33.

THE WILKIE POINT GROUP (LOWER-UPPER JURASSIC), SVERDRUP BASIN, ARCTIC ISLANDS

Project 750083

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Abstract

The Wilkie Point Formation, a Lower-Upper Jurassic sandstone-dominant unit in the Sverdrup Basin, is herein raised to group status. Four new formations are recognized within the group. These new formations are formally defined herein and, in ascending order are: Jameson Bay, Sandy Point, McConnell Island and Hiccles Cove. The Jameson Bay and McConnell Island formations comprise mainly shale and siltstone of offshore marine shelf origin. The Sandy Point and Hiccles Cove consist predominantly of very fine- to medium-grained sandstone of nearshore to strandplain origin.

The Jameson Bay Formation is divided into three members that are formally defined herein. In ascending order these members are named Intrepid Inlet, Cape Canning and Snowpatch.

Résumé

La formation de Wilkie Point, unité à grès dominants du Jurassique inférieur et supérieur dans le bassin de Sverdrup, a été reclassée comme groupe. Quatre nouvelles formations sont reconnues dans le groupe. Ces nouvelles formations sont définies dans ce texte et elles sont par ordre ascendant: Jameson Bay, Sandy Point, McConnell Island et Hiccles Cove. Les formations de Jameson Bay et McConnell Island comprennent surtout des schistes argileux et du siltstone ayant pour origine un plateau continental marin. Les formations de Sandy Point et de Hiccles Cove comprennent surtout des grès à grains très fins à moyens provenant des plaines d'accumulation littorale.

La formation de Jameson Bay est divisée en trois membres qui sont définis dans ce texte. Par ordre ascendant ces membres sont: Intrepid Inlet, Cape Canning et Snowpatch.

Introduction

The Wilkie Point Formation was defined by Tozer (1956) as a sandstone-dominant unit of Early, Middle and Late Jurassic age that outcrops on Prince Patrick Island. Subsequent to Tozer's field studies numerous wells have been drilled on Prince Patrick and adjacent areas. Subsurface studies have led to the recognition of four distinctive lithological units in the Wilkie Point. Consequently the Wilkie Point is herein raised to group status and four component formations are formally defined.

Regional stratigraphic studies have revealed that the formations of the Wilkie Point Group are widespread in the Sverdrup Basin (Fig. 33.1). Surface sections for the formations have been measured at numerous localities in the eastern Sverdrup where Mesozoic strata are folded and faulted and exposed in mountainous terrain. In the central and western Sverdrup, where structures and the terrain have much lower relief, outcrops are confined mainly to the basin margins. Eighty-eight wells have penetrated the formations, with most of the well control occurring in the western Sverdrup (Fig. 33.1).

Previous work

Tozer (1956) recognized the Wilkie Point Formation during reconnaisance field work on Prince Patrick Island in the summer of 1954. He established a type section on the coastal exposures along the east side of Intrepid Inlet and estimated the thickness of the formation to be 200 m. The base of the formation is not exposed at the type section although at other localities Tozer (1956) found the Wilkie Point resting unconformably on Devonian strata. At the type section, the Wilkie Point is overlain by the Mould Bay Formation. The Wilkie Point is a sandstone-dominant unit and Tozer (1956) distinguished a lower member consisting of red-brown to orange weathering, fossiliferous sandstone, and an upper member of white, carbonaceous sandstone. The basal portion of the type section is recessive and not exposed.

Tozer continued his field studies of the western Sverdrup in 1958, extending the Wilkie Point Formation to Melville, Borden and Mackenzie King islands (Tozer and Thorsteinsson, 1964). The Wilkie Point on Melville is similar to that on Prince Patrick, and Tozer and Thorsteinsson (1964) recognized the same two informal members. On Mackenzie King the lower portion of the formation was found to consist of shale and siltstone, and strata similar to the upper member were not present. On Borden Island a contact of the basal shale and siltstone of the Wilkie Point with sandstone of the Borden Island Formation was established. Fossils collected from the Wilkie Point in the western Sverdrup are Early and Middle Jurassic in age (Tozer and Thorsteinsson, 1964).

