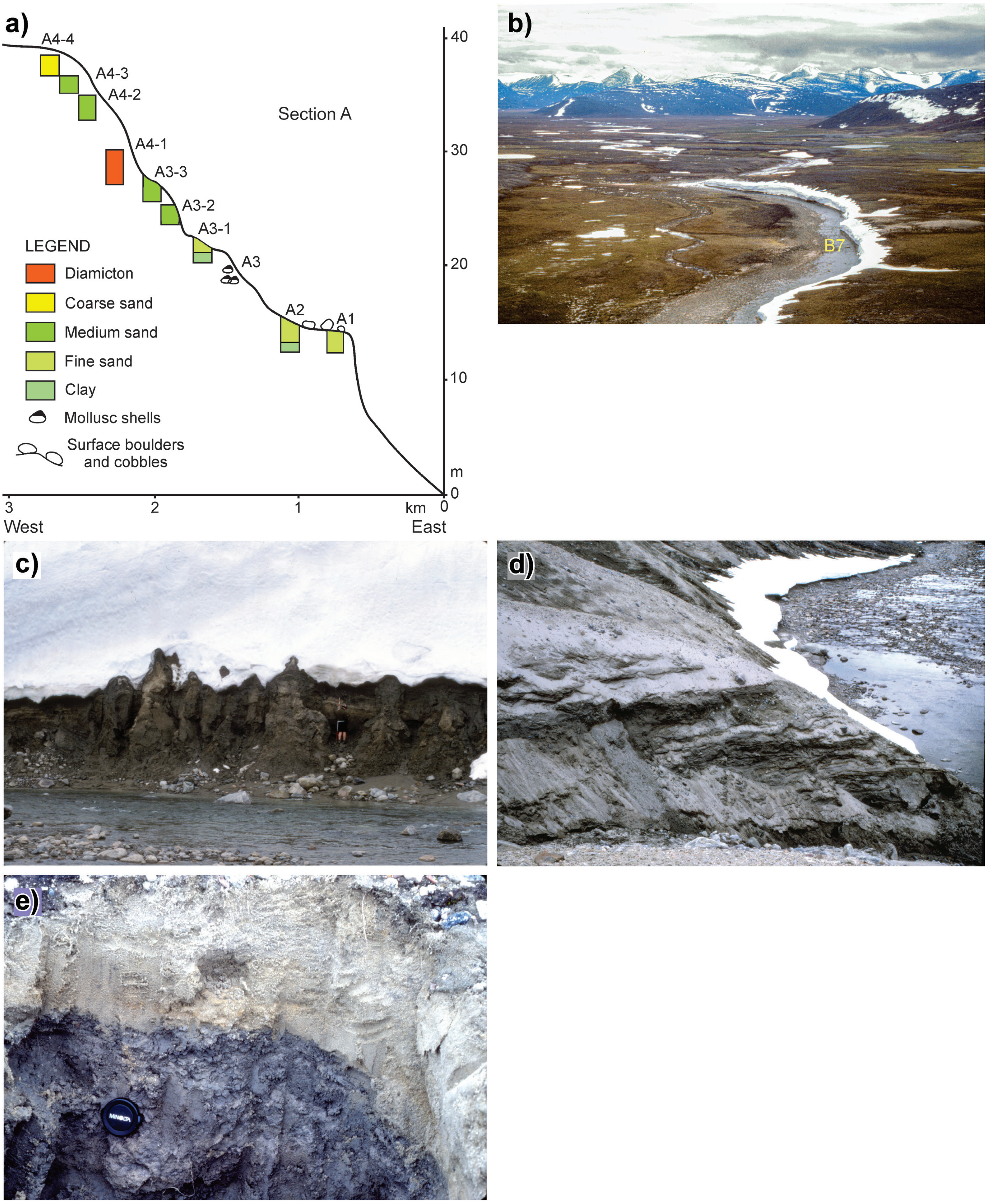


Figure 7. Stratigraphic section and photographs showing exposures of possible (?)Cretaceous–Quaternary strata in the Scott Inlet lowland area (inset B of Fig. 1), Baffin Island. *See* Figure 6 for section locations. **a)** Stratigraphic section A of Newman (1987), showing thicknesses of exposures along river bank plotted against distance from shoreline. Note general coarsening-upward trend. **b)** View of the valley of stratigraphic section B of Newman (1987), showing general terrain of the lowland. Station B7 of Newman (1987) is located beneath snowbank on north (right) side of river. Riverbank snow drifts in foreground are approximately 2.5 m tall. NRCan photo 2021-203. **c)** Station B7 of Newman (1987), showing horizontally stratified, poorly consolidated sand and mud, overlain by glacial silt and mud layers beneath snowbank. Person with stick is 1.7 m tall. NRCan photo 2021-204. **d)** Station B8 of Newman (1987), showing horizontal, cross-stratified and poorly consolidated sand and mud, locally with cobble conglomerate, overlain by buff glacial sand; bluff is approximate 15 m high from river to glacial sand. NRCan photo 2021-205. **e)** Station A3-1 of Newman (1987), showing excavated face of mud overlain by quartz-rich planar cross-stratified sand. Lens cap for scale is 6.5 cm across. NRCan photo 2021-206. All photographs by E.T. Burden.

separate exposures of Cretaceous to Paleocene strata in the Bylot Island area into two distinct regions first described by Jackson et al. (1975): Eclipse Trough (Fig. 8, 9) and North Bylot Trough (Fig. 10). Eclipse Trough is the more southerly region and is preserved on northeastern Baffin Island (Fig. 8), the southwest side of Bylot Island (Fig. 9), and possibly some areas beneath the Tasiujaq (Eclipse Sound)–Navy Board Inlet waterway. On Bylot Island, the Eclipse Trough is bounded to the east by the Aktineq Fault Zone (Jackson and Davidson, 1975b), but farther south the location of this fault is not clear (Fig. 9). Miall et al. (1980) and Jackson (2000) showed it continuing to the south-southeast under Tasiujaq and onto northern Baffin Island, whereas McWhae (1981) showed it continuing to the east-southeast beneath Tasiujaq. Vertical displacement of uplifted basement blocks along the Aktineq Fault Zone and associated fault zones is inferred to be "on the order of several thousand feet" (about 600–1200 m; Clarke, 1976).

Tasiujaq bisects the onshore exposures of the Eclipse Trough, leaving an outlier preserved along Salmon River and adjacent areas east and southwest of Pond Inlet (Fig. 8). These exposures and others nearby along the coast of Baffin Island or just inland, constitute the Salmon River region of the Eclipse Trough.

Bedding surfaces in Cretaceous to Paleocene strata in the Eclipse Trough generally dip shallowly toward the southwest and become steeper near the Aktineq Fault Zone. Along the south coast of Bylot Island near the fault zone, they become more southerly dipping. Broad, open upright folds have been mapped south of Twosnout creek (informal name) and northeast of Canada Point (Fig. 9; Jackson and Davidson, 1975b).

Farther north, the North Bylot Trough region includes Cretaceous–Paleocene strata found on the north coast of Bylot Island between the Archean to Paleoproterozoic gneiss units, which form the Liverpool and Central Bylot topographic highs (Harrison et al., 2011) (Fig. 10). The North Bylot Trough is bounded to the southwest by the Cape Hay Fault Zone, locally up to 1 km wide, and by an unnamed fault to the east that parallels a ca. 720 Ma Franklinian dyke (Jackson and Davidson, 1975b). Both of these structures have been interpreted to extend northwestward into Lancaster Sound, where they are recognized on marine seismic lines (McWhae, 1981; Harrison et al., 2006; Brent et al., 2013). Adjacent to these faults in the North Bylot Trough, Cretaceous–Paleocene strata are strongly deformed and locally steeply dipping (Benham, 1991); elsewhere in the trough, Cretaceous–Paleocene strata are gently warped and form a north-south-oriented, open anticline-syncline pair (Benham and Burden, 1990).

Lithostratigraphy and biostratigraphy of the Eclipse and North Bylot troughs

The initial interest in the Eclipse Trough sedimentary deposits stemmed from the identification of the coal deposits exposed near Pond Inlet, a stopping point for Arctic exploration vessels. These coal units, particularly well developed in the vicinity of Salmon River, were of interest as a fuel source. Indeed, Bernier (1939, p. 362) reported that "a seam of coal was found during the [1910 *Arctic*] trip and a bag taken for testing was found to be excellent for cooking purposes"; however, more specific assessments of the coals in the Salmon River area were undertaken by different workers over many years (e.g. J.D. Craig, unpub. GSC report, 1923; Mohr, 1925; B.R. MacKay, unpub. GSC report, 1925; Weeks, 1927; Research Council of Alberta, 1940; Swartzman, 1947a, b; W.L. Davison, unpub. GSC report, 1955) and concluded that the coals are of limited extent and insufficient to provide a regular power source.

Continued interest in the nature of the coal deposits and their depositional framework, as well as broader issues of hydrocarbon resource potential in the region, led to subsequent research programs of the Geological Survey of Canada (GSC) in the 1960s and 1970s, followed by an extended research program undertaken by Memorial University of Newfoundland (MUN). Each of the focused programs in the latter part of the twentieth century contributed uniquely to the lithostratigraphic understanding of the successions preserved within the Eclipse and North Bylot troughs. The most comprehensive mapping of Cretaceous–Paleogene strata was by Miall et al. (1980) for the Eclipse Trough, and by Benham (1991) for the North Bylot Trough, and their maps are shown in Figures 9 and 10, respectively. With regard to the lithostratigraphy, the MUN researchers undertook more detailed, albeit not regionally comprehensive studies; their interpretations are included in Figure 2.

Interestingly, few molluscan or other invertebrate fossil remains have been described from the Upper Cretaceous–Paleocene succession preserved on Baffin Island and adjacent Bylot Island, in contrast to the rich assemblages that have been described from coeval strata of the Nuussuaq Basin preserved onshore West Greenland (Ravn, 1918; Rosenkrantz et al., 1942; Birkelund, 1965; Kollmann and Peel, 1983). Consequently, biostratigraphic subdivision and correlation of Cretaceous–Paleocene onshore strata along the western Baffin Bay margin has relied primarily on palynology, principally dinocysts, pollen, and spores, with associated rare molluscs (e.g. Haggart et al., 2017). As noted by Miall et al. (1980), the recovery and preservation of palynoflora in these rocks is often poor, and reworking of

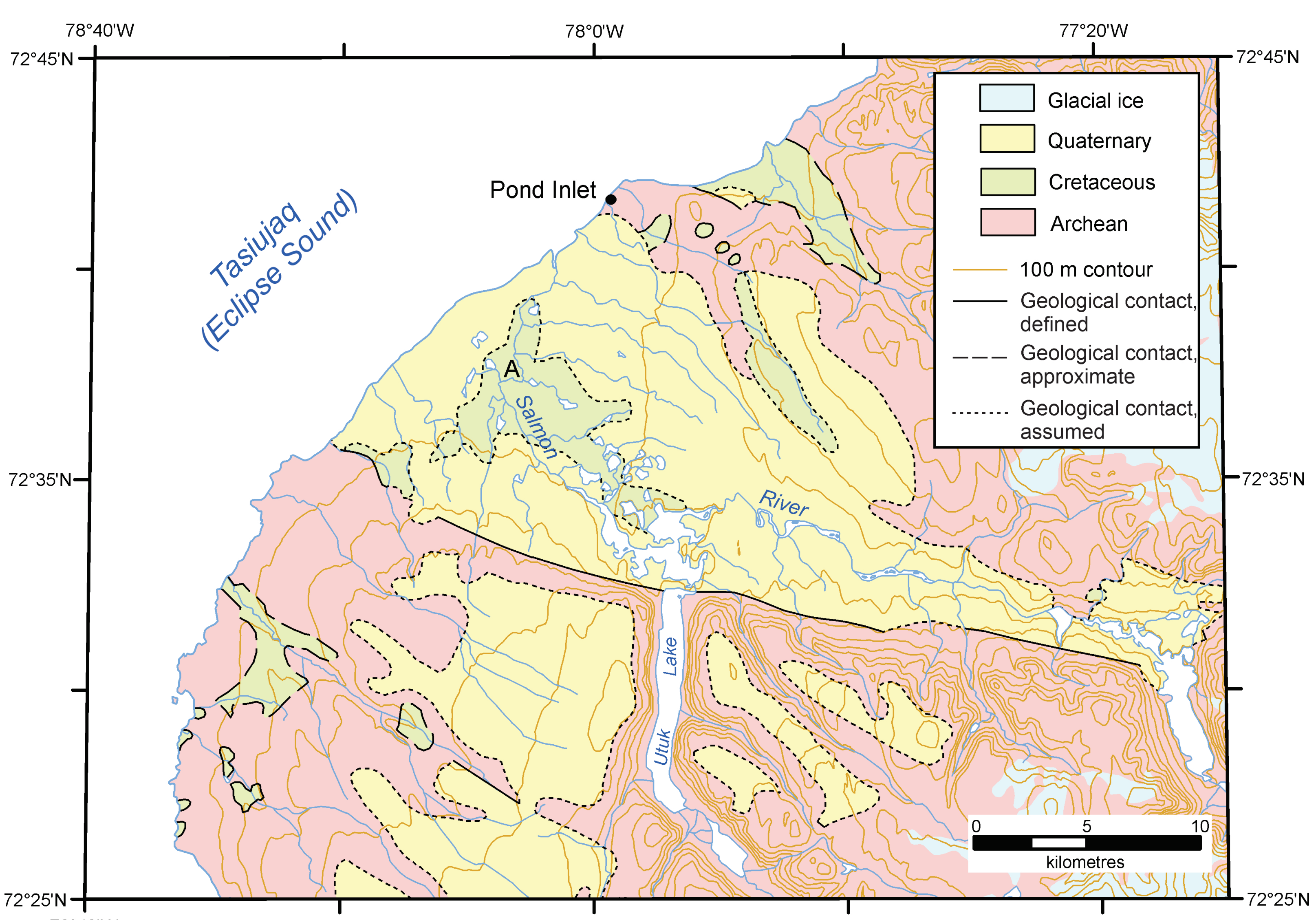


Figure 8. Generalized distribution of Cretaceous strata in the Salmon River area (inset C of Fig. 1; southern margin of the Eclipse Trough), northern Baffin Island (*after* Jackson et al. (1975) and Miall et al. (1980)). A shows location of Figure 13a.

