

**Introduction**

Ammonite faunas from the Wilkie Point Formation of Toarcian to Early Bathonian age on Prince Patrick Island, Canadian Arctic Archipelago (Fig. 33.1), were collected in 1954 and 1958 (Tozer and Thorsteinsson, 1964; Frebald, 1975). Samples from the matrices of macrofossils were obtained from GSC localities 24643, 24648, 24651, 24661, 24664 and 35324. Figure 33.2 indicates the geographic and stratigraphic positions of these localities.

Age assignments of the samples from the Wilkie Point Formation are based on the recovered ammonite faunas (Fig. 33.3).

The samples were processed for palynology with standard processing techniques and palynomorphs were recovered from six samples (Fig. 33.3); GSC locality 24664

contained no microplankton. The productive samples yielded a diversity of fossil spores and pollen (not discussed in this paper) and well-preserved microplankton.

The latter listed in order of abundance include:

- Nannoceratopsis gracilis** Alberti
- N. senex** sp. nov.
- Meiourogonyaulax** sp. cf. **M. deflandrei** Sarjeant
- Michrhystridium** sp.
- Veryhachium** sp.
- ?**Dictyopyxidia** sp.



Figure 33.1. Location map of Wilkie Point Formation outcrops A, B, C and D, with studied fossil localities, western Queen Elizabeth Islands, Arctic Archipelago.

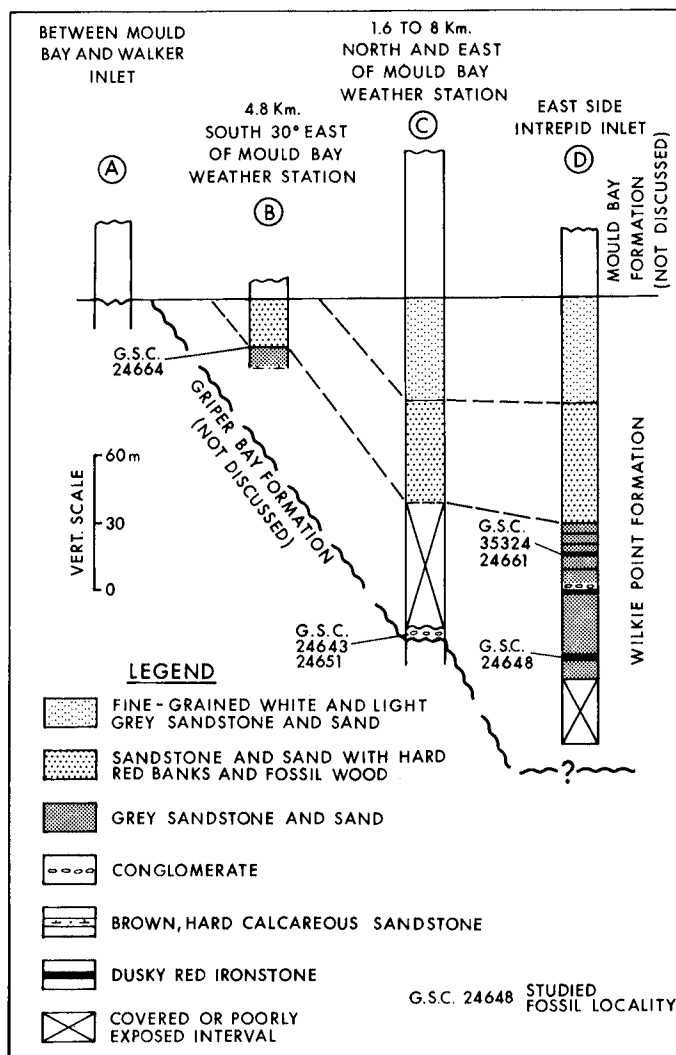


Figure 33.2. Columnar sections of Wilkie Point Formation, Prince Patrick Island, with studied fossil localities (after Tozer and Thorsteinsson, 1964, p. 128, Fig. 8).