The name Wilkie Point was not extended to the central and eastern Sverdrup where equivalent strata were assigned to either the Jaeger Formation or the Savik Formation. The Jaeger Formation was defined by Greiner (1963) from studies undertaken on Cornwall Island during Operation Franklin in 1955. He described the formation as consisting of 300 m of grey to red-brown, pebbly sandstone containing Lower and Middle Jurassic fossils. At the type section on eastern Cornwall Island the Jaeger is bounded by the Heiberg Formation below and the Awingak Formation above.

Also during Operation Franklin, Souther (1963) studied the Mesozoic succession of central Axel Heiberg Island. In this area, the strata between the Heiberg and Awingak formations consist of shale and siltstone. Souther (1963) named these argillaceous strata the Savik Formation, and he established a type section west of Buchanan Lake on eastern Axel Heiberg. Lower, Middle and Upper Jurassic fossils were found in the Savik during Operation Franklin (Tozer, 1963a).

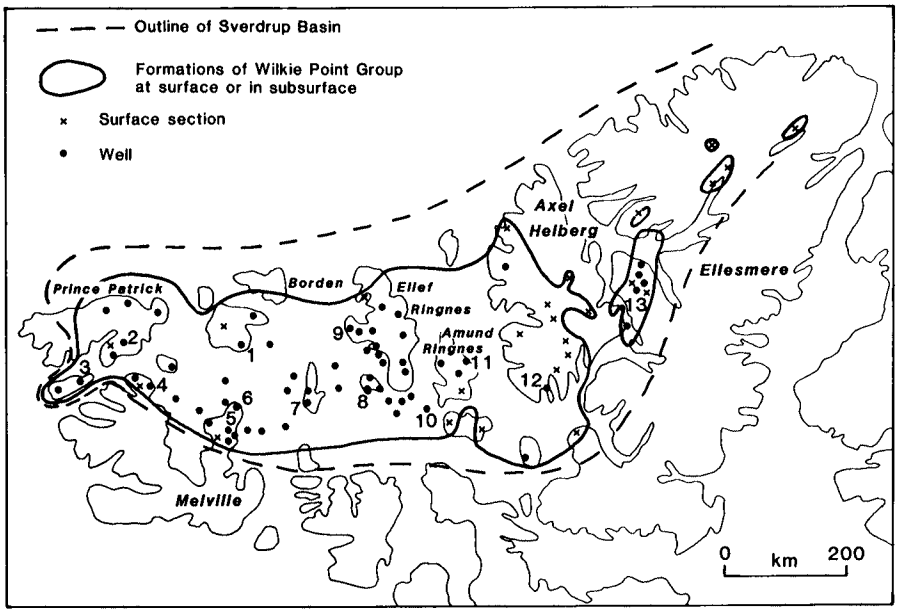


Figure 33.1. *Distribution of formations of Wilkie Point Group and control points. Key to numbered wells listed in appendix.*

1. *Cape Norem A-80,*
2. *Jameson Bay C-31,*
3. *Eglinton P-24,*
4. *Depot Island C-44,*
5. *Drake Point D-68,*
6. *North Sabine H-49,*
7. *Skybattle Bay C-15,*
8. *Sutherland O-23,*
9. *Mocklin Point D-23,*
10. *Linckens Island P-46,*
11. *East Amund M-05,*
12. *Sherwood P-37,*
13. *Romulus C-42.*

Tozer (1963b) examined Mesozoic strata on Ellesmere and Axel Heiberg islands in the late fifties and early sixties. He extended the Savik Formation over much of Axel Heiberg and western Ellesmere. On Ellesmere and southern Axel Heiberg Tozer (1963b) recognized a glauconitic sandstone unit within the Savik Formation and he referred to it as the Jaeger Member. Shales below the Jaeger Member are medium to dark green-grey and were called "Lower Savik", and those above are dark grey to black and were called "Upper Savik" (Tozer, 1963b). Tozer demonstrated that at the type section the "Upper Savik" unconformably overlies the "Lower Savik" and that Middle Jurassic strata are missing. However on western Axel Heiberg the Savik Formation includes Middle Jurassic strata (Tozer, 1963b).

Fricker (1963) mapped in detail the area surrounding Expedition Fiord on west-central Axel Heiberg and his report contains a description of three measured sections through the Savik Formation.