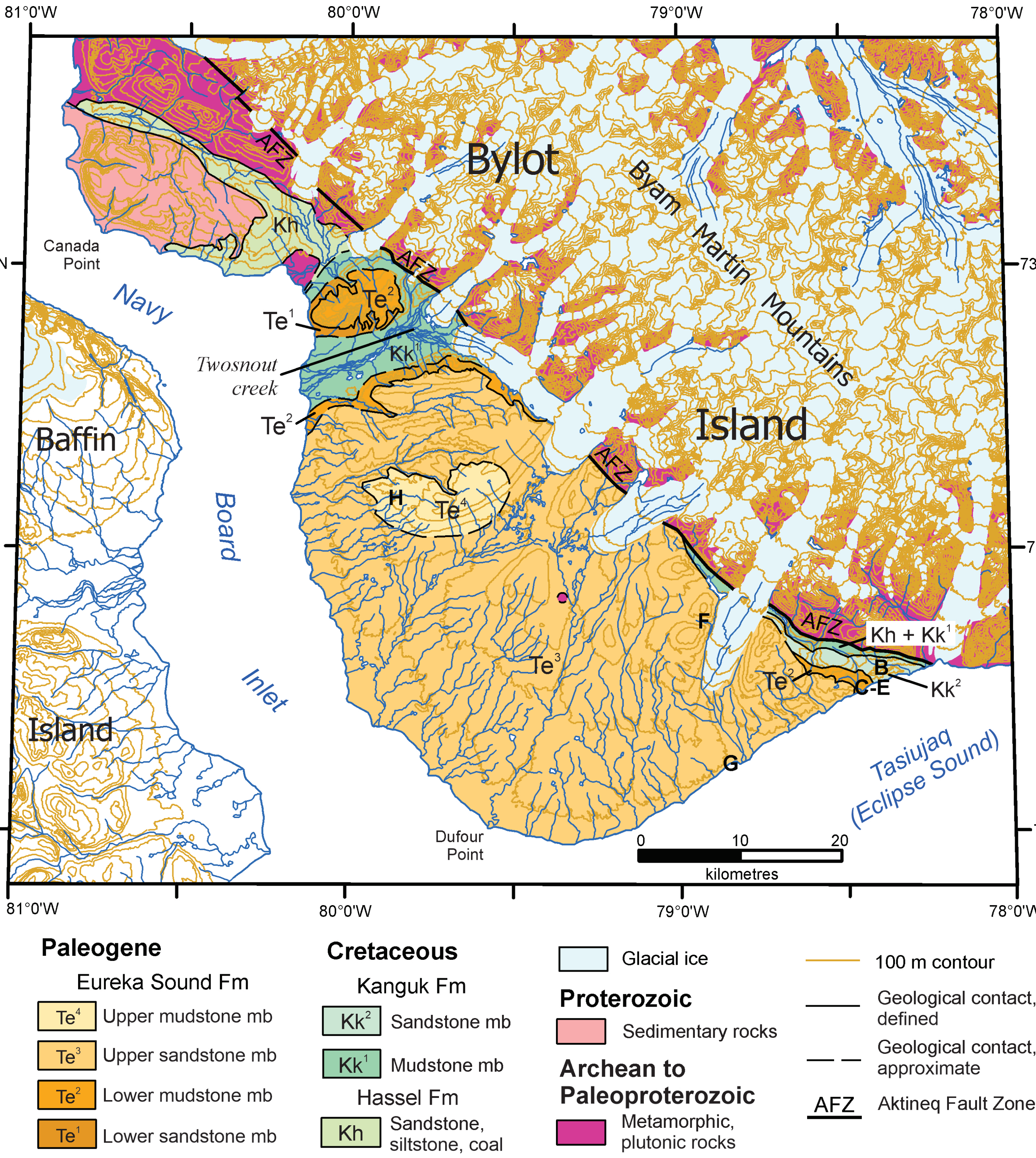


Figure 9. Generalized geological map of Cretaceous–Paleogene strata of southwestern Bylot Island (Eclipse Trough; inset D of Fig. 1), *after* Miall et al. (1980). Proterozoic and Archean geology simplified *after* Blackadar and Davison (1968), Jackson and Davidson (1975a, b), and Jackson et al. (1975). Letters B–H show locations of photographs shown in Figure 13.

palynomorphs into younger strata presents a considerable problem (Ioannides, 1986; Fenton and Pardon, 2007). Based on these palynological data, the stratigraphic succession preserved on Bylot Island provides an extended record of sedimentation beginning in the Early Cretaceous (Albian) and continuing into the Paleogene (Fig. 2).

1970s and 1980s Geological Survey of Canada research

During reconnaissance geological mapping of the northeastern Baffin Island region in the late 1960s, driven primarily by interest in mineral resource potential, Jackson and Davidson (1975a, b) and Jackson et al. (1975) briefly described the younger sedimentary succession preserved on southwestern Bylot Island and on Baffin Island in the area of Pond Inlet. They assigned these strata to the Eclipse Group, and designated the basin containing them as the Eclipse Trough (Fig. 9). These researchers recognized a variety of clastic rock types in the Eclipse Group, including mudstone, siltstone, and sandstone. Jackson and Davidson (1975a) and Jackson et al. (1975) subdivided the Cretaceous–Cenozoic section of the Eclipse Trough into four map units (Fig. 11), from oldest to youngest: unit K, consisting of quartzose sandstone; unit KT1, consisting of greywacke, mudstone, and siltstone; unit KT2, consisting of arkosic sandstone; and unit T, consisting of shale and mudstone. In the two papers, the Eclipse Group was regarded as Early Cretaceous to Eocene, based on preliminary biostratigraphic analysis of microfossils, primarily the palynological studies of W.S. Hopkins (W.S. Hopkins, unpub. GSC Paleontological Reports K-2 WSH 1969, 1969; K-6 WSH 1969, 1969; K-20-WSH-1972, 1972; T-02-WSH-1973, 1973; K-08-WSH-1977, 1977; K-01-WSH-1978, 1978; KT-23-WSH-1978, 1978; KT-25-WSH-1978, 1978). In particular, Hopkins (W.S. Hopkins, unpub. GSC Paleontological Report K-08-WSH-1977, 1977) established an Early Cretaceous age and provided a summary of the palynological age for the coal units of the Salmon River outlier of the southern Eclipse Trough.

Beginning in the 1970s, detailed regional studies of the Upper Cretaceous–Cenozoic successions of the Canadian Arctic Islands were undertaken by various parties to better understand the stratigraphic setting, regional extent, and resource potential of the rocks. As part of this effort, Miall et al. (1980) reassessed the Cretaceous–Cenozoic succession preserved in the Eclipse Trough and produced a schematic geological map and expanded stratigraphic framework for the strata (Fig. 9, 11, 12). The study focused on the south coast and Twosnout creek areas of southwest Bylot Island, but also included other localities; photographs of the strata are shown in Figure 13. Miall et al. (1980) identified a quartz-rich sandstone at the base of the succession (their map unit Kh) (Fig. 10, 11, 14), which they interpreted as resting unconformably on Precambrian rocks. They correlated this unit, which ranges from 15 to 120 m in thickness locally, with the Hassel Formation of the Sverdrup Basin to the north and west, and considered Jackson and Davidson's (1975a, b) and Jackson et al.'s (1975) unit K to be equivalent to their Hassel Formation. Palynological analysis (using pollen and spores only) of the Hassel Formation in the Eclipse Trough, particularly in the Salmon River outlier (W.S. Hopkins, unpub. GSC Paleontological Report K-08-WSH-1977, 1977), indicated an age of Albian to Cenomanian based on the presence of simple tricolpate pollen grains and spore taxa such as *Clavifera*, *Dictyophyllidites*, *Kuylisporites*, *Acanthotriletes*, *Foveosporites*, *Sestrosporites*, *Trilobosporites*, and *Appendicisporites*, and is consistent with the age of the Hassel Formation in the Sverdrup Basin (Miall et al., 1980). As described by Miall et al. (1980), the Hassel Formation consists predominantly of

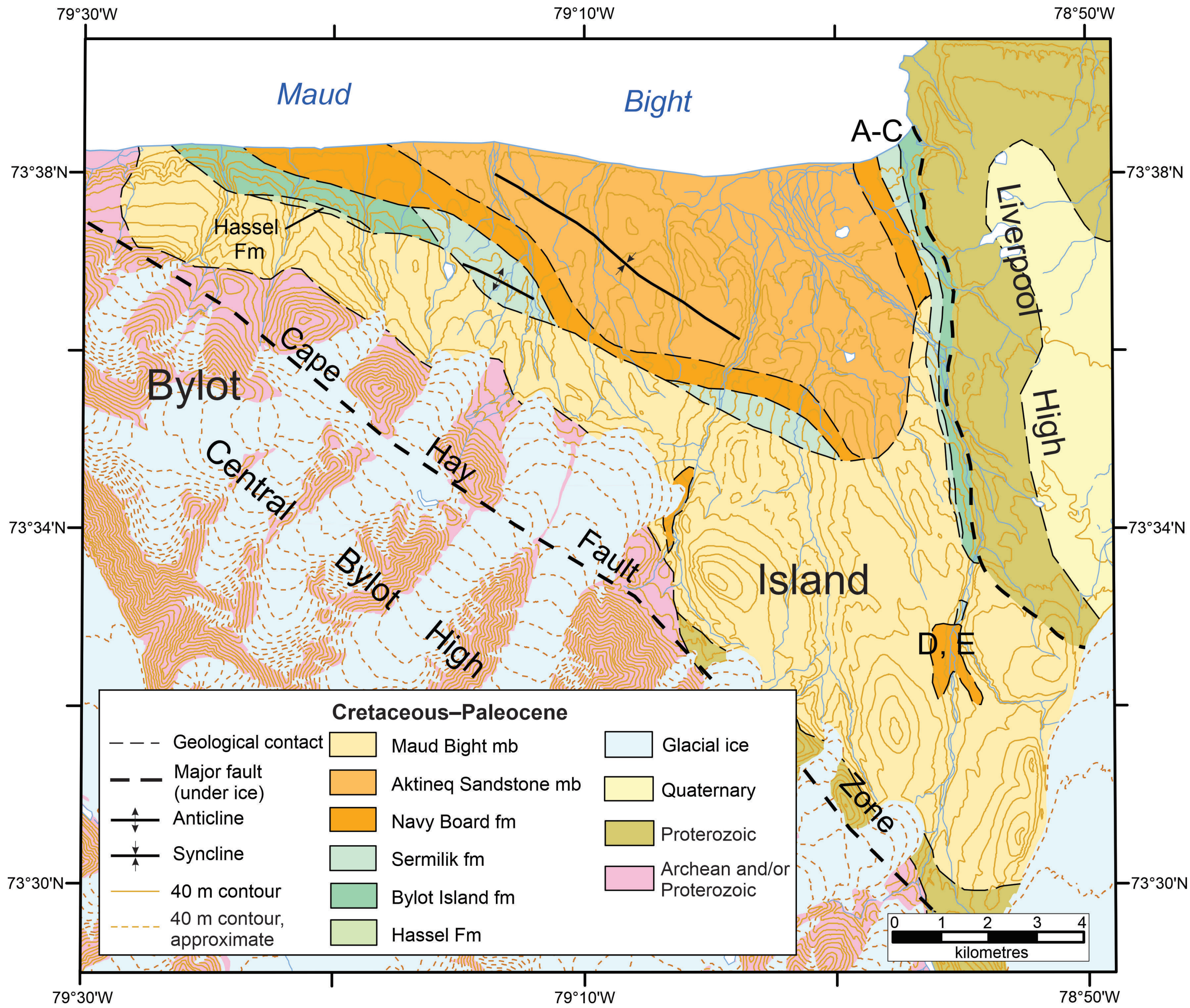


Figure 10. Generalized geological map of Maud Bight area, north Bylot Island (North Bylot Trough; inset E of Fig. 1), *modified from* Jackson and Davidson (1975a, b); Cretaceous–Paleogene geology *after* Benham and Burden (1990) and Benham (1991). Letters A–E show locations of photographs in Figure 17.

fine- to very coarse-grained quartzose sandstone, locally with pebble lenses containing clasts of quartz, metamorphic rocks, and rare sandstone ranging up to 6 cm in diameter. Coal is present locally in the formation, such as at Salmon River, as is siltstone and mudstone, and these previous authors regarded the formation as of nonmarine origin.

Miall et al. (1980) considered the Hassel Formation in the Eclipse Trough to be overlain unconformably by a widespread unit of basal mudstone (their map unit Kk^1) up to 600 m thick and an overlying and laterally interfingering sandstone (their map unit Kk^2), both of which they assigned to the Kanguk Formation (Kk). They regarded the Kanguk Formation to be the equivalent of unit KT1 of Jackson and Davidson (1975a, b) and Jackson et al. (1975). Miall et al. (1980) reported the mudstone member of the Kanguk to consist predominantly of soft grey mudstone, locally glauconitic, with fish scales and sideritic concretions. Based on the presence of silicoflagellates, radiolarians, and dinocysts, with rare foraminifera and terrestrial palynomorphs, Miall et al. (1980) dated the age of the mudstone member of the Kanguk Formation as Campanian to Maastrichtian.

In contrast to the Kk^1 mudstone unit, Miall et al. (1980) noted that the sandstone member of the Kanguk Formation is restricted to the south coast region of Bylot Island, where it overlies the mudstone member and attains a maximum thickness of 540 m. The sandstone member consists of white to light brown, medium- to coarse-grained friable sandstone, mostly massive, but with rare low-angle, planar cross-stratification. Pebble lenses and rare boulders, mostly of foliated metamorphic rocks, are noted, but also present are quartzose sandstone and intraformational mud clasts. According to Miall et al. (1980), the member contains root beds, carbonate-cemented

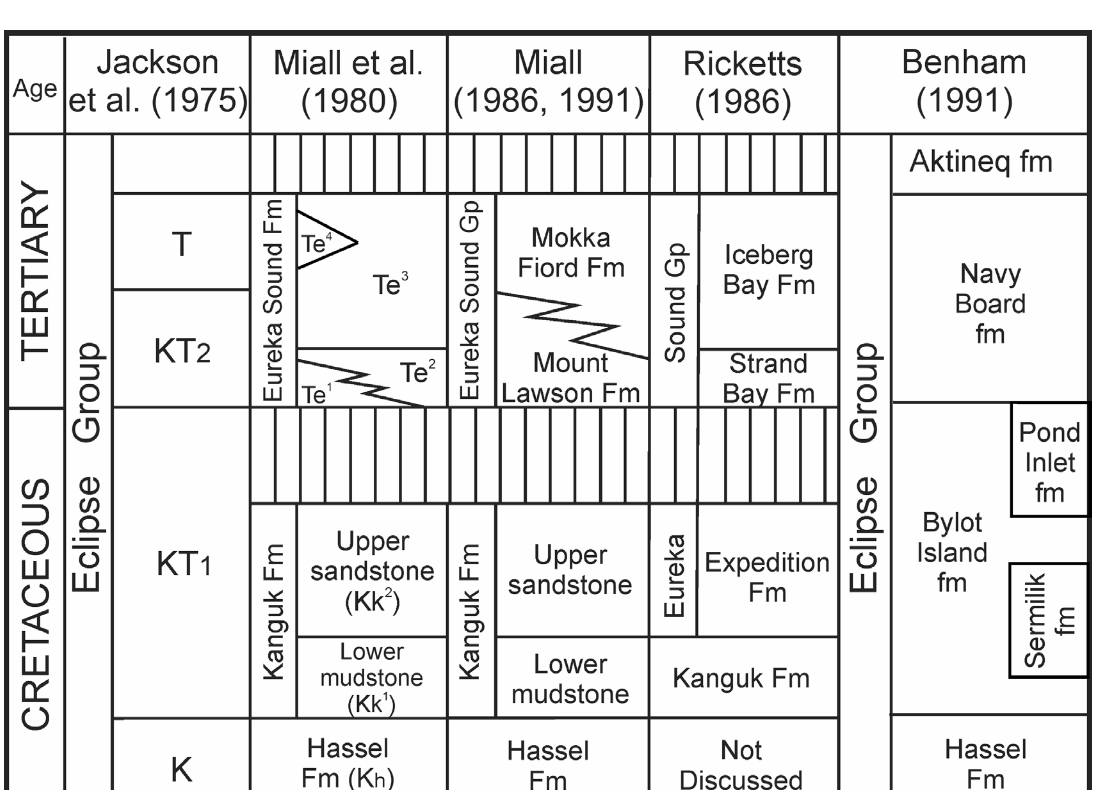


Figure 11. Summary of evolving stratigraphic framework and correlations for Cretaceous–Paleogene strata of the Eclipse Trough by Jackson et al. (1975), Miall et al. (1980), Miall (1986, 1991), Ricketts (1986), and Benham (1991). Proposals of Miall (1986) and Ricketts (1986) based on correlations with Eureka Sound Group strata of Sverdrup Basin.