<sup>1</sup>Chevron Standard Limited

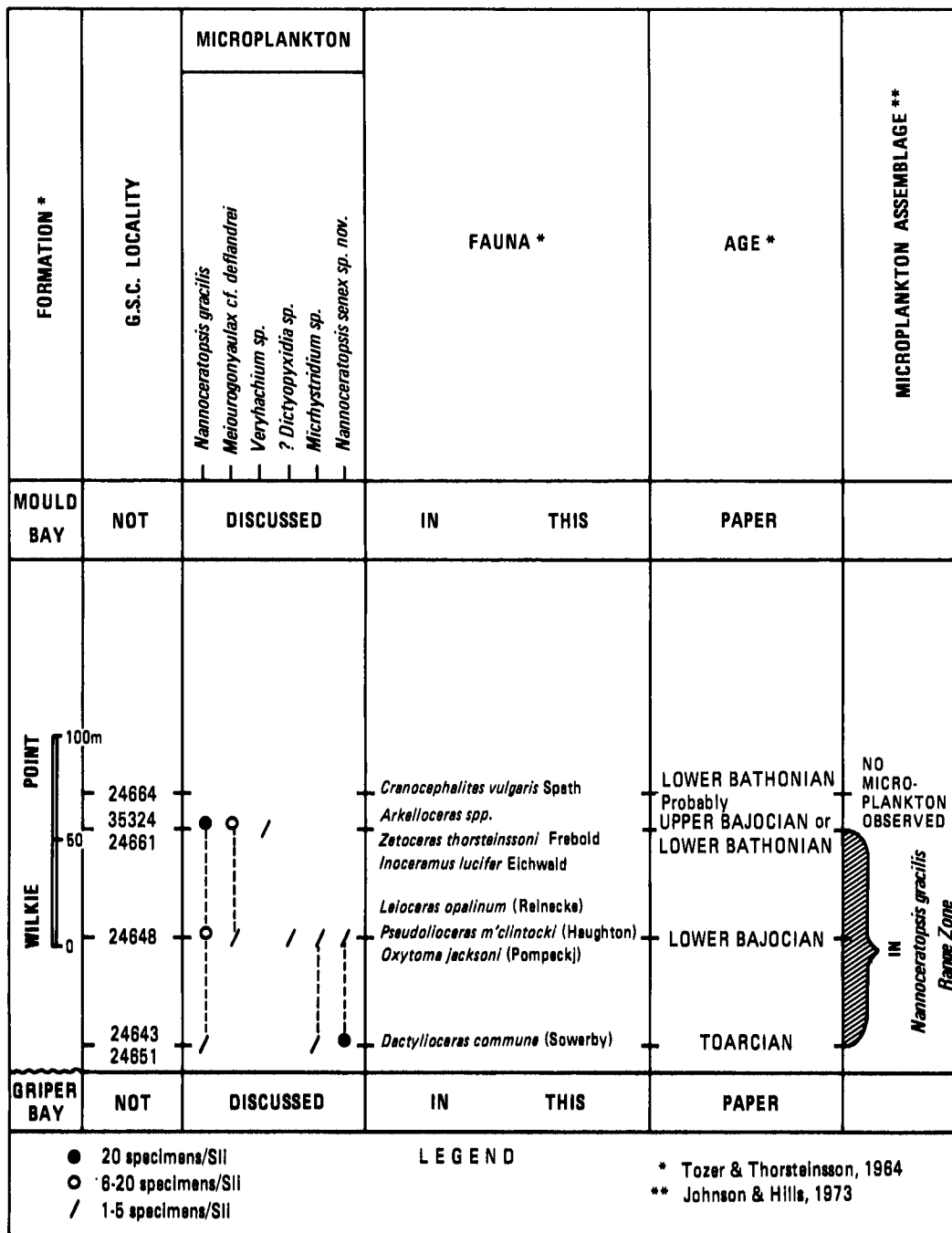


Figure 33.3. Correlation of microplankton assemblages with ammonite faunas, Wilkie Point Formation, Prince Patrick Island.

Of particular interest was the occurrence of a new species of *Nannoceratopsis* Deflandre. This species, recorded by several authors (Evitt, 1961; Morgenroth, 1970; Johnson and Hills, 1973) as a variant of *Nannoceratopsis gracilis* Alberti, did not occur as high in the section of *N. gracilis* and, in most cases, could be distinguished readily from that species by its morphology. The new species is considered stratigraphically significant and has a range from (?Late) Pleinsbachian to Early Bajocian.