In 1967 Stott (1969) mapped Ellef Ringnes Island. On Reindeer Peninsula he recognized both Savik and Jaeger formations. The Savik in this area consists of 76 m of soft, greenish grey shale and contains Toarcian, Aalenian and Bathonian fossils. It overlies the Borden Island Formation and is overlain by the Jaeger, which consists of 15 m of glauconitic sandstone with Callovian fossils. The Jaeger is overlain by dark grey to black shale which Stott (1969) assigned to the Deer Bay Formation.

On northeastern Ellesmere Island Nassichuk and Christie (1969) included all strata between the Heiberg Formation and the Isachsen Formation in an informal "Jurassic-Cretaceous shales and sandstones" unit. A red weathering, glauconitic sandstone near the base of the map unit was referred to as "Jaeger equivalent".

Balkwill (1983) mapped Amund Ringnes, and Cornwall islands. He divided the Jaeger Formation of Cornwall Island into four informal members: a lower shale-siltstone (JjA), a lower sandstone (JjB), an upper shale-siltstone (JjC), and an upper sandstone (JjD). Balkwill (1983) also recognized an "Upper Savik" unit on Cornwall between the Jaeger and the Awingak. These strata consist mainly of dark grey, silty shale and contain a medial sandstone unit.

On Amund Ringnes, Balkwill (1983) mapped the Savik Formation between the Heiberg Formation and the Ringnes Formation (Upper Jurassic, dark grey shale). In subsurface sections for the area Balkwill (1983) subdivided the Savik into Lower Savik (Lower Shale), Jaeger, and Upper Savik (Upper Shale) members.

Subsurface studies of strata now included in formations of the Wilkie Point Group include those of Henao-Londono (1977) on Sabine Peninsula, Melville Island, Balkwill and Roy (1977) on King Christian Island, and Balkwill et al. (1982) on Lougheed Island. Henao-Londono (1977) subdivided the Wilkie Point interval into lower Wilkie Point (siltstone-sandstone), Savik (shale-siltstone) and upper Wilkie Point (sandstone), and indicated that both the lower contact with the Borden Island and the upper contact with the Mould Bay are unconformable.

On King Christian Island, Balkwill and Roy (1977) subdivided the Savik Formation into Lower Shale, Jaeger and Upper Shale members. Balkwill et al. (1982) did not subdivide the Savik in the Skybattle Bay C-15 well on Lougheed Island.

Macrofossil identifications from Wilkie Point Group strata are found in the above publications and also in Frebold (1958, 1960, 1961, 1964, 1975). Identifications of recent collections are in unpublished GSC paleontological reports. Palynological data from Wilkie Point strata have been published by Johnson and Hills (1973) and Davies (1983) and a considerable amount of data is also in unpublished reports. Wall (1983) described the micropaleontology from the Savik Formation of Ellesmere and Axel Heiberg islands.

Present work

Rocks now included in formations of the Wilkie Point Group comprise the strata between the sandstones of the Heiberg Formation/Group (Embry, 1983a, b) below, and the dark shales of the Ringnes Formation (Balkwill et al., 1977) above. These strata have been studied by various geologists in different parts of the Sverdrup Basin and a somewhat confusing nomenclature has evolved. For this study all subsurface sections for these strata have been examined and surface sections in the eastern, central, and western Sverdrup have been measured (Fig. 33.1). All of these sections have

been correlated, and four distinct formations have been recognized. In ascending order these four formations and their dominant lithologies are: Jameson Bay (shale-siltstone), Sandy Point (sandstone), McConnell Island (shale-siltstone), and Hiccles Cove (sandstone).

Figure 33.2 is a stratigraphic cross-section of the Wilkie Point Group between Prince Patrick and Melville islands. Notable stratigraphic relationships illustrated on this section include:

1. The Jameson Bay Formation in this area is divided into three members on the basis of the occurrence of two clay-rich shale units. In ascending order these members are named Intrepid Inlet, Cape Canning and Snowpatch. They are formally described herein.
2. The Sandy Point Formation gradationally overlies the Jameson Bay and is unconformably overlain by the McConnell Island Formation.
3. The Hiccles Cove Formation conformably overlies the McConnell Island and it gradually shales out northeastwards.
4. The contact between the Hiccles Cove and the overlying Ringnes Formation is conformable along this line of section. However, as demonstrated by Tozer and Thorsteinsson (1964), this contact becomes unconformable to the southwest of the Jameson Bay C-31 well.