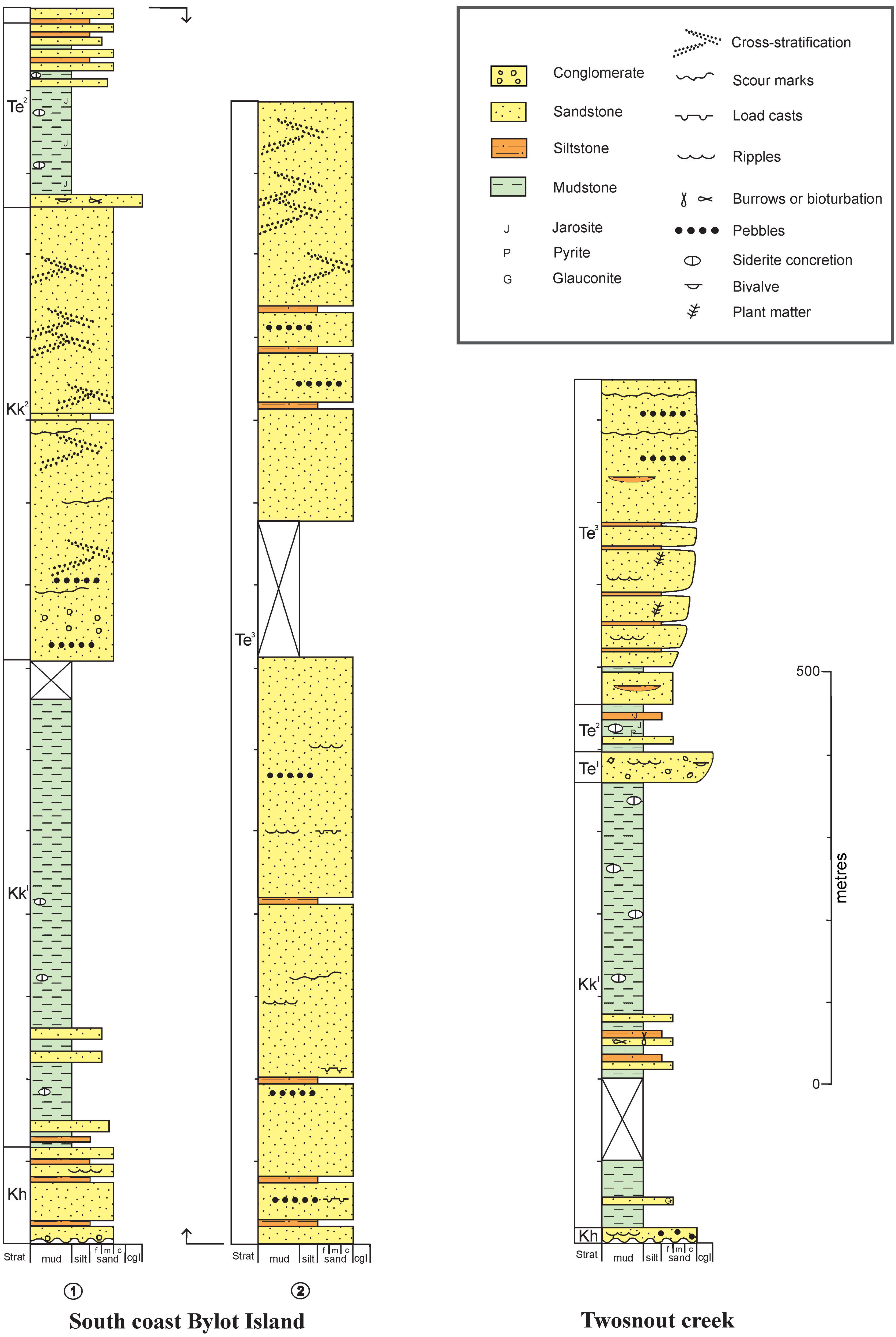


Figure 12. Schematic stratigraphic columns of Cretaceous–Paleogene strata in the Eclipse Trough, preserved along the south coast of Bylot Island and at Twosnout creek (inset D of Fig. 1), with stratigraphic nomenclature of Miall et al. (1980). *Modified from* Miall et al. (1980). c = coarse; cgl = conglomerate; f = fine; m = medium; Strat = stratigraphic unit.

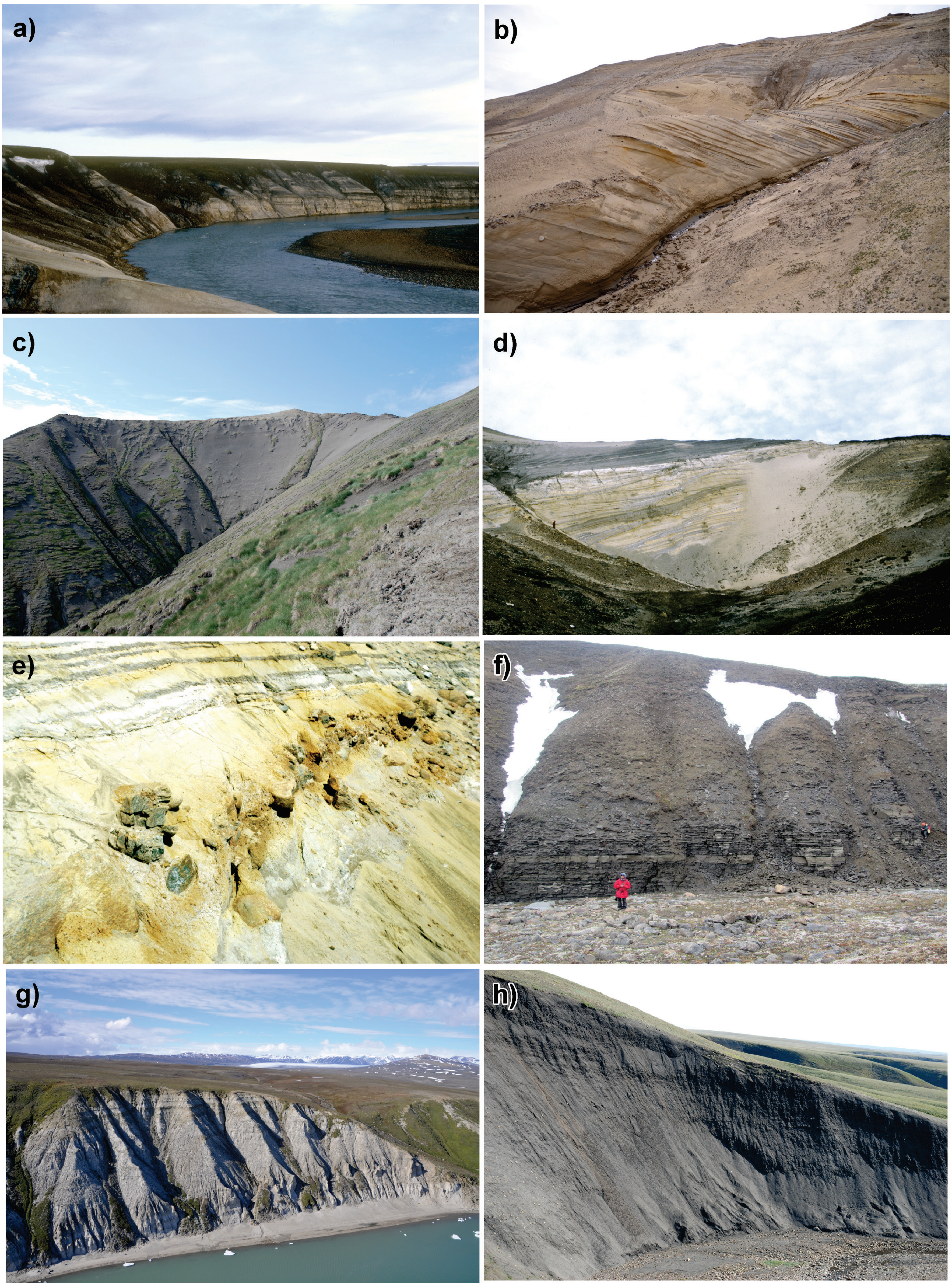


Figure 13. Photographs showing examples of Cretaceous–Paleocene strata preserved in the Eclipse Trough region of southwestern Bylot Island–northeastern Baffin Island region (insets C and D of Fig. 1). *See* Figure 7 for location of photograph 13a, Figure 9 for photographs 13b–13h. **a)** Salmon River exposures of Hassel Formation. NRCan photo 2021-207. Photograph by E.T. Burden. **b)** Low-angle planar-cross-stratified sandstone units of Sermilik formation, southwest coast Bylot Island; exposure is approximately 125 m thick. NRCan photo 2021-210. Photograph by J.W. Haggart. **c)** Mudstone units of Bylot Island formation, southwest coast Bylot Island; approximately 80 m of gently dipping strata are shown. NRCan photo 2021-211. Photograph by J.W. Haggart. **d)** Large-scale cross-stratified sandstone and siltstone of Pond Inlet formation, southwest coast Bylot Island; person for scale. NRCan photo 2021-208. Photograph by E.T. Burden. **e)** Angular boulders within sandstone of lower part of Pond Inlet formation, southwest coast of Bylot Island; foreground fractured boulder approximately 0.80 m in maximum dimension. NRCan photo 2021-209. Photograph by E.T. Burden. **f)** Interstratified sandstone and mudstone of Navy Board formation, Aktineq Glacier area of southwest Bylot Island. Person is 1.8 m tall. NRCan photo 2021-212. Photograph by J.W. Haggart. **g)** Flat-lying sandstone beds of Aktineq formation, southwest coast of Bylot Island; exposure is approximately 110 m thick. NRCan photo 2021-213. Photograph by J.W. Haggart. **h)** Flat-lying mudstone of Te^4 unit of Miall et al. (1980), southwest coast region of Bylot Island; exposure is approximately 40 m thick. NRCan photo 2021-214. Photograph by J.W. Haggart. Stratigraphic nomenclature for photographs 13b–13g *after* Sparkes (1989) and Waterfield (1989).

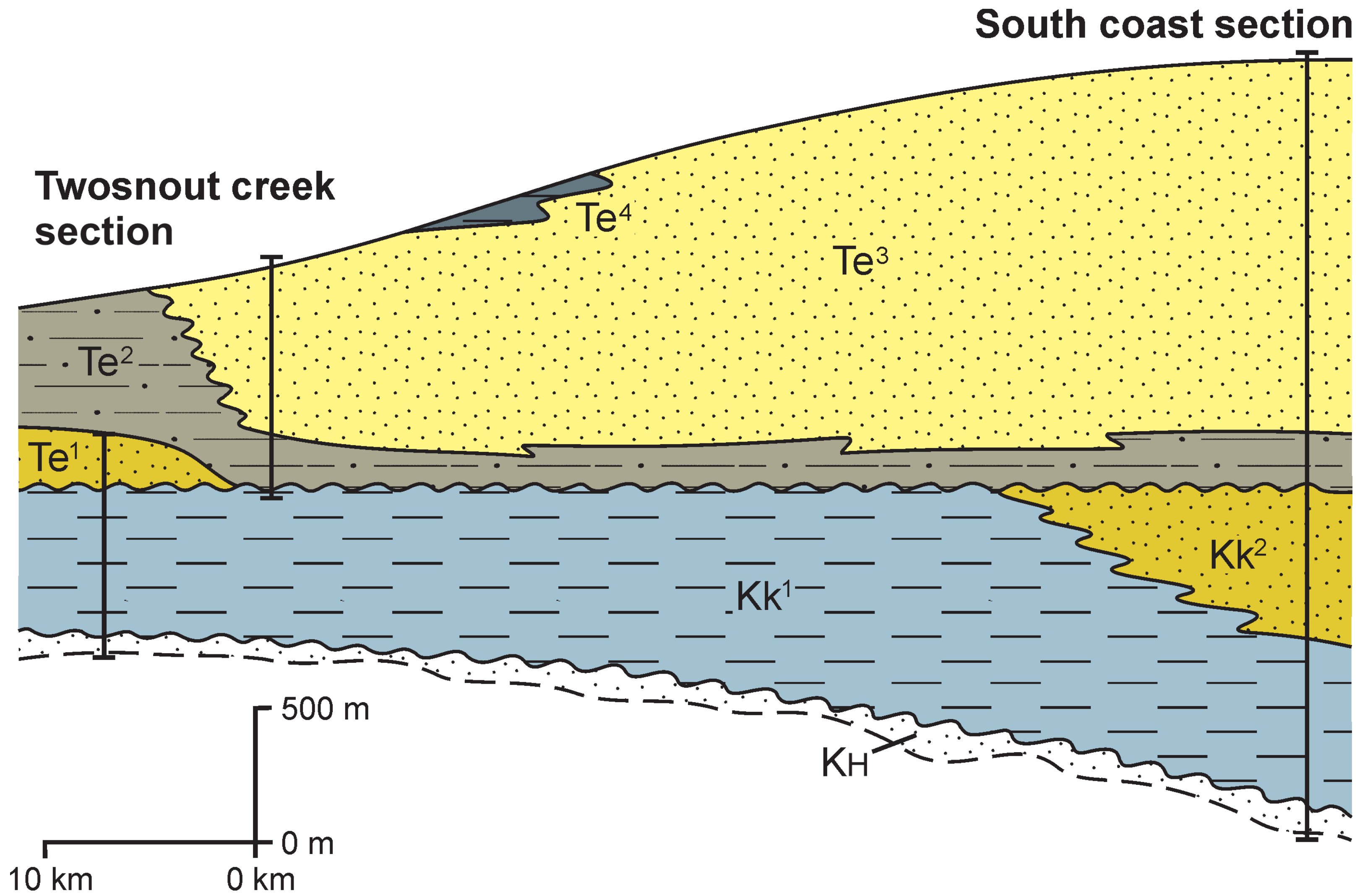


Figure 14. Schematic representation of intertonguing of Cretaceous and Paleogene coarse clastic strata preserved in southern part of the Eclipse Trough with finer grained, more offshore deposits to the northwest. *Modified from* Miall et al. (1980). Note distinct unconformities interpreted in the succession at the base of unit Kk^1, spanning the Cenomanian–early Campanian, and at the base of units Te^1 and Te^2, spanning the latest Cretaceous–earliest Paleogene. Vertical lines correspond to schematic stratigraphic columns shown in Figure 12.

sandstone, and bivalve shell fragments that would seem to indicate a fluvial to shallow-marine, possibly deltaic setting. Miall et al. (1980) did not provide biostratigraphic data, but considered the member to be of probable Maastrichtian age based on stratigraphic relationships. They also noted the lithological similarity of their sandstone member of the Kanguk Formation with the basal Eureka Sound Formation of the Sverdrup Basin, although they considered them to be distinct units, as the sandstone and mudstone members of the Kanguk Formation in Eclipse Trough appeared to be intertonguing. Moreover, this conclusion was supported by the presence of an inferred unconformity developed on Bylot Island between the Kanguk Formation and the overlying Eureka Sound Formation (Miall et al., 1980).