The occurrence and frequency distribution of the recorded microplankton is summarized in Figure 33.3. The samples and slides bearing type specimens and figured specimens used in this study are stored in the collections of the Geological Survey of Canada, 601 Booth Street, Ottawa.

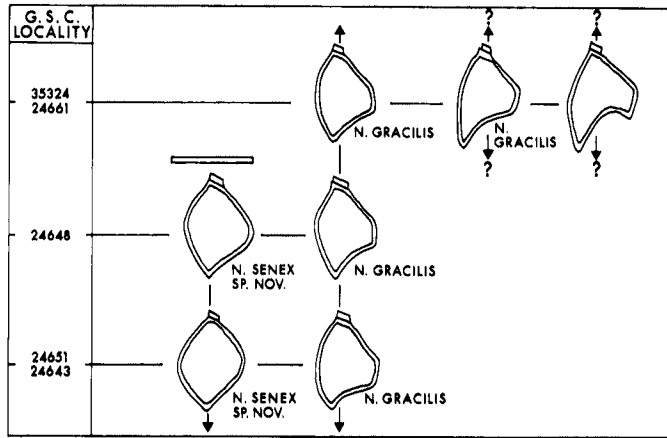


Figure 33.4. Diagrammatic sketch showing the vertical distribution and the variability of *Nannoceratopsis gracilis* Alberti emend. and *Nannoceratopsis senex* sp. nov.

### Acknowledgments

The author thanks the Geological Survey of Canada for permitting examination of the material and for the opportunity to publish, and Chevron Standard Limited for permission to publish these data. W.W. Brideaux and H.R. Balkwill (Institute of Sedimentary and Petroleum Geology, Calgary) critically read the manuscript and their suggestions for improvement are gratefully acknowledged.

### Systematics

Order DINOPHYSALES Lindemann, 1928

Family NANNOCERATOPSITACEAE Sarjeant and Downie, 1974

Genus *Nannoceratopsis* Deflandre, 1938

*Nannoceratopsis gracilis* Alberti, 1961 emend.

Plate 33.1, figures 10-14, Plate 33.2, figures 1-13

*Nannoceratopsis?* *gracilis* Alberti, 1961, p. 30, Pl. 7, figs. 16, 17.

*Nannoceratopsis deflandrei* Evitt, 1961, p. 308, Pl. 1, figs. 2-14.

**Emended diagnosis.** Lateral outline variable: subtriangular with two antapical horns (ventral horn always much shorter and less well developed than the dorsal horn) to nearly ovoid with a poorly developed ventral horn and a pronounced dorsal horn. Postcingular ventral area above ventral horn and below parasulcal area more or less straight and parallel to apical-antapical axis, sometimes pronouncedly bulging. Periphragm sculpture reticulate. All other features as in Evitt (1961).

**Remarks.** The emended diagnosis of *Nannoceratopsis gracilis* Alberti restricts the morphology of the species to forms having a distinctly reticulate ornamentation, one dorsal antapical horn and one short ventral antapical horn, which may be poorly developed.

This emended diagnosis excludes forms having a microreticulate to scabrate or nearly smooth ornamentation and a distinctly ovoid, rounded outline with only the dorsal antapical horn developed.

**Occurrence** (see Fig. 33.3). *Nannoceratopsis gracilis* occurs in abundance at GSC localities 24661 and 35324, represented by two morphotypes which differ in outline: one form with a well-developed dorsal antapical horn and a short ventral antapical horn, separated by a concave area (Pl. 33.2, figs. 5-13), and one form with a very prominent dorsal antapical horn and one poorly to slightly developed ventral antapical horn (Pl. 33.2, figs. 1-4, Fig. 33.4). The stratigraphic significance of this difference in outline has not yet been evaluated.

The form *Nannoceratopsis gracilis* var. A of Johnson and Hills (1973, p. 208, Pl. 3, fig. 16) was not encountered in the samples.

*Nannoceratopsis senex* sp. nov.

Plate 33.1, figures 1-9, Figure 33.4

*Nannoceratopsis gracilis* Alberti, Morgenroth, 1970, Pl. 11, fig. 6 only.

*Nannoceratopsis deflandrei* Evitt, 1961, Pl. 1, fig. 1 only.  
*Nannoceratopsis gracilis* Alberta, Johnson and Hills, 1973, Pl. 3, figs. 18, 19 only.