Figure 33.3 illustrates the relationships between the new formations and the informal and formal nomenclature used by previous workers. "Jaeger" was used for a variety of

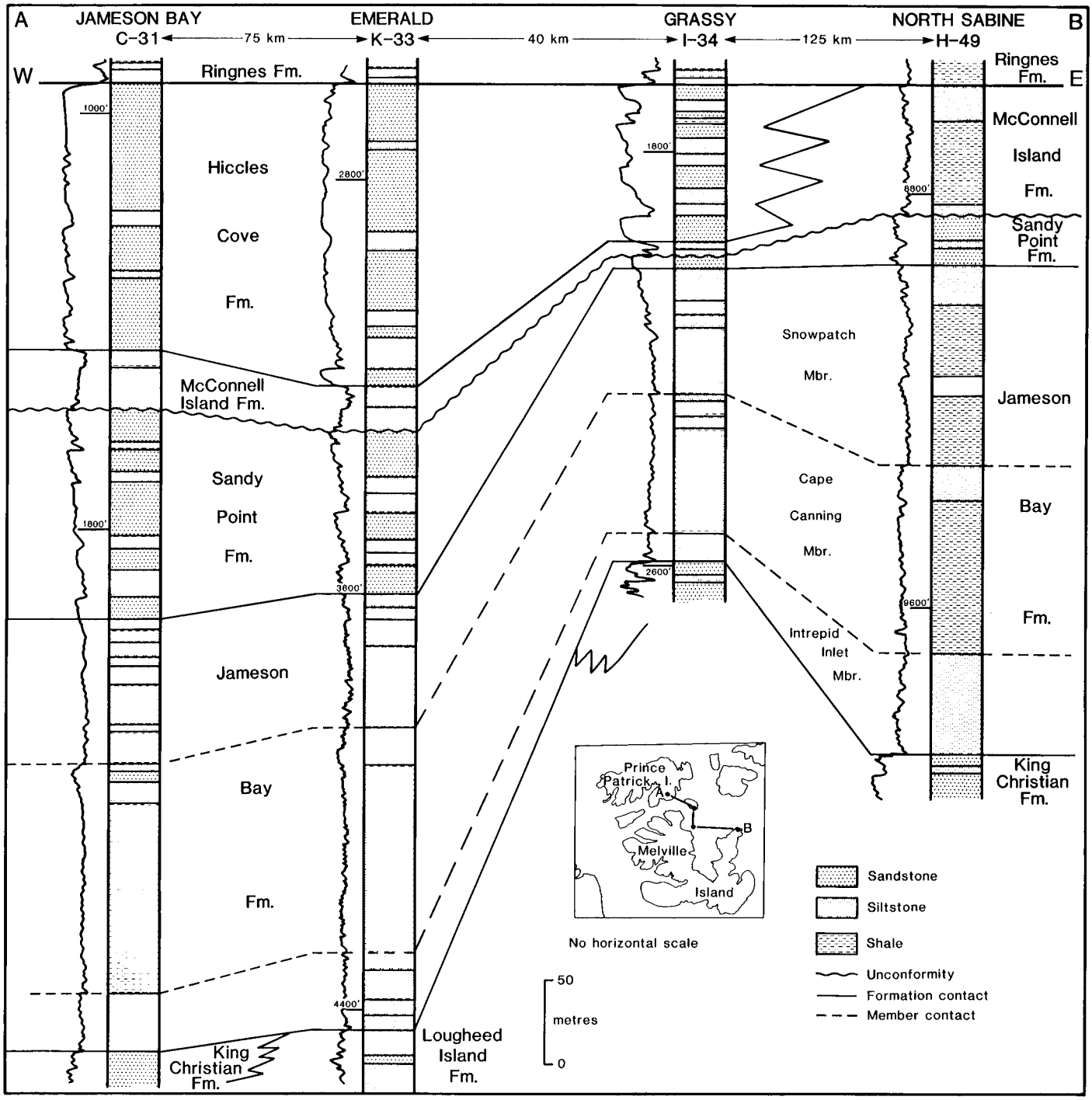


Figure 33.2. *Stratigraphic cross-section, Wilkie Point Group, western Sverdrup Basin. Gamma-ray logs displayed beside lithologies.*

stratigraphic units and consequently the term is herein abandoned. The name Wilkie Point now refers to a group and is used in basin margin areas where sandstones of the Sandy Point and Hiccles Cove formations are prominent. Strata previously assigned to the Savik Formation are now placed in the Jameson Bay, Sandy Point (thin or absent), McConnell Island and Ringnes formations. The term Savik is retained and is given group status because it is a useful mapping unit on Axel Heiberg Island where it forms a recessive interval between the resistant Heiberg and Awingak formations. Figure 33.4 is a schematic cross-section illustrating the nomenclature and stratigraphic relationships for the succession between the Heiberg and the Awingak formations.