Following Miall et al.'s (1980) work, Ioannides (1986) undertook a comprehensive study of diverse dinocyst assemblages from Upper Cretaceous and lower Cenozoic strata from the south coast and Twosnout creek regions of Bylot Island. In the south coast section, Ioannides recognized four intervals — I, II, III, and IV — the first three being Late Cretaceous, and IV being early Cenozoic (Table 2). In the Twosnout creek section, he outlined three similarly aged intervals, designated as Ia, IIIa, and IVa. Interval I in the south coast section was found in strata of the Kanguk Formation and was assigned a Santonian to Campanian age; it contains a rich and diverse assemblage of dinocysts, with sparse spores and pollen. Ioannides (1986) correlated the interval Ia of the Twosnout creek section with interval I of the south coast section, based on the general dinocyst similarity and several species common to both intervals. He considered interval Ia to also be of Santonian to probably early Campanian age.

Miall et al. (1980) assigned strata overlying the Kanguk Formation in the Eclipse Trough to the Eureka Sound Formation, using nomenclature characteristic at the time for Maastrichtian–Eocene strata of the Sverdrup Basin. Within the Eclipse Trough, Miall et al. (1980) recognized four local members within the Eureka Sound Formation, a lower sandstone member (Te^1), a lower mudstone member (Te^2), an upper sandstone member (Te^3), and an upper mudstone member (Te^4), in ascending stratigraphic order (Fig. 11, 14). Miall et al. (1980) could not readily assign Jackson and Davidson's (1975a, b) and Jackson et al.'s (1975) KT1, KT2, and T lithostratigraphic units directly to their members of the Eureka Sound Formation. As noted by Miall et al. (1980), their Eureka Sound Formation members are variable in thickness and not distributed everywhere across the basin, suggesting that the formation rests unconformably, possibly with angular unconformity, on the Kanguk Formation.

Miall et al.'s (1980) lower sandstone member (Te^1) of the Eureka Sound Formation consists of mostly massive, white quartzose and locally glauconitic, fine- to very coarse-grained sandstone with bivalve shell fragments; 1 cm diameter pebbles of metamorphic rock fragments are present, as are shale rip-up clasts up to 50 cm long. Locally in the member, they noted horizontal grazing traces, interference ripples, contorted laminations, scour surfaces exhibiting up to 2 m of relief, and dish structures. The lower mudstone member (Te^2) of Miall et al.'s (1980) Eureka Sound Formation in the Eclipse Trough consists of dark grey, silty mudstone with sideritic concretions and thin lenses of weakly calcareous-cemented, fine- to medium-grained sandstone exhibiting ripple marks, groove casts and load structures, and root and leaf impressions. The sandstone lenses tend to become thicker and more common upsection, reflecting transition into the overlying upper sandstone member of the formation. According to Miall et al. (1980), the upper sandstone member (Te^3) of their Eureka Sound Formation consists of massive white to orange to brown, very fine-grained to pebbly sandstone, locally with silty and muddy interbeds; they noted silty mudstone intraclasts up to 1 m in length locally in the member, as well as liquefaction features and dish structures. Finally, Miall et al.'s (1980) youngest stratigraphic unit, the upper mudstone member (Te^4), was reported to consist of dark grey, carbonaceous mudstone with rare lenses of concretionary fine-grained sandstone that conformably overlies the Te^3 member.

Miall et al. (1980) considered the overall age of the Eureka Sound Formation of the Eclipse Trough as probably Paleocene, and likely extending up to the early or middle Eocene for their Te^4 unit, based on pollen and spores, as well as dinocysts. These included locally abundant angiosperm pollen, such as *Momipites*, cf. *Corylus*, cf. *Carpinus*, proto-*Carya*, *Pterocarya*, *Alnus*, *Paraalnipollenites*, cf. *Myrica, (?)Extratriporopollenites, Platycarya, Platycarya*, *Chenopodium*, and the fungal spore genus *Pesavis*. Based on the above, Miall et al. (1980) suggested the presence of significant unconformities within the Cretaceous–Paleogene succession of the Eclipse Trough (Fig. 14).

Dinocyst interval II of Ioannides (1986) corresponds with the basal part of Miall et al.'s (1980) Eureka Sound Formation along the south coast of Bylot Island, but dinocysts in the interval were exclusively reworked and it was thus not assigned an age. Interval III, also within strata of the Eureka Sound Formation, was assigned a Maastrichtian age based on the first (earliest) occurrences of *Cerodinium diebelii*, *Elytrocysta druggii*, *Palaeocystodinium golzowense*, *Spinidinium uncinatum*, and *Thalassiphora pelagica*, and the absence of a number of taxa associated with interval I. Ioannides (1986) regarded interval IIIa of the Twosnout creek section as equivalent to the upper part

Table 2. Dinoflagellate cyst intervals and characteristic taxa of onshore Cretaceous–Paleocene strata of the Eclipse Trough, Bylot Island.

Possibly Early Paleocene	**Interval IV**	**Interval IVa (Twosnout creek)**	Possibly Early Paleocene
	Cordosphaeridium spp.	*Areoligera* sp.	
	Glaphyrocysta ordinata	*Cerodinium diebelii*	
	Palaeoperidinium pyrophorum	*Cerodinium speciosum*	
	Thalassiphora pelagica	*Cordosphaeridium exilimurum*	
		Cordosphaeridium inodes	
		Glaphyrocysta sp.	
		Palaeoperidinium pyrophorum	
		Thalassiphora pelagica	
Maastrichtian	**Interval III**	**Interval IIIa (Twosnout creek)**	Maastrichtian
	Cerodinium diebelii	*Cerodinium diebelii*	
	Elytrocysta druggii	*Thalassiphora pelagica*	
	Palaeocystodinium golzowense		
	Spinidinium uncinatum		
	Thalassiphora pelagica		
No age assigned	**Interval II**		
	No in situ dinoflagellate cysts		
Santonian to Campanian	**Interval I (South coast)**	**Interval Ia (Twosnout creek)**	Santonian to early Campanian
	Canningia sp. 1	*Odontochitina operculata*	
	Chatangiella ditissima	*Xenascus ceratioides*	
	Chatangiella granulifera	*Xiphophoridium alatum*	
	Chatangiella madura		
	Chatangiella verrucosa		
	Chlamydophorella? *grossa*		
	Diconodinium granulifera		
	Isabelidinium acuminatum		
	Isabelidinium cooksoniae		
	Isabelidinium microarmum		
	Laciniadinium williamsii		
	Odontochitina sp.		
	Palaeohystrichophora infusorioides		
	Spinidinium sp.		
	Trithyrodinium sp.		
	Xenascus ceratioides		
	Dinoflagellate sp. A		

After Ioannides (1986).
The columns on the right are representative of the taxa and ages in the Twosnout creek area.

of interval III of the south coast section and, hence, Maastrichtian (Table 2). He based this conclusion on the presence of *Thalassiphora pelagica* in both intervals III and IIIa and a questionable record of *Cerodinium diebelii* in one Twosnout creek sample. Interval IV contained species of *Cordosphaeridium* and *Glaphyrocysta ordinata*, *Palaeoperidinium pyrophorum*, and *Thalassiphora pelagica*, but an absence of characteristic Late Cretaceous assemblages throughout interval IV led Ioannides (1986) to conclude that the age of the interval was possibly early Paleocene.

Using outcrop sedimentology, lithofacies analysis, and paleontological content, Miall et al. (1980) proposed that the Albian–Paleocene and/or Eocene succession of the Eclipse Trough was deposited in a variety of sedimentary environments. Basal strata of the Hassel Formation were considered to represent shallow-marine intertidal or beach environments to fluvial environments — most likely, sandy low- to high-sinuosity braided settings — as evidenced by the lack of marine fossils, extensive cross-stratification, and common coal deposits. Miall et al. (1980) interpreted the overlying mudstone member of the Kanguk Formation as representing widespread marine deposition due to transgression during the Late Cretaceous. The sandstone member of the Kanguk Formation, present only along the south coast of Bylot Island and in the adjacent interior area of the island, was considered by Miall et al. (1980) to represent local deposition in a fluvial system present in the southern part of the Eclipse Trough. It conformably overlies transitional facies from the underlying mudstone member of the Kanguk Formation. Miall et al. (1980) interpreted the unconformably overlying strata of the Eureka Sound Formation to represent: local marine beach or shoreface deposits (lower sandstone member, Te^1); open-marine environments to nearshore, deltaic settings (lower mudstone member, Te^2); alluvial-plain, braided fluvial environments (upper sandstone member, Te^3); and renewed marine transgression in the Early or Middle Eocene (upper mudstone member, Te^4). Paleocurrent and facies trends within the Eclipse Trough succession suggested to Miall et al. (1980) that basin geometry was controlled by basin-margin block faulting to the east, with fluvial and deltaic facies in the southeast interfingering with marine facies to the northwest, potentially connecting with widespread marine sedimentation in the Sverdrup Basin during the Cretaceous. During the Paleocene, the trough began to infill and deposits were derived predominantly from more localized sedimentary sources and discontinuous depocentres.

1980s Memorial University of Newfoundland research

Whether the Upper Cretaceous–Cenozoic stratigraphy of the Bylot Island region could justifiably be correlated with the standard stratigraphic framework of the Sverdrup Basin was the basis for investigations by a research group at MUN. These investigations of the Eclipse and North Bylot troughs began in the mid-1980s, led by E.T. Burden, one of the present authors. (The same MUN group also undertook the detailed stratigraphic description and sampling of the

Cretaceous–Cenozoic successions exposed north of Cape Dyer and at Scott Inlet lowland discussed above.) In the Bylot Island region, they focused on the stratigraphic successions preserved along the southwest coast, in the area of the Twosnout creek in south-central Bylot Island, and in the Maud Bight area on the north coast of the island. The objectives for this research were to better understand the Cretaceous–Paleogene sedimentary successions preserved in these areas, to develop a more comprehensive biostratigraphic framework, and to establish a suitable stratigraphic nomenclature for the strata that would reflect its distinctness from the Sverdrup Basin stratigraphy and its relationship with the evolution of Baffin Bay.

The MUN research was undertaken mainly as a series of undergraduate- and Masters-level field studies and associated theses, but remains mostly unpublished. The first of these studies focused on the Eclipse Trough region and were those of Sparkes (1989), who examined the Cretaceous portion of the succession, and Waterfield (1989), who examined the overlying Paleocene succession reported by Miall et al. (1980). Wiseman (1991) further studied both the Cretaceous and Paleocene successions preserved in the Twosnout creek region. Finally, Benham (1991), with a short summary published in Benham and Burden (1990), described the Cretaceous and Cenozoic strata preserved in the fault-bounded North Bylot Trough, noting similarities and differences with the strata of Eclipse Trough. In all of these studies, detailed measurements of stratigraphic sections were undertaken and integrated with sedimentary petrography; most also involved palynostratigraphy. The resulting theses provide a wealth of litho- and biostratigraphic data, and Figure 2 summarizes the lithostratigraphic framework for the Eclipse Trough and Maud Bight proposed by the MUN research team.

Examining the Cretaceous succession preserved along the south coast of Bylot Island, Sparkes (1989) revisited the Upper Cretaceous stratigraphic framework of Miall et al. (1980), informally introducing the Byam Martin, Sermilik, and Bylot Island formations. (Informal stratigraphic nomenclature is referred to in this contribution using lowercase letters for the lithostratigraphic category, e.g. formation and member.) The first two of these units corresponded to the lower mudstone member (Kk^1) and the upper sandstone member (Kk^2), respectively, of the Kanguk Formation of Miall et al. (1980), as exposed along the south coast of Bylot Island. Sparkes (1989) did not identify any sandstone facies exposed in the Bylot Island south coast succession beneath his Byam Martin formation and assignable to the Hassel Formation of Miall et al. (1980); however, he did recognize that the Sermilik formation was a wedge of sandstone that pinched out laterally to the northwest into a deeper water marine basin containing mudstone, referring these more offshore strata to the Bylot Island formation, which overlies the Sermilik formation in the south coast succession (Fig. 15).