**Diagnosis.** A species of *Nannoceratopsis* having a distinctly rounded, ovoid outline, being dorso-ventrally more or less symmetrical, with a nearly smooth to microreticulate or scabrate surface.

**Description.** Lateral outline distinctly rounded to ovoid. Ventral side smoothly curved. A dorsal antapical horn with a finely pointed end is usually well developed. Ventral antapical horn absent. Surface sculpture microreticulate or scabrate to nearly smooth. Paracingulum and a small precingular area visible in some specimens. Other features as for genus.

**Comparison.** This species differs from *Nannoceratopsis gracilis* Alberti 1961, emend. and from all other known species of the genus in possessing an extremely rounded outline, both dorsally and ventrally, with only the dorsal antapical horn (well) developed, and in the reduction or absence of the ornamentation (reticulation) on its surface that is characteristic for *N. gracilis* Alberti, emend. *Nannoceratopsis senex* sp. nov. lacks a ventral antapical horn, which distinguishes it from *N. pellucida* Deflandre, 1938 and from *N. spiculata* Stover, 1966.

The (?Late) Pleinsbachian to Early Bajocian stratigraphic range of *N. senex* sp. nov. differs from the ranges of all other species of the genus *Nannoceratopsis*.

**Holotype** (Pl. 33.1, figs. 6, 7). GSC 53017, single mount. Wilkie Point Formation, B.P. et al. Panarctic Emerald K-33 well, interval 4280 to 4300 feet (1425-1430 m), where it is associated with *Nannoceratopsis gracilis* Alberti, emend, *Micrhystridium* spp., *Mancodinium semitabulatum* Morgenroth and small "algal spheres" (abundant). This interval is considered (?Late) Pleinsbachian to Toarcian in age.

Plate 33.1

**Nannoceratopsis senex** sp. nov.

- Figure 1. Paratype GSC 53018 from GSC locality 24651, slide 18527-1, co-ordinates 364X1032 (interference contrast).
- Figure 2. Paratype GSC 53019 from GSC locality 24651, slide 18527-1, co-ordinates 369X1044 (interference contrast).
- Figures 3, 4. Paratype GSC 53029 from GSC locality 24651, slide 18527-3, co-ordinates 318X1149, showing pronounced, pointed, dorsal antapical horn (Fig. 3, interference contrast).
- Figure 5. Paratype GSC 53021 from GSC locality 24651, slide 18527-1, co-ordinates 131X1178 (interference contrast).
- Figures 6, 7. Holotype GSC 53017 from B.P. et al. Panarctic Emerald K-33 well (4280-4300 ft.), slide 18087, single mount No. 201 (Fig. 7, interference contrast).
- Figures 8, 9. Paratype GSC 53022 from GSC locality 24651, slide 18527-1, co-ordinates 247X1008 (interference contrast), showing paracingulum, apical region, microreticulation.

**Nannoceratopsis gracilis** Alberti emend.

(pronounced reticulation, ventral antapical horn poorly developed)

- Figures 10, 14. GSC 53023 from GSC locality 24651, slide 18527-3, co-ordinates 310X1074 (Fig. 10, interference contrast).
- Figure 11. GSC 53024 from GSC locality 24648, slide 18526-4, co-ordinates 212X1062.
- Figure 12. GSC 52035 from GSC locality 24648, slide 18526-2, co-ordinates 284X1068.
- Figure 13. GSC 53026 from GSC locality 24648, slide 18526-2, co-ordinates 392X1025.

?**Dictyopyxidia** sp.

- Figures 15, 16. GSC 53027 from GSC locality 24648, slide 18526-4, co-ordinates 141X1174; 1250 (Fig. 16, interference contrast).

**Micrhystridium** sp.

- Figure 17. GSC 53028 from GSC locality 24643, slide 18525-3, co-ordinates 364X1035.

**Meiourogonyaulax** cf. **M. deflandrei** Sarjeant

- Figure 18. GSC 53029 from GSC locality 24648, slide 18526-3, co-ordinates 402X1161.

PLATE LEGENDS

All photographs x500 (except Pl. 33.1, figs. 15, 16; x1250) and, unless otherwise indicated, taken in brightfield on Ilford Pan F film, 50 A.S.A., with a Leitz Orthomat camera mounted on Leitz Ortholux microscope, frame no. 646 441, property of Chevron Standard Limited, Calgary, Alberta. The distance between the small vertical lines in all figures is 50  $\mu$ .