The tops for the new formations and members from thirteen selected wells throughout the Sverdrup Basin are listed in the Appendix. Chip samples taken at three-metre intervals from the type sections of the formations and members defined in this paper can be examined at the Institute of Sedimentary and Petroleum Geology, Calgary, Alberta, Canada.

Jameson Bay Formation

Definition

The Jameson Bay Formation consists of shale and siltstone with scattered thin interbeds of very fine grained sandstone. The type section is in the Elf Jameson Bay C-31 well (76°40'12"N, 116°43'45"W; spud. March 11, 1971, abandoned May 18, 1971, T.D. 2539 m, K.B. 63 m) between 601 m (1970 ft) and 855 m (2806 ft), and is 254 m thick (Fig. 33.5). The name is taken from Jameson Bay, which is on the east coast of Prince Patrick Island.

Synonyms

1. Lower portion of Wilkie Point Formation, western Sverdrup Basin (Tozer, 1956; Tozer and Thorsteinsson, 1964).
2. Lower Savik, Savik Formation, western Ellesmere and southern Axel Heiberg (Tozer, 1963b).
3. Units 1-3, Section S1 and units 1-4, Section S2, Savik Formation, Expedition Fiord, western Axel Heiberg (Fricker, 1963).
4. Units 1-4, Savik Formation, northwestern Ellef Ringnes (Stott, 1969).
5. Member JjC, Jaeger Formation, Cornwall Island (Balkwill, 1983).
6. Lower Savik, Savik Formation, Amund Ringnes and King Christian islands (Balkwill, 1983; Balkwill and Roy, 1977).
7. Lower Wilkie Point and Savik, Sabine Peninsula (Henao-Londono, 1977).

Boundaries

In the western Sverdrup the Jameson Bay Formation overlies sandstone of the King Christian Formation. The contact is placed at the base of the lowest shale-siltstone unit above which shale and siltstone are predominant. This contact is usually conformable but is unconformable on the basin margins (Embry, 1983b). In the central and eastern Sverdrup the Jameson Bay conformably overlies the Heiberg Formation. The contact is placed at the base of the lowest shale-siltstone unit above which shale and siltstone are predominant.