Sparkes (1989) dated his three Cretaceous units as mid- to late Campanian, late Campanian to early late Maastrichtian, and late Campanian to late Maastrichtian, respectively, based on the distribution of terrestrial and marine palynomorphs in the strata. Sparkes (1989) defined three informal assemblage zones based on these palynomorphs (Table 3), recognized in sections at Twosnout creek and along the Bylot Island south coast. The *Gleicheniidites* sp. cf. *G. circiniidites–Antulsporites distaverrucosus* Zone was characterized by low palynomorph diversity, but a mid- to late Campanian age was proposed based on the occurrence of Late Cretaceous palynomorph taxa *Carpinipites anciptes*, *Hazaria sheopiarii*, and *Polytriopollenites stellatus*, in combination with the age of the overlying zone. Sparkes (1989) identified the *Gleicheniidites* sp. cf. *G. circiniidites–Antulsporites distaverrucosus* Zone in strata of the Byam Martin and Bylot Island formations. The *Porosipollis porosus–Aquilapollenites scabridus* (now considered *Triprojectus scabridus*) Zone was assigned a very late Campanian to mid-Maastrichtian age based on the first occurrence of several biostratigraphically important Late Cretaceous taxa such as: *Radialisporis radiatus*, *Hamulatisporis amplus*, *Wodehouseia gracile*, *Momipites wyomingensis*, *Polyvestibulopollenites trinus*, *Porosipollis porosus*, *Paleoperidinium kozlowskii*, and *Ceratiopsis diebelii* (now considered *Cerodinium*). The *Porosipollis porosus–Aquilapollenites scabridus* Zone was identified in the Sermilik and Bylot Island formations. Finally, Sparkes (1989) assigned an early late Maastrichtian age to the *Singularia aculeata–Pesavis parva* Zone, based on the first occurrence of the taxa *Pesavis parva* and *Paraalnipollenites alterniporus*. Taxa with restricted ranges characterizing the *Singularia aculeata–Pesavis parva* Zone include *Appendicisporites erdtmanii*, *Asbeckiasporites wirthi*, *Extratriporopollenites* sp. 2 of McIntyre, *Singularia aculeata*, *Manicorpus trapeziforme*, *Paralnipollenites alterniporus*, *Pesavis parva*, and *Trudopollis variabilis*. The *Singularia aculeata–Pesavis parva* Zone was identified in strata of the Sermilik and Bylot Island formations. Sparkes (1989) also included additional species that characterize these three zones, but are not restricted to them, and also noted new or unknown taxa where applicable (*see* Table 3).

Sparkes (1989) interpreted the Byam Martin formation as comprising basin-plain and turbidite deposits, succeeded upsection by deposits of braided delta and submarine facies deposits that are related to a major progradational event, represented by the Sermilik formation (Fig. 15). At the top of the Cretaceous succession, he interpreted the upper Maastrichtian Bylot Island formation as representing renewed transgression and deposition in slope, basin-plain, and distal submarine-fan environments.

Waterfield (1989) undertook a detailed stratigraphic assessment of the Paleocene succession preserved along the southwest coast of Bylot Island and correlated these rocks, as well as the underlying Cretaceous strata, with the succession seen in the Twosnout creek region to the northwest. Waterfield (1989) utilized the stratigraphic nomenclature of Sparkes (1989) for the Cretaceous strata of southwestern Bylot Island. In addition, he defined three Cenozoic units, the Pond Inlet formation, the Navy Board formation, and the Aktineq formation. The oldest Cenozoic stratigraphic unit of the south coast succession is the Pond Inlet formation, which conformably overlies the Bylot Island formation there. The Pond Inlet formation was considered to have been deposited in basin-margin settings such as fan-delta, shelf, and submarine-fan environments, and recorded marine regression in the basin. Waterfield's (1989) Pond Inlet formation, which he extended northwestward to the Twosnout creek area, where he noted that it was notably thinner and interfingered with his Navy Board formation (Fig. 16), was equivalent to Miall et al.'s (1980) Eureka Sound Formation units Te^1, Te^2, and Te^3. The Navy Board formation was considered to consist of basin-plain deposits grading upward into a deltaic sequence, all distal equivalents of the shallower water deposits of the Pond Inlet formation preserved to the southeast. Waterfield (1989) defined the Aktineq formation as a deltaic succession at the top of the Bylot Island succession, overlying both the Pond Inlet and Navy Board formations, and which prograded into the Eclipse Trough from the south as a result of relative sea-level fall.

Working principally in the section along the south coast of Bylot Island, but also examining strata in the Twosnout creek area, Waterfield (1989) described two informal assemblage biozones for uppermost Cretaceous to lower Paleocene strata of the Eclipse Trough (Table 4). The *Hamulatisporis amplus–Ulmipollenites* sp. 1 Zone was assigned a late Maastrichtian age based on the following biostratigraphically significant, but not restricted, taxa: *Carpinipites ancipites*, *Polyatripollenites stellatus*, *Polyvestibulopollenites verus*, *Pesavis parva*, *Ceratiopsis* (now *Cerodinium*) *diebelii*, and *Thalassiphora pelagica*. This zone was identified in strata of the Bylot Island formation and shares many characteristic taxa with the *Singularia aculeata–Pesavis parva* Zone of Sparkes (1989); although the *Hamulatisporis amplus–Ulmipollenites* sp. 1 Zone is found overlying strata in which the *Singularia aculeata–Pesavis parva* Zone is defined, Waterfield (1989) interpreted his zone as a continuation of Sparkes' (1989) zone. According to Waterfield (1989), the transition from the *Hamulatisporis amplus–Ulmipollenites* sp. 1 Zone to the overlying *Trivestibulopollenites betuloides–Triatripollenites* sp. 1 Zone corresponds with the boundary between the Bylot Island and Pond Inlet formations. This latter zone was assigned an early Paleocene age based on the presence of *Trivestibulopollenites betuloides*, *Sequioapollenites paleocenicus*, and *Pesavis parva*. Waterfield (1989) further subdivided this assemblage zone into subzones a and b, where subzone b is based on the increased abundance of *Carpinipites ancipites*, *Trivestibulopollenites betuloides*, and *Triatriopollenites* sp. 1, as well as the absence of dinocysts. Waterfield (1989) identified the *Trivestibulopollenites betuloides–Triatriopollenites* sp. 1 Zone throughout strata of the Pond Inlet, Navy Board, and Aktineq formations, with subzone a identified locally in the Pond Inlet formation and lower Navy Board formation, and subzone b restricted to the upper Navy Board and Aktineq formations locally.

Wiseman (1991) undertook a more detailed study of the Pond Inlet formation of Waterfield (1989), as exposed in the Twosnout creek area, in order to better understand and characterize the depositional environments represented in the unit there. He documented the sedimentology, biostratigraphy, and facies associations of the formation and favoured a Maastrichtian age for the succession, in contrast with the early Paleocene age suggested by Ioannides (1986) and also by Waterfield (1989) for the exposures of the formation preserved along the southwest coast of Bylot Island. Furthermore, Wiseman (1991) used outcrop sedimentology to interpret the Pond Inlet formation in the Twosnout creek area as deposited in subaqueous fan-channel environments in a shallow-marine, presumably fan-delta, setting.

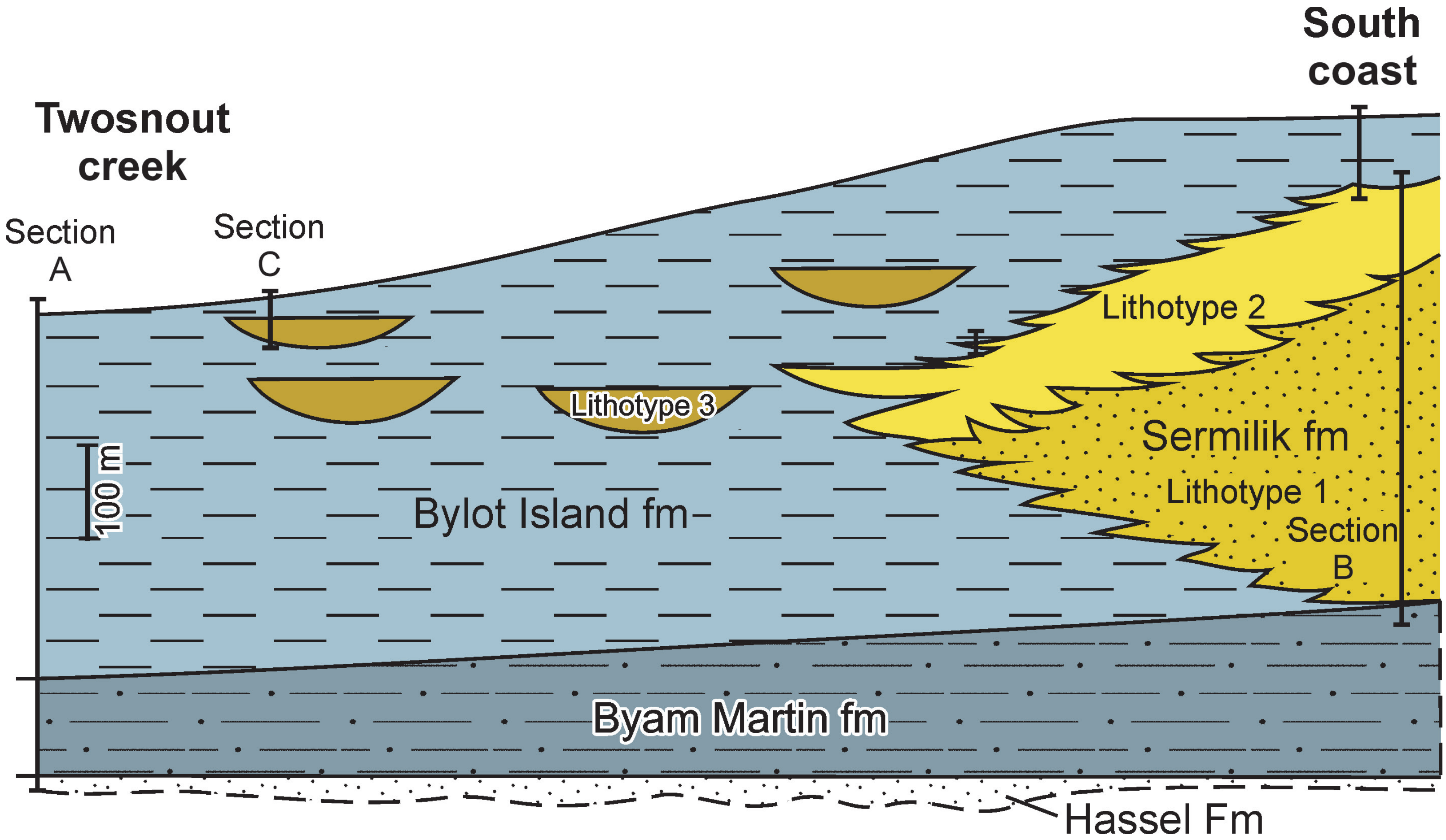


Figure 15. Interpretation of Cretaceous stratigraphy, south coast to Twosnout creek area of Bylot Island (inset D of Fig. 1), after Sparkes (1989: Fig. 4.3). Lithotypes are facies assemblages defined by Sparkes (1989); formal and informal stratigraphic units are included. Vertical bars represent stratigraphic sections presented in Sparkes (1989). Sparkes (1989) followed Waterfield (1989) in assignment of Paleogene strata overlying his Cretaceous sections; although Paleogene strata are not shown, evidence for a significant unconformity in the succession at the uppermost Cretaceous–lowermost Paleogene interval was lacking.

Table 3. Palynological zones and important taxa for onshore Cretaceous strata of the Eclipse Trough, south coast of Bylot Island and Twosnout creek area.

Early late Maastrichtian	***Singularia aculeata–Pesavis parva* Zone**
	Appendicisporites erdtmanii
	Asbeckiasporites wirthii
	Extratriporopollenites sp. 2 of McIntyre
	Mancicorpus trapeziforme
	Paraalnipollenites alterniporus
	Pesavis parva
	Singularia aculeata
	Trudopollis variabilis
Very late Campanian to mid-Maastrichtian	***Porosipollis porosus–Aquilapollenites scabridus* Zone**
	Aquilapollenites scabridus
	Caprifoliipites longus
	Ceratiopsis diebelii
	Cirratriradites teter
	Densoisporites velatus
	Hamulatisporis amplus
	Momipites wyomingensis
	Neotriangulipollis sp. 1 of Azema
	Palaeoperidinium kozlowskii
	Pityosporites alatipollenites
	Polyvestibulopollenites trinus
	Porosipollis porosus
	Radialisporis radiatus
	Rousea georgensis
	Tubifloridites lilliei
	Wodehouseia gracile
Mid- to late Campanian	***Gleicheniidites* sp. cf. *G. circinidites–Antulsporites distaverrucosus* Zone**
	Antulsporites distaverrucosus
	Carpinipites anciptes
	Gemmatriletes clavatus
	Gleicheniidites sp. cf. *G. circinidites*
	Hazaria sheoparii
	Ornamentifera baculata
	Polytriopollenites stellatus
After Sparkes (1989).	

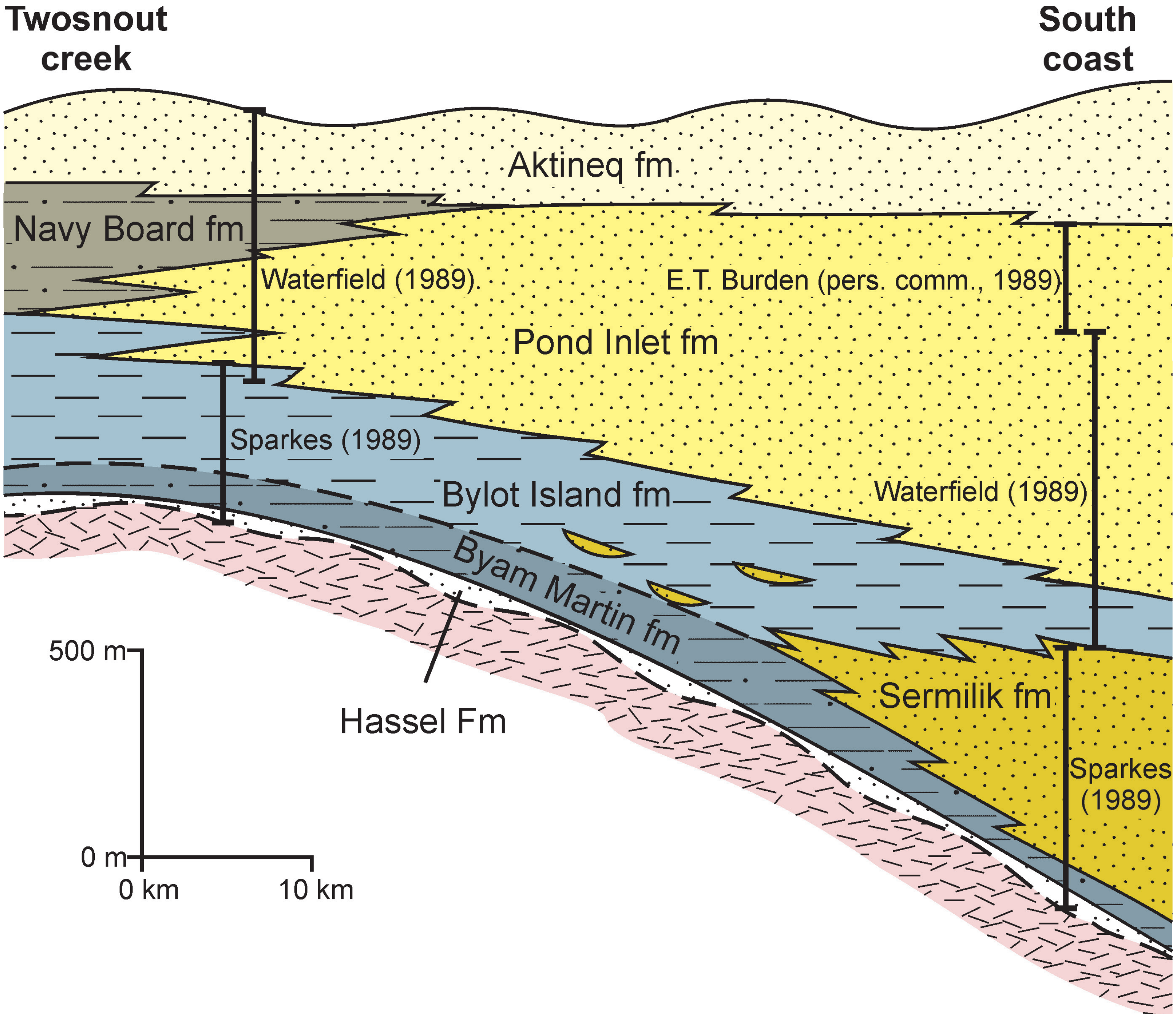


Figure 16. Schematic representation of interfingering of Cretaceous–Paleogene coarse clastic rocks within the Sermilik, Pond Inlet, and Aktineq formations preserved in the southern part of the Eclipse Trough with finer grained, more offshore deposits of the Bylot Island and Navy Board formations to the northwest in the Eclipse Trough (inset D of Fig. 1). Formal and informal stratigraphic units are included (*modified from* Waterfield, 1989). Vertical bars represent stratigraphic sections presented in Waterfield (1989).