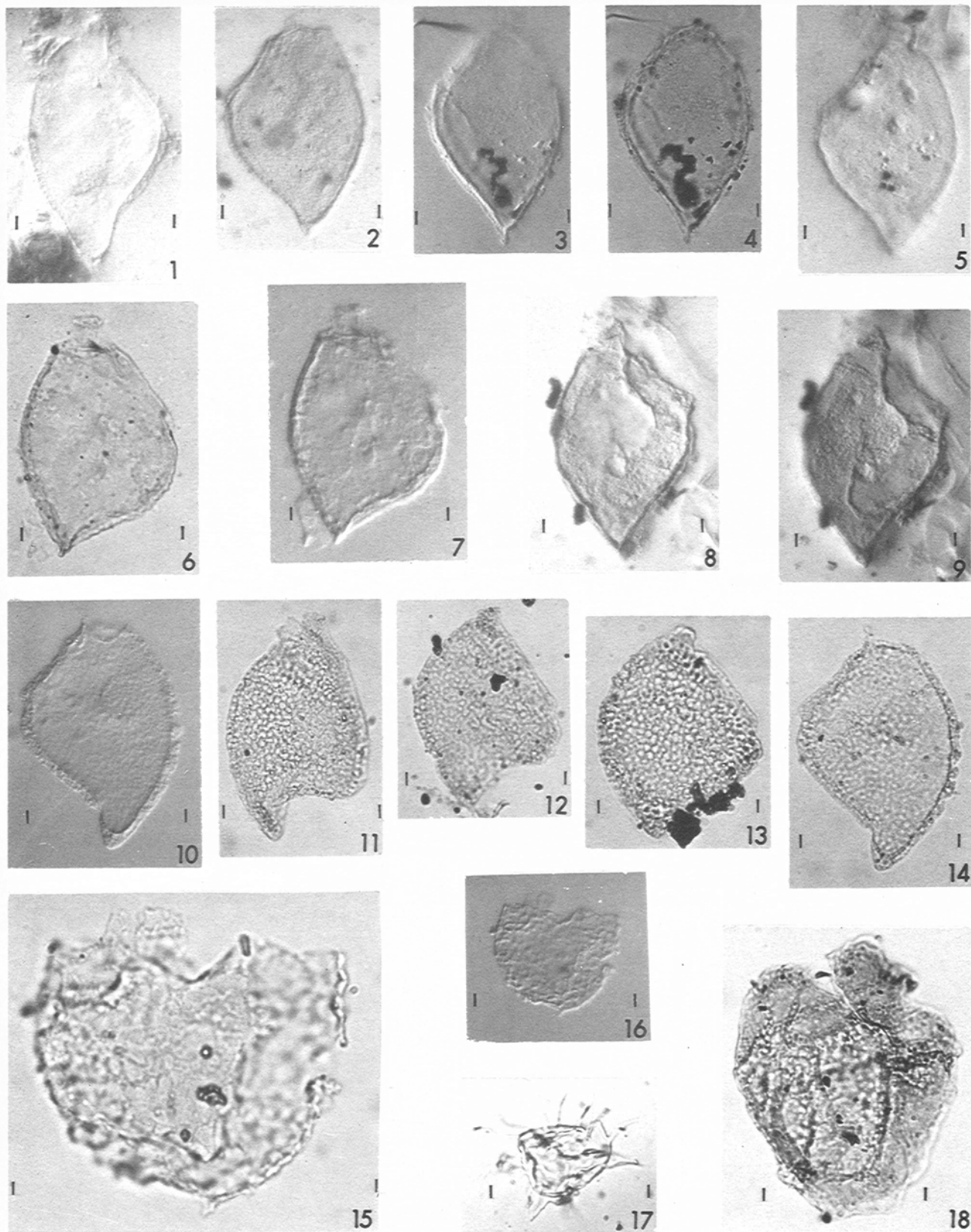


Plate 33.2

**Nannoceratopsis gracilis** Alberti emend.  
(forms with prominent dorsal antapical horn)

- Figures 1, 2. GSC 53030 from GSC locality 35324, slide 18530-4, co-ordinates 204X1108 (Fig. 1, interference contrast).
- Figure 3. GSC 53031 from GSC locality 35324, slide 18530-4, co-ordinates 136X1072.
- Figure 4. GSC 53032 from GSC locality 24661, slide 18528-4, co-ordinates 362X1201.