Examining Cretaceous–Cenozoic strata in the North Bylot Trough (Fig. 10, 17), Benham (1991) and Benham and Burden (1990) recognized similarities in the stratigraphic succession to those of the Eclipse Trough, as described by Miall et al. (1980), Sparkes (1989), and Waterfield (1989); specifically, the Hassel Formation overlain by the Bylot Island, Sermilik, Navy Board, and Aktineq formations, with a newly recognized conglomerate member, the Maud Bight member, capping the succession (Fig. 2, 17). Benham (1991) did not recognize the Pond Inlet formation of the Eclipse Trough in the Maud Bight area, and suggested that a thicker Sermilik formation at Maud Bight included age-equivalent strata of the Pond Inlet formation. In addition to biostratigraphic data contributed from microfossils, Benham and Burden (1990) reported Paleocene plant macrofossils from strata in the North Bylot Trough, corroborating earlier findings of Paleocene strata in the Bylot Island area (Jackson and Davidson, 1975a; Miall et al., 1980; Waterfield, 1989).

Benham (1991) defined three biostratigraphic assemblage zones, as well as one subzone, for the North Bylot Trough strata (Table 5): 1) the *Azonia cribrata–Aquilapollenites trialatus* Zone; 2) the *Porosipollis porosus–Wodehouseia spinata* Zone; and 3) the *Paraalnipollenites alterniporus–Pesavis parva* Zone. Benham (1991) assigned the *Azonia cribrata–Aquilapollenites trialatus* Zone a late Campanian to middle Maastrichtian age, with characteristic restricted species being *Pseudoplicapollis serenus*, *Trudopollis conrector*, *Azonia cribrata*, *Wodehouseia gracile*, *Aquilapollenites reticulatus*, and *Aquilapollenites* (now *Parviprojectus*) *trialatus*. Benham (1991) also noted the presence of an interval (subzone R) within the *Azonia cribrata–Aquilapollenites trialatus* Zone characterized by a high abundance (>85%) of recycled middle to late Albian palynomorphs such as *Cicatricosisporites*, *Tappanispora*, and *Klukisporites*. The *Azonia cribrata–Aquilapollenites trialatus* Zone and subzone R are both within the Bylot Island formation.

The *Porosipollis porosus–Wodehouseia spinata* Zone of Benham (1991) was assigned a middle to late Maastrichtian age based primarily on the abundant *Porosipollis porosus* and restricted *Wodehouseia spinata* that characterize the zone, as well as *Hazaria sheoparii*. Other species restricted to the *Porosipollis porosus–Wodehouseia spinata* Zone include *Cicatricosisporites eocenicus*, *Cranwellia striata*, *Cranwellia rumseyensis*, *Triatriopollenites costatus*, *Trudopollis* ex gr. *arector*, *Beaupreaidites angulatus*, *Beaupreaidites mollis*, *Azonia jacutense*, *Wodehouseia quadrispina*, *Singularia aculeata*, and *Mancicorpus trapeziforme*. The *Porosipollis porosus–Wodehouseia spinata* Zone was identified within Sermilik formation strata of the North Bylot Trough (Benham, 1991).

Benham (1991) considered the third zone for the North Bylot Trough, the *Paraalnipollenites alterniporus–Pesavis parva* Zone, to be Early to Middle Paleocene: taxa restricted to this zone include *Striatopollis tectatus*, *Ulmoideipites krempii*, *Momipites wyomingensis*, *Caryapollenites* sp. cf. *C. inelegans*, *Complexiopollis* sp., *Aquilapollenites augustus*, *Aquilapollenites* sp. cf. *A. immiser*, *Diporicellasporites* sp. cf. *D. stacyi*, *Staphlosporonites delumbus*, *Pesavis tagluensis*, *Phragmothyrites* sp., *Callimothallus pertusus*, *Plochmopeltinites masonii*, and *Microthallites lutosus*. Benham (1991) indicated that the *Paraalnipollenites alterniporus–Pesavis parva* Zone characterizes the Navy Board and Aktineq formations of the North Bylot Trough.

Benham and Burden (1990) and Benham (1991) ascribed a threefold tectonosedimentary model for the development of the Maud Bight strata. Phase 1 of this model was represented by the arenaceous fluvial deposits of the Hassel Formation, which accumulated prior to rifting associated with Baffin Bay and Lancaster Sound and was presumably linked with deposition in the Eclipse Trough to the south. Overlying upper Campanian to middle Maastrichtian shelf mudstone units of the Bylot Island formation and middle to upper Maastrichtian quartz-rich nearshore and beach deposits of the Sermilik formation in Maud Bight reflected the initial uplift of the Byam Martin Mountains of central Bylot Island and separation from sedimentation in the Eclipse Trough. This constituted Phase 2 of the tectonic development model of Benham and Burden (1990) and Benham (1991). The final, Phase 3, episode of the tectonostratigraphic model is represented by the lower to middle Paleocene Navy Board and Aktineq formations; the former was interpreted as fluvial, braided stream, and lacustrine

Table 4. Palynological zones and important taxa for onshore Cretaceous–Paleocene strata of the Eclipse Trough, south coast of Bylot Island.

Early Paleocene	***Trivestibulopollenites betuloides–Triatripollenites* sp. 1 Zone**
	Caryapollenites sp. 1
	Cingutriletes clavus
	Gemmatriletes sp. 1
	Impardecispora sp. 1
	Momipites sp. 1
	Pesavis parva
	Pityosporites elongatus
	Pityosporites elongatus var. *grandis*
	Podocarpidites sp. 1
	Polyvestibulopollenites trinus
	Retriletes sp. 1
	Semioculopollis sp. 1
	Sequioapollenites paleocenicus
	Triatriopollenites sp. 1
	Tricolpites hians
	Trivestibulopollenites betuloides
	Trudopollis spp.
Late Maastrichtian	***Hamulatisporis amplus–Ulmipollenites* sp. 1 Zone**
	Carpinipites anciptes
	Ceratiopsis diebelii
	Ceratosporites equalis
	Cibotiumspora juncta
	Echinatisporis varispinosus
	Hamulatisporis amplus
	Intratriporopollenites sp. 1
	Pesavis parva
	Polyatripollenites stellatus
	Polyvestibulopollenites verus
	Thalassiphora pelagica
	Ulmipollenites sp. 1
	Wodehouseia sp. 1

After Waterfield (1989).

facies, whereas the latter was considered to represent meandering stream sandstone deposits and alluvial fan conglomerate units (Maud Bight member). These later units of Phase 3 represented the initiation of rifting in Baffin Bay and in the Lancaster Aulacogen (i.e. Lancaster Sound; Kerr, 1980) immediately to the north. Although Benham and Burden (1990) and Benham (1991) utilized much of the same stratigraphic nomenclature for the North Bylot Trough as initially described for the Eclipse Trough by Miall et al. (1980), Sparkes (1989), and Waterfield (1989), they did interpret the stratigraphic evolution of the successions during Phases 2 and 3 to be distinct from that of the Eclipse Trough and separated from it by the uplifted Byam Martin Mountains.

Based on his understanding of the ages and lithostratigraphic successions of Eclipse and North Bylot troughs, Benham (1991) correlated strata of these basins with other basins in the circum-Baffin Bay region (Fig. 18), including the Cape Dyer area of onshore Baffin Island, the Labrador Sea, and onshore and offshore West Greenland. One notable difference highlighted in the Benham (1991) correlation is the distinct lack of volcanic strata in the Eclipse Trough and North Bylot Trough successions compared to the significant volumes of volcanic rocks present in the Cape Dyer and West Greenland areas, adjacent to the Davis Strait transform margin. Presumably, this reflects the distant location of the former areas from active rift-related volcanism, and their location within the nonvolcanic (i.e. magma-poor) portion of the Baffin Island continental margin, now recognized as the region north of Home Bay (Skaarup et al., 2006; Dafoe, Dickie, and Williams, this volume; Keen et al., this volume).

2000s subsequent research

Fenton and Pardon's (2007) comprehensive review of the litho- and biostratigraphy of Bylot Island strata also included the south coast and Twosnout creek sections. These authors reassessed palynological samples utilized by Ioannides (1986) from both of the Bylot Island sections, but it is not clear whether they obtained any new samples from the island. They followed Miall et al. (1980) in recognizing the presence of the Hassel Formation at the base of the Bylot Island south coast succession, in contrast to Sparkes (1989), and accepted its general Albian–Cenomanian age as proposed by Miall et al. (1980). Importantly, Fenton and Pardon (2007) examining the Twosnout creek samples, recognized that the lowest sample available, from near the base of the exposed mudstone beds of the Kanguk Formation (Kk1 of Miall et al., 1980), had an age of Turonian to "(intra-) Coniacian," again older than recognized by previous workers. Younger parts of the south coast succession were assigned similar ages to those presented by Miall et al. (1980), Sparkes (1989), and Waterfield (1989), with the youngest age recognized as Danian in the lower part of the Te^3 unit of Miall et al. (1980) (equivalent to the Pond Inlet formation of Waterfield, 1989), although Fenton and Pardon (2007) acknowledged the possibility that younger Paleocene strata could be present.

DISCUSSION

Considerable work was undertaken on the Cretaceous–Paleogene stratigraphy of the onshore successions along western Baffin Bay during the 1970s to 1990s, but no comprehensive overview of the rocks was formulated and the data were never fully integrated and synthesized into a formal depositional framework for the onshore succession. As well, these studies were undertaken before the advent of modern GPS, and in some cases, studied stratigraphic sections could only be located approximately on topographic maps. For the Bylot Island region, home to the thickest, most widespread, and most stratigraphically comprehensive of the onshore successions, previous studies targeted specific, readily accessible and known localities. The result was a view of the stratigraphy limited in its scope and in the understanding of the stratigraphic relationships relative to basin geometry and sedimentation history.

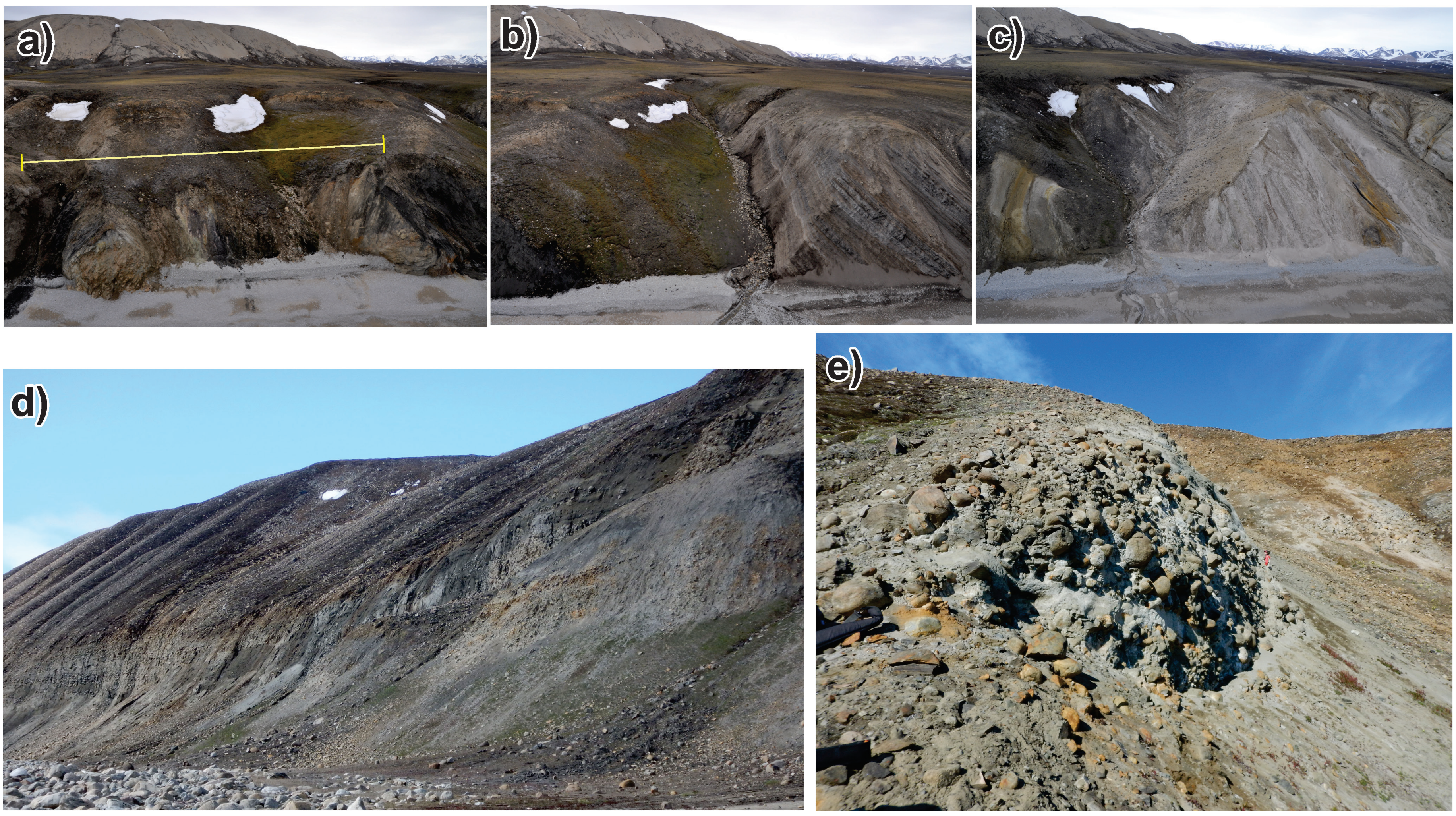


Figure 17. Photographs showing examples of Cretaceous–Paleogene strata preserved in the North Bylot Trough, north coast of Bylot Island (inset E of Fig. 1). *See* Figure 10 for photograph locations. **a), b), c)** Sequential photographs looking south-southeast, showing stratigraphy in parts of Section 3, the most complete section of strata at Maud Bight, studied by Benham (1991); rocks are deformed along faulted contact with Proterozoic strata; photographs do not fully overlap; total length of outcrop is about 0.75 km. **a)** Base of section showing strongly deformed black mudstone beds of Bylot Island formation in fault contact with Proterozoic strata; fault zone delimited by yellow line; multiple fault blocks of Proterozoic rocks are involved in the fault zone. NRCan photo 2021-215. **b)** Black mudstone in upper part of Bylot Island formation at left and covered in middle, succeeded by interstratified sandstone and mudstone transitional to overlying Sermilik formation. NRCan photo 2021-216. **c)** Buff and yellowish sandstone of Sermilik formation at left, succeeded by pale yellow sandstone of Pond Inlet formation on right. NRCan photo 2021-217 **d)** Flat-lying (?)Paleogene boulder conglomerate and interstratified sandstone of Maud Bight member of Aktineq formation of Benham (1991); total height of exposure approximately 125 m; top of hill is capped by Quaternary gravel beds and differentiating the contact of the gravel beds with the boulder conglomerate is problematic. NRCan photo 2021-218. **e)** Close-up of Maud Bight member boulder conglomerate, showing rounded nature of clasts; person for scale. NRCan photo 2021-219. All photographs by J.W. Haggart.

The initial work of Miall et al. (1980) established the broad lithological units that exist in the Eclipse Trough area of Bylot Island and their general ages. Subsequent work by the MUN research team in a series of theses (Sparkes, 1989; Waterfield, 1989; Benham and Burden, 1990; Benham, 1991; Wiseman, 1991) provided significantly more lithological and biostratigraphic detail for these units, and assigned them new nomenclature chosen to reflect their local derivation geographically distant from the successions of the High Arctic. As well, the MUN team also undertook the first investigations of the succession preserved in the North Bylot Trough, recognizing many similarities, as well as some discrepancies, compared to the Eclipse Trough succession. These results provide the best overall summary of the geology and lithostratigraphy of the Bylot Island rocks, and in the greatest detail; however, inconsistencies among these theses in ages assigned to lithological units, as well as varying interpretations of the depositional environments represented by the strata, highlight that this research needed further pursuit.

Studies in the 1970s and 1980s did not produce detailed geological maps of the Cretaceous–Paleogene succession of the onshore region due to limitations to outcrop access at the time. Thus, recognizing patterns and trends of lateral facies relationships among strata was limited, and defining the lateral and vertical extents of important stratigraphic units was not fully established. Interpretations of depositional environments of some lithostratigraphic units were often confusing and contradictory amongst the various contributions, with no clear model of changing environments and depositional patterns through time. For example, Sparkes (1989) interpreted his Byam Martin formation to consist of basin-plain and turbidite deposits that give way upsection to braided delta and submarine fan (presumed herein to be fan-delta) deposits of the progradational Sermilik formation. Unfortunately, Sparkes (1989) did not qualify the types of submarine-fan environments represented by these units — deep-marine or fan-delta settings — creating some interpretive confusion. Similarly, Waterfield (1989) assigned the Pond Inlet formation to a wide variety of depositional settings, including basin-margin fan-delta, shelf, and submarine-fan environments; he also suggested that the Navy Board formation represented basin-plain deposits grading upward into deltaic facies, a wide range of depositional settings.

Previous researchers were also influenced by regional perspectives in their correlations of the succession on Bylot Island, which is located between the Cretaceous and Cenozoic basins of the High Arctic and those of the Labrador–Baffin Seaway rift system. Miall et al. (1980) posited that the Eclipse Trough exposures represented the farthest southeastward preserved extent of the Kanguk Formation, widespread in the High Arctic, based on the lithostratigraphic and biostratigraphic similarities of the units, and was perhaps influenced by the recognition of Kanguk Formation strata on Somerset Island, approximately 450 km west of Bylot Island (Dixon et al., 1973).

Miall (1986, 1991) and Ricketts (1986) further correlated the Cenozoic succession of the Eclipse Trough with the Eureka Sound Group of the High Arctic, although each presented different lithostratigraphic schemes for the Paleogene strata of Bylot Island (Fig. 11). Miall (1986) correlated the Cenozoic lithostratigraphic units of the Eclipse Trough (i.e. Eureka Sound Formation, with members Te^1, Te^2, Te^3, and Te^4; Miall et al., 1980; Fig. 11) with the Paleocene–Eocene portion of the principally nonmarine to deltaic Paleocene–Oligocene Eureka Sound Group, exposed widely in the Sverdrup Basin to the northwest of Bylot Island (Fig. 19). The Eureka Sound Group in the Sverdrup Basin, according to Miall (1986), accumulated in at least seven distinct sedimentary basins across the Arctic, which were rarely linked regionally during their depositional histories, and the stratigraphic units within the group are markedly diachronous. For this reason, Miall (1986) based his correlations on facies assemblages, rather than strict, biostratigraphically constrained successions. Miall (1986) thus correlated units Te^1 (lower sandstone member) and Te^2 (lower mudstone member) of the Eureka Sound Formation of Miall et al. (1980), which were considered to unconformably overlie the Campanian–Maastrichtian Kanguk Formation in the Eclipse Trough, with the Paleocene to Eocene Mount Lawson Formation of the Eureka Sound Group found in more northerly parts of the Arctic. Miall et al.'s (1980) Eclipse Trough unit Te^2 (lower mudstone member) of the Eureka Sound Formation was further considered to correlate most closely with the Mount Lawson Formation, and they interpreted their unit Te^1 (the lower sandstone member of the Eureka Sound Formation) as a marine shoreline sandstone forming the basal member of the

Table 5. Palynological zones and important taxa for onshore Cretaceous–Paleocene strata of the North Bylot Trough, north coast of Bylot Island.

Early to mid-Paleocene	***Paraalnipollenites alterniporus–Pesavis parva* Zone**
	Aquilapollenites augustus
	Aquilapollenites sp. cf. *A. immiser*
	Brachysporites cotalis
	Callimothallus pertusus
	Carpinipites ancipites
	Caryapollenites sp. cf. *C. inelegans*
	Complexiopollis sp.
	Dicellaesporites popovii
	Diporicellasporites reticulatus
	Diporicellasporites sp. cf. *D. stacyi*
	Ericaceoipollenites rallus
	Hazaria sheoparii
	Microthallites lutosus
	Momipites wyomingensis
	Monoporisporites singularis
	Paraalnipollenites alterniporus
	Pesavis parva
	Pesavis tagluensis
	Phragmothyrites sp.
	Plochmopeltinites masonii
	Polyvestibulpollenites verus
	Sequioapollenites paleocenicus
	Staphlosporonites delumbus
	Striatopollis tectatus
	Triporopollenites mullensis
	Trivestibulopollenites betuloides
	Ulmoideipites krempi
Mid- to late Maastrichtian	***Porosipollis porosus–Wodehouseia spinata* Zone**
	Azonia jacutense
	Beaupreaidites angulatus
	Beaupreaidites mollis
	Brachysporites cotalis
	Carpinipites ancipites
	Cicatricososporites eocenicus
	Cranwellia rumseyensis
	Cranwellia striata
	Dicellaesporites popovii
	Ericaceoipollenites rallus
	Extratriporopollenites sp. 2 of McIntyre
	Fraxinoipollenites variabilis
	Hazaria sheoparii
	Mancicorpus trapeziforme
	Paraalnipollenites alterniporus
	Pesavis parva
	Porosipollis porosus
	Sequioapollenites paleocenicus
	Singularia aculeata
	Triatriopollenites costatus
	Triporopollenites mullensis
	Trivestibulopollenites betuloides
	Trudopollis ex gr. *arector*
	Wodehouseia quadrispina
	Wodehouseia spinata
Late Campanian to mid-Maastrichtian	***Azonia cribrata–Aquilapollenites trialatus* Zone**
	Aquilapollenites reticulatus
	Aquilapollenites trialatus
	Azonia cribrata
	Ceratiopsis diebelli
	Densoisporites velatus
	Echinatisporis varispinosus
	Hazaria sheoparii
	Liliacidites leei
	Monoporisporites singularis
	Palaeoperidinium kozlowskii
	Porosipollis porosus
	Pseudoplicapollis serenus
	Radialisporis radiatus
	Triatriopollenites rurensis
	Trudopollis conrector
	Wodehouseia gracile

After Benham (1991).

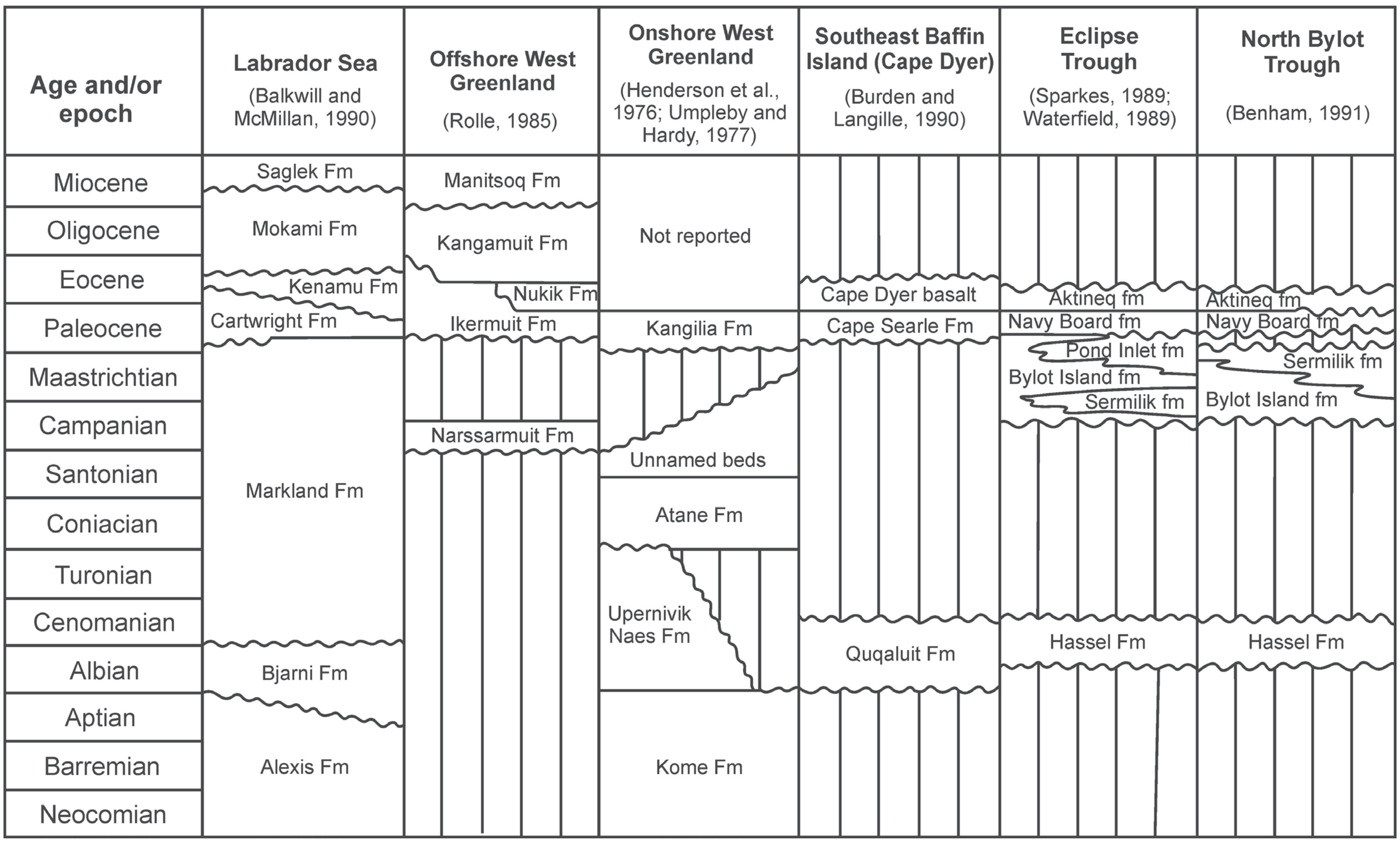


Figure 18. Correlation of Cretaceous–Cenozoic strata of the circum-Baffin Bay region, as understood ca. 1991, *after* Benham (1991).