**Nannoceratopsis gracilis** Alberti emend.

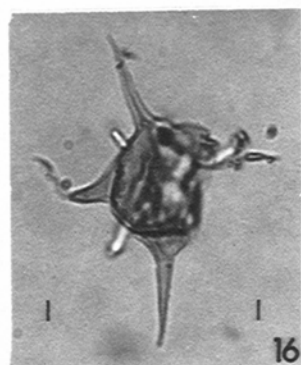
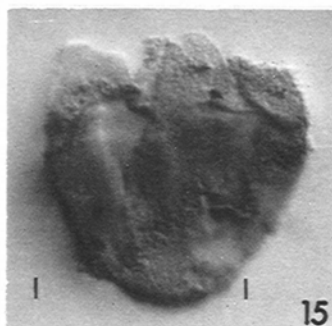
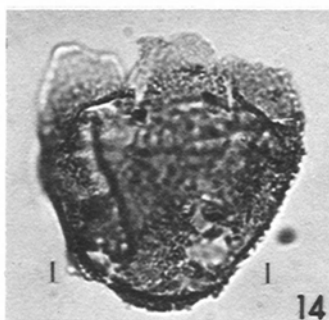
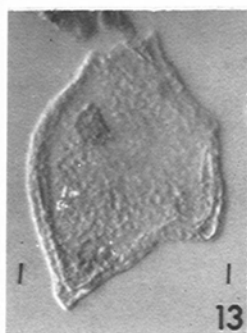
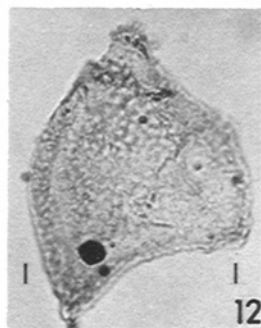
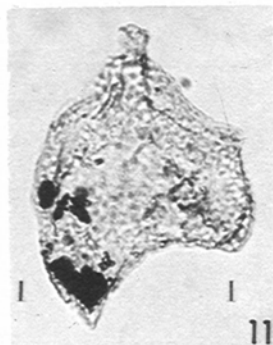
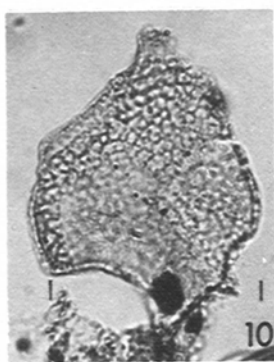
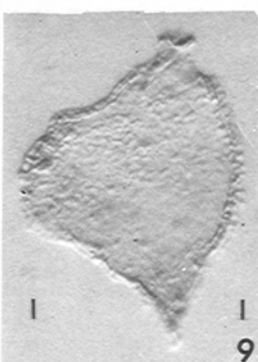
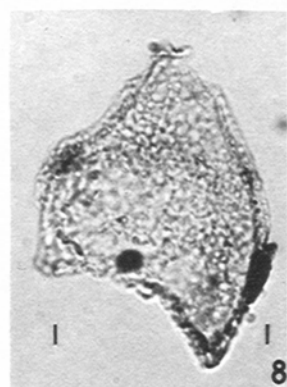
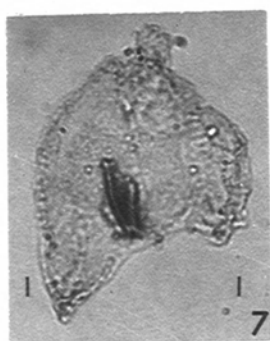
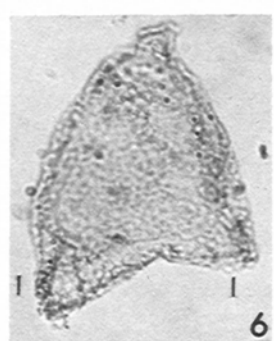
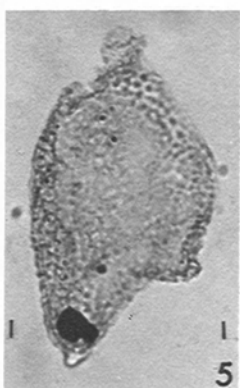
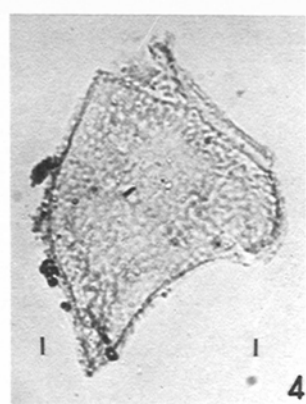
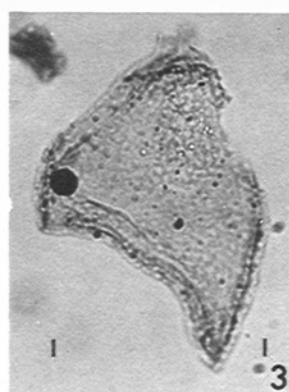
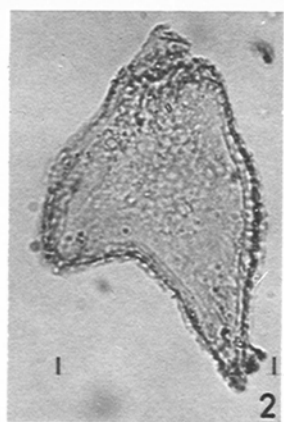
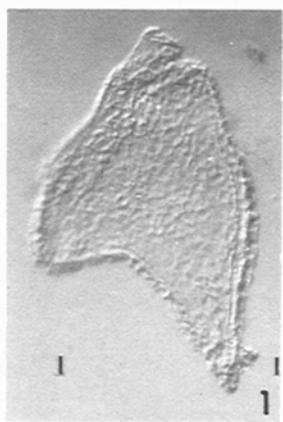
- Figure 5. GSC 53033 from GSC locality 35324, slide 18530-4, co-ordinates 173X1005.
- Figure 6. GSC 53034 from GSC locality 35324, slide 18530-4, co-ordinates 203X1011.
- Figure 7. GSC 53035 from GSC locality 24661, slide 18528-4, co-ordinates 438X1104.
- Figure 8. GSC 53036 from GSC locality 24661, slide 18528-4, co-ordinates 229X1095.
- Figure 9. GSC 53047 from GSC locality 35324, slide 18530-4, co-ordinates 359X1123 (interference contrast).
- Figure 10. GSC 53058 from GSC locality 35324, slide 18530-4, co-ordinates 244X1046.
- Figure 11. GSC 53049 from GSC locality 35324, slide 18530-4, co-ordinates 440X1131.
- Figure 12. GSC 53040 from GSC locality 35324, slide 18530-4, co-ordinates 324X1142.
- Figure 13. GSC 53041 from GSC locality 35324, slide 18530-4, co-ordinates 153X1103 (interference contrast).