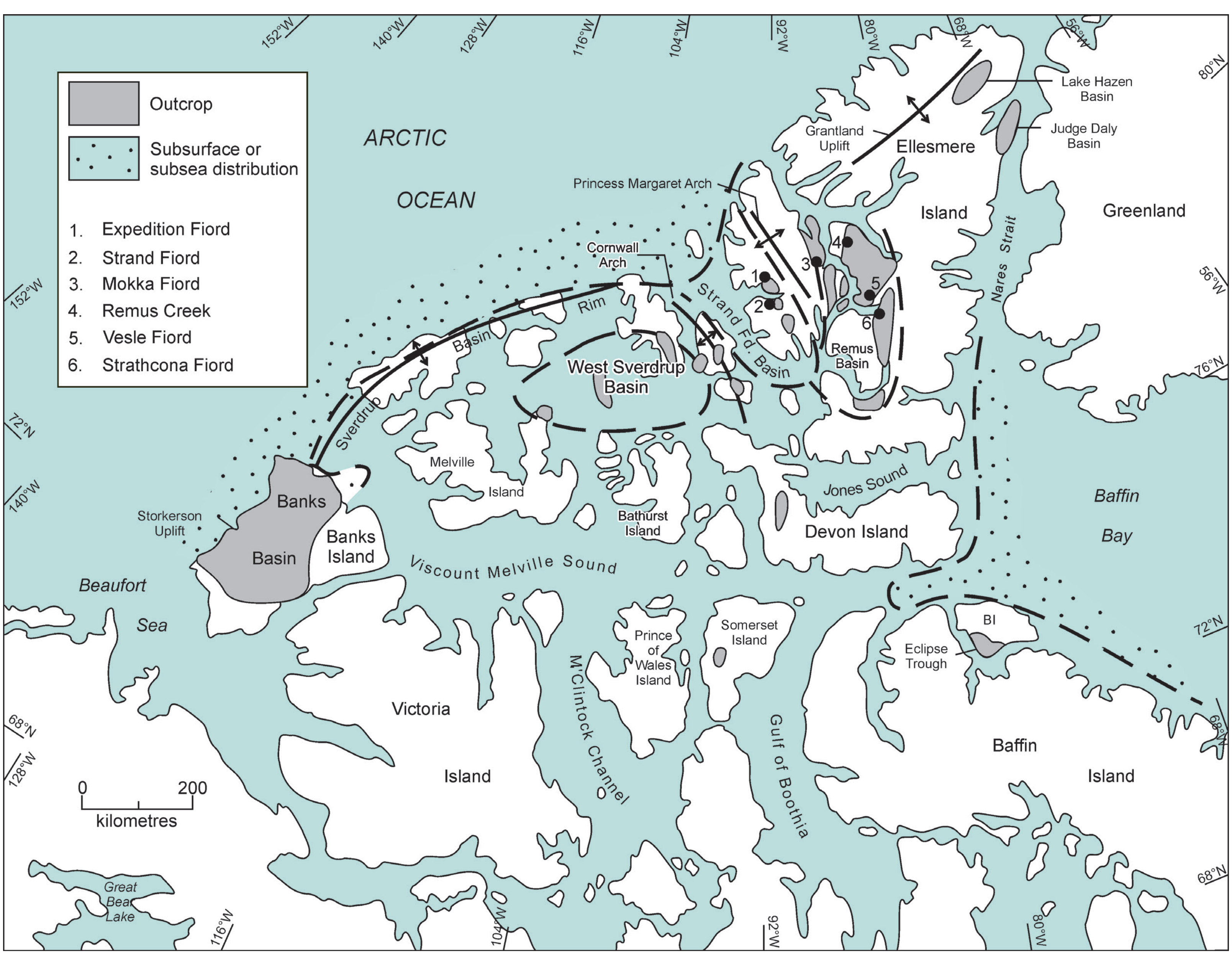


Figure 19. Map showing distribution of Eureka Sound Group depositional basins, Canadian Arctic, and also the Eclipse Trough, Bylot Island (*after* Miall, 1991). BI = Bylot Island; Fd. = Fiord.

Mount Lawson Formation. Subsequently, Miall (1986) correlated unit Te^3 (upper sandstone member) of the Eureka Sound Formation of the Eclipse Trough with the Mokka Fiord Formation of the Eureka Sound Group. Miall (1986) did not attempt to correlate the stratigraphically highest unit (Te^4, upper mudstone member) of the Miall et al. (1980) Eureka Sound Formation of the Eclipse Trough with any stratigraphic units of the Eureka Sound Group of the Sverdrup Basin.

In contrast, Ricketts (1986) suggested that some distinctive lithostratigraphic units of the Eureka Sound Group recognized in the Sverdrup Basin could also be recognized in more distant areas to the south, including the Bylot Island region (Fig. 11, 19). Ricketts (1986) thus correlated Miall et al.'s (1980) uppermost sandstone member (Kk^2) of the Kanguk Formation on Bylot Island with his Expedition Formation of the Eclipse Sound Group within Sverdrup Basin, and Miall et al.'s (1980) overlying Te^1, Te^2, and Te^3 units of the Eclipse Trough succession with his Strand Bay and Iceberg Bay formations of the Eureka Sound Group. In subsequent publications, Ricketts (1991, 1994) did not continue to compare the Cenozoic strata of the Eclipse Trough and the Bylot Island region with Eureka Sound Group stratigraphy of the Sverdrup Basin, suggesting he may have reconsidered this hypothesis.

Neither Miall (1986) nor Ricketts (1986) took into account the large geographic distance, some 400 km, separating known exposures of the Eclipse Trough, especially the Cenozoic succession, from contemporary deposits of the Sverdrup Basin. In particular, the choice of Miall (1986, 1991) and Ricketts (1986) to apply the stratigraphic nomenclature of Eureka Sound Group rocks to the Eclipse Trough succession seemingly discounted their own statements that the subbasins containing Eureka Sound Group within the Sverdrup Basin were essentially separate depocentres throughout most of their history, with sediment supply controlled by localized tectonic highs. Given this, it might have been preferable to assign separate stratigraphic nomenclatures to each of those disjunct Paleocene–Eocene depocentres, which would have reflected their distinct lithostratigraphic and depositional characteristics. To find the same stratigraphic succession preserved in both the Eclipse Trough and Sverdrup Basin, in which sedimentation was locally controlled by different structural regimes and basement blocks, would be highly unusual. Indeed, Miall (1988) subsequently suggested that the application of stratigraphic names across such large geographic distances was perhaps inappropriate.

The MUN research team viewed the Eclipse Trough succession much differently, considering it to be an onshore extension of basins within northern Baffin Bay, and related to the tectonic evolution of that region. Thus, the group formulated a stratigraphic nomenclature for the rocks that was generally distinct from that of the schemes of Miall et al. (1980), Miall (1986, 1991), and Ricketts (1986). Unfortunately, the MUN research was never formalized in the geological literature and did not consider potential genetic linkages with the rocks of the High Arctic, other than with the Hassel Formation. Significantly, the MUN team did attempt to establish detailed biostratigraphic zonations for the Cretaceous–Paleogene strata of the troughs, but this work involved multiple biozonation schemes with limited correlation value. Application of these zonations to the rocks of Bylot Island resulted in different ages for some lithostratigraphic units: for example, Wiseman (1991) assigned a Maastrichtian age to the Pond Inlet formation in the Twosnout creek area, whereas both Ioannides (1986) and Waterfield (1989), also using palynology, assigned these strata to the Early Paleocene.

Despite these limitations, studies in the 1970s and 1980s established a number of significant contributions regarding the Eclipse and North Bylot troughs and correlative strata of onshore Baffin Island. They also helped to define research opportunities and objectives of the Geological Survey of Canada's Geomapping for Energy and Minerals (GEM) Program. These can be summarized as follows.

- The broad overall patterns of Cretaceous–Paleogene sedimentation preserved in the onshore sedimentary successions adjacent to western Baffin Bay were identified (Jackson and Davidson, 1975a; Jackson et al., 1975), and details of their depositional environments were subsequently established (Miall et al., 1980; Sparkes, 1989, Waterfield, 1989, Benham, 1991). These studies provide an analogue for the nature and depositional environments of the sedimentary successions preserved in the offshore shelf and slope areas of western Baffin Bay; a relationship later demonstrated by Dafoe et al. (2019b).
- The similarity of the Cretaceous stratigraphic succession of the Eclipse Trough to that of the Sverdrup Basin of the High Arctic was noted by Miall et al. (1980), and both Miall (1986, 1991) and Ricketts (1986) attempted correlation of the Cenozoic strata of the Eclipse Trough with the Eureka Sound Group of the High Arctic; however, these researchers minimized the potential influence of the evolving tectonism related to the Labrador–Baffin Seaway rift system in the deposition of the Eclipse Trough succession.
- Studies in the 1970s to 1990s led to the recognition that the Cretaceous–Paleogene succession of the Eclipse and North Bylot troughs, as well as of the Cape Dyer area, included a complexity of strata with laterally interfingering facies relationships, changing depositional environments, and internal discontinuities; this contrasts with the 'layer-cake' view of the stratigraphy that existed earlier. Subsequent detailed assessment of paleoenvironments, including trace-fossil analysis, has revealed: Lower Cretaceous fluvial, lake-margin, and shoreface strata; Upper Cretaceous outer shelf (or more distal) to foreshore deposits; and Paleocene deltaic, shoreface, foreshore, and estuarine settings (Dafoe and Haggart, 2018; Dafoe et al., 2019a).
- Cretaceous–Paleogene sedimentation in the Bylot Island region was recognized to have taken place in two distinct depocentres — the Eclipse and North Bylot troughs (Jackson and Davidson, 1975a, b; Miall et al., 1980). These depocentres shared a similar history during the Cretaceous, but diverged somewhat during the Paleogene, due to evolving tectonic activity related to rifting and evolution of Baffin Bay (Benham and Burden, 1990; Benham, 1991). Studies by Haggart et al. (2018) have further confirmed that similar units can be identified in both troughs, with lateral facies changes also being a significant factor in lithostratigraphic relationships within each trough.
- The MUN research group established that the Eclipse Trough succession is stratigraphically much more complete than had been considered previously (Miall et al., 1980; Miall, 1986; Ricketts, 1986), with biostratigraphic evidence indicating more or less continuous deposition from the late Campanian and through the late Maastrichtian to Paleocene (Sparkes, 1989; Waterfield, 1989; Benham, 1991). Although preliminary, recent GEM work has suggested that the Eclipse Trough may contain an even more complete stratigraphic succession, possibly from the Albian–Cenomanian through to the Selandian, with settings from nonmarine to open ocean (Haggart et al., 2017, 2018), in rough agreement with the limited analyses of Fenton and Pardon (2007).
- In addition to establishing a biostratigraphic zonal sequence for the North Bylot Trough strata, Benham (1991) also undertook a comprehensive taxonomic review of floral taxa found there, and included new and unknown taxa in the definition of his floral zones. These comprehensive descriptions and identifications provide a significant resource to help refine and improve understanding of the stratigraphic ranges for many of these biostratigraphically significant taxa. For example, more recent understanding of the biostratigraphic range of *Parviprojectus trialatus* (formerly *Aquilapollenites trialatus*) suggests that Benham's *Azonia cribrata–Aquilapollenites trialatus* Zone is more likely to be Campanian rather than late Campanian to middle Maastrichtian (Braman and Sweet, 2012). Subsequent preliminary study by Haggart et al. (2018) has further revealed additional new palynomorphs, as well as recognizing known floral taxa comparable to established palynoevents in the region (e.g. Nøhr-Hansen et al., 2016).
- Sedimentation and volcanism in the Cape Dyer area was linked to rift-related development and tectonism of Baffin Bay and with the magmatic province of West Greenland (Burden and Langille, 1990).
- The importance of palynostratigraphic control to elucidate details of basin stratigraphy, changing depositional environments, and ages of stratigraphic units was recognized (Ioannides, 1986; Sparkes, 1989; Waterfield, 1989; Wiseman, 1991), as was the significant challenge of differentiating relatively flat-lying, poorly indurated Paleogene coarse clastic strata from adjacent Quaternary deposits (Burden and Holloway, 1985; Newman, 1987).

In the late 2000s, the Geological Survey of Canada initiated the Geo-mapping for Energy and Minerals (GEM) program, with a project targeting the onshore Cretaceous–Paleogene sedimentary successions along western Baffin Bay. The objective of this project was to re-examine this stratigraphy in the context of geological mapping, and to interpret the ages of the onshore strata and their paleoenvironments, the sequence stratigraphic history of the onshore basins, their sedimentary provenance, and their uplift histories. Research is ongoing and results are still forthcoming, but reviews of field programs and preliminary assessments of new geological understandings have been presented in a series of abstracts and contributions (Haggart et al., 2011, 2017, 2018; Galloway et al., 2012; Brent et al., 2013; Dafoe and Haggart, 2018; Dafoe et al., 2019a, b; Currie et al., 2020). These are beyond the scope of this review.

SUMMARY

A number of researchers examined the onshore Cretaceous–Paleogene deposits of the eastern Baffin Island region during the 1970s to 1990s, and attempted to formulate stratigraphic frameworks that described these strata and their depositional setting. The age control for these studies was based exclusively on palynology (pollen and spores and dinocysts) since molluscs, foraminifera, and radiolarians were conspicuously absent from the strata, or limited in abundance. It was recognized that stratigraphic successions in all areas studied consist almost exclusively of clastic deposits: sandstone, siltstone, mudstone, and conglomerate. The geographically and stratigraphically restricted Cretaceous–Paleogene deposits of the Cape Dyer region (Burden and Langille, 1990, 1991) are associated with volcanic strata of Paleogene age, and interpreted to reflect the onset of seafloor spreading in southern Baffin Bay (Keen et al., this volume). In contrast, the much thicker and complete successions of the Eclipse Trough and North Bylot Trough regions lack any association with volcanic strata. For this reason, as well as the notable similarity of the Cretaceous lithostratigraphic succession of the Eclipse Trough with that of the Sverdrup Basin of the High Arctic, the stratigraphic framework established by Miall et al. (1980) for the Eclipse Trough succession, and subsequently followed by Miall (1986, 1991) and Ricketts (1986), utilized nomenclature from the Sverdrup Basin to describe the succession. Researchers from Memorial University of Newfoundland (Sparkes, 1989; Waterfield, 1989; Benham and Burden, 1990; Benham, 1991; Wiseman, 1991) took a different approach to the study of the Eclipse Trough and North Bylot Trough successions, considering them to have developed in response to tectonic activity associated with rifting of the Baffin Bay region. The result was a stratigraphic interpretation that diverged significantly from that of the earlier researchers, while describing the same lithostratigraphic units. In terms of understanding the overall onshore Cretaceous–Paleogene history of the northwest Baffin Bay region, little clarity has been established regarding the tectonic events that have controlled that depositional history.

This review of the existing literature on the onshore Cretaceous–Paleogene successions of the western Baffin Bay region by researchers during the 1970s to 1990s reveals differing interpretations of stratigraphic successions, incomplete and outdated biostratigraphic assessments, and conflicting models of ages and depositional environments for these strata. To address these issues, the Geological Survey of Canada's GEM program, undertaken during the period 2009 to 2020, included field studies targeting the onshore strata of Bylot Island and associated areas; the new data resultant from these studies will provide clarity regarding the stratigraphic architecture of the onshore successions of the western Baffin Bay region, utilizing a biochronological framework that is based on modern taxonomic thinking and comprehensive biostratigraphic occurrence data. Future biostratigraphic work on Bylot Island in particular should focus on developing an event stratigraphy integrating terrestrial and marine fossils to resolve ages and propose correlations, both locally and regionally. Such future study will hopefully make it possible to better understand the evolving paleoenvironmental and depositional history of the onshore Cretaceous–Paleocene strata, and elucidate the finer details of their stratigraphic correlation. A modern stratigraphic framework for the strata will also allow their sequence-stratigraphic history to be established, enhancing correlations with associated offshore successions. As well, such a framework will provide the necessary stratigraphic context for studies of sediment petrography and provenance to establish the basin geometries and depositional histories, and to assess basement thermal and uplift history.

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