**Meiourogonyaulax** cf. **M. deflandrei** Sarjeant

- Figures 14, 15. GSC 53042 from GSC locality 35324, slide 18530-4, co-ordinates 373X1004 (Fig. 15, interference contrast).

**Veryhachium** sp.

- Figure 16. GSC 53043 from GSC locality 35324, slide 18530-4, co-ordinates 509X1125.



Paratypes (Pl. 33.1, figs. 1-5). GSC 53018 to 53021 from GSC locality 24651.

<u>Dimensions</u>	<u>Length</u>	<u>Width</u>
Holotype	72 $\mu$	49 $\mu$
Paratypes	72-79 $\mu$	42-48 $\mu$
Average size	72-76 $\mu$	42-47 $\mu$

Derivatio nominis. **Senex** (Latin) meaning: old man, referring to the top of its stratigraphic range in the Wilkie Point Formation below the top of the local range of **N. gracilis**.

Occurrence. Wilkie Point formation (lower part), GSC localities 24643, 24651 (abundant), 24648 (one specimen only); also reported from the lower part of the Savik Formation (Johnson and Hills, 1973); also in the lower part of the Bug Creek Formation in subsurface sections in the Mackenzie Delta (van Helden, unpubl.).

Age. The earliest occurrence of **Nannoceratopsis senex** sp. nov. is in the Lias Delta (?Upper Pliensbachian) from Lühnde, Germany (Morgenroth, 1970) where it is recorded as **Nannoceratopsis gracilis** Alberti (Morgenroth, 1970, Pl. 11, fig. 6 only), occurring together with **Mancodinium semitabulatum** Morgenroth.

The youngest occurrence of **Nannoceratopsis senex** sp. nov. is in GSC locality 24648, dated as Early Bajocian. Therefore, the total known stratigraphic range of **Nannoceratopsis senex** sp. nov. is from (?Late) Pliensbachian to Early Bajocian.

Johnson and Hills (1973) also noted the restricted stratigraphic range of this form, being restricted to the lower part ( $\pm 0-70$  m) of the Savik Formation at Vantage Point (Johnson and Hills, 1973, p. 199, 200, Textfig. 10).

Order PERIDINIALES Schutt, 1896

Family MICRODINIACEAE Eisenack, emend.  
Sarjeant and Downie, 1966

Genus **Meiourogonyaulax** Sarjeant, 1966

**Meiourogonyaulax** cf. **M. deflandrei** Sarjeant, 1968

Plate 33.1, figure 18, Plate 33.2, figures 14, 15

cf. **Meiourogonyaulax deflandrei** Sarjeant, 1968, p. 288, Pl. 1, fig. 20, Pl. 3, fig. 13.

Remarks. This species resembles **M. deflandrei** Sarjeant in possessing an "infrareticulate" sculpture on the pericyst. The paratabulation could not be determined exactly.

Occurrence. Five specimens were encountered in slides from GSC locality 35324; only one specimen was found in GSC locality 24648.

Family CANNINGIACEAE Sarjeant and Downie, 1966,  
emend. Sarjeant and Downie, 1974

Genus **Dictyopyxidia** Eisenack, 1961

?**Dictyopyxidia** sp.

Plate 33.1, figures 15, 16

Remarks. Only one specimen was encountered (GSC loc. 24648). The preservation did not allow further refinement of the identification.

Group ACRITARCHA Evitt, 1963

Subgroup ACANTHOMORPHITAE Downie,  
Evitt and Sarjeant, 1963

Genus **Veryhachium** Deunff, 1958,  
emend. Downie and Sarjeant, 1963

**Veryhachium** sp.

Plate 33.2, figure 16

Remarks. Only a few specimens were encountered (GSC loc. 35324).

Genus **Micrhystridium** Deflandre, 1937,  
emend. Lister, 1970

**Micrhystridium** sp.

Plate 33.1, figure 17

Remarks. Only a few specimens were recorded (GSC locs. 24643, 24648).

## Conclusions

The presence of **Nannoceratopsis gracilis** Alberti emend. in GSC localities 24643, 24648, 24651 and 35324 indicates that these samples contain an assemblage belonging in the **Nannoceratopsis gracilis** range zone (Johnson and Hills, 1973, p. 199), with an assigned age of Toarcian to Bajocian (Johnson and Hills, 1973, Fig. 7).

The age of GSC localities 24643, 24648, 24651 and 35324 is from Toarcian to Early Bathonian, based on ammonites (Fig. 33.3). **Nannoceratopsis senex** sp. nov. occurs singly at GSC locality 24648 and in abundance at GSC localities 24643 and 24651. The top of its local stratigraphic range occurs within the lower part of the **Nannoceratopsis gracilis** range zone in the Lower Bajocian. This observation is in agreement with the writer's unpublished observation on other sections (mostly subsurface) within the Arctic Archipelago.

**Nannoceratopsis senex** sp. nov. can be used for biostratigraphic subdivision of the **Nannoceratopsis gracilis** range zone. Based on other information (van Helden, unpubl.) about the Jurassic section in the Canadian Arctic, the writer believes that **N. senex** sp. nov. ranges farther down into the Toarcian and probably into the Pliensbachian (?Upper).

## Summary

Outcrops of the Wilkie Point Formation on Prince Patrick Island, Canadian Arctic Archipelago, have been dated as Early Bathonian to Toarcian using ammonites. Microplankton has been recovered from the matrices of the microfossils and, thus, the microfloral ages can be correlated with those derived from studies of the ammonites. The microplankton is dominated by dinoflagellate cysts of **Nannoceratopsis gracilis** Alberti, emend. and **N. senex** sp. nov.



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