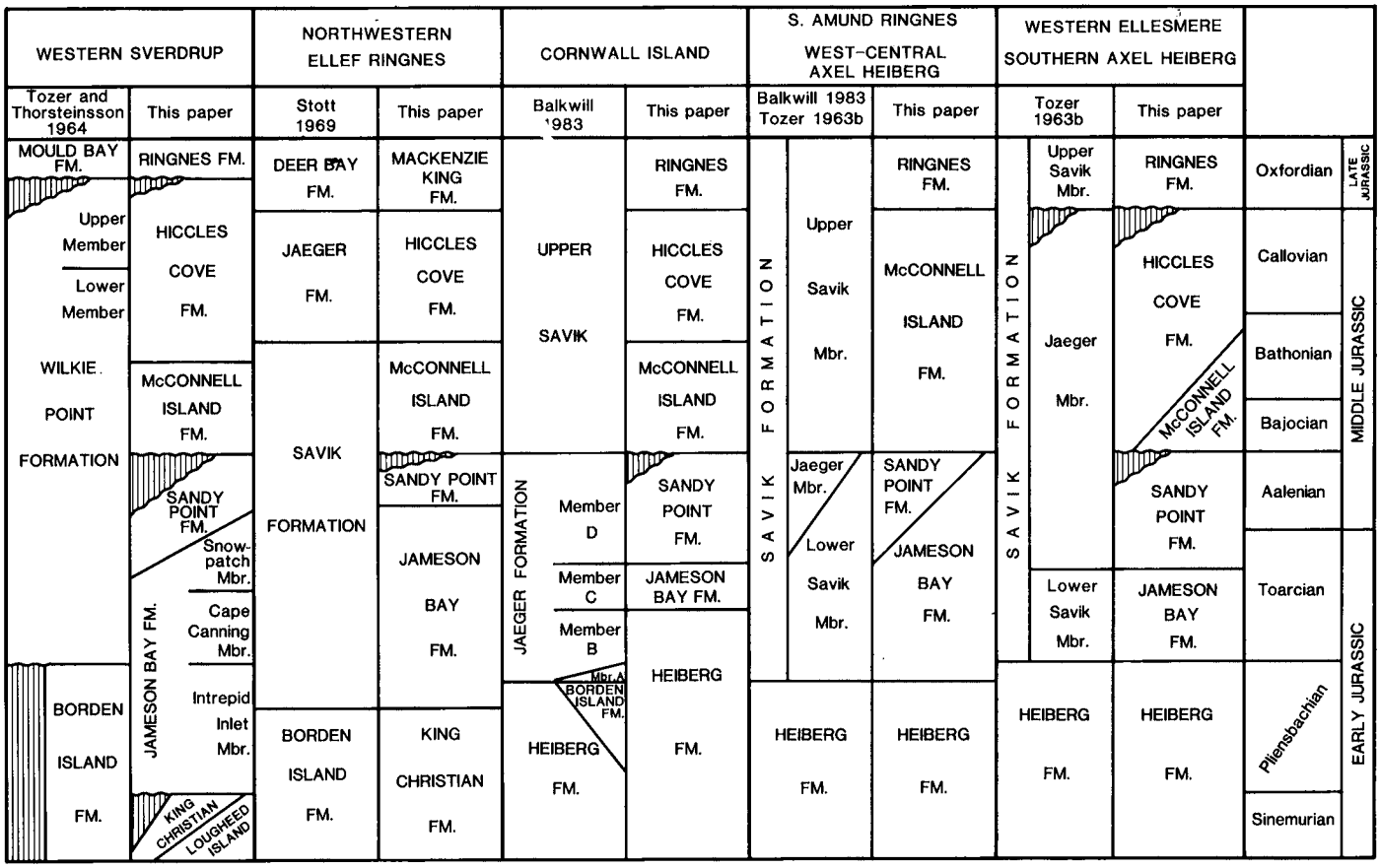


Figure 33.3. *Past and present nomenclature of Toarcian to Oxfordian strata, Sverdrup Basin.*

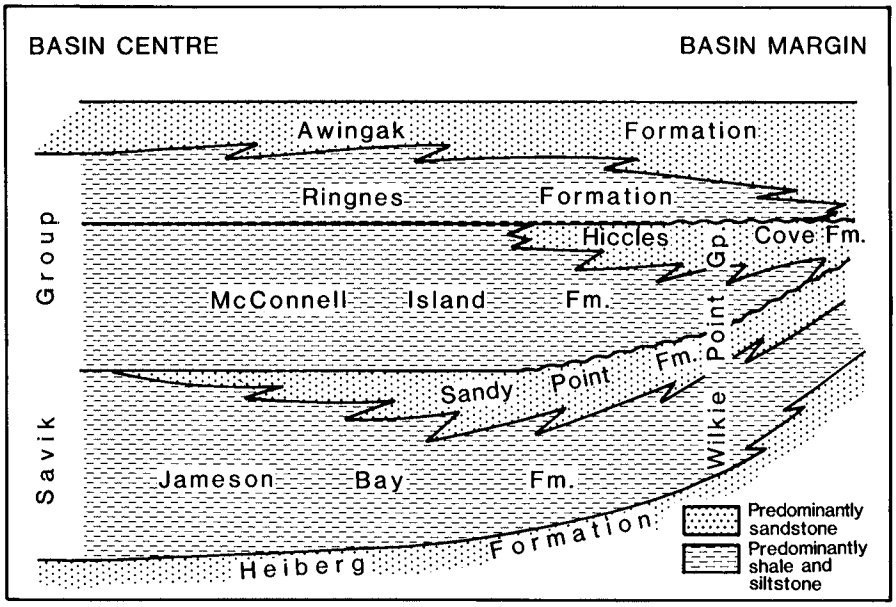


Figure 33.4

Schematic stratigraphic cross-section, Wilkie Point and Savik groups, Sverdrup basin.

Over most of the Sverdrup the Jameson Bay is conformably overlain by the Sandy Point Formation. The contact is placed at the base of the lowest sandstone unit above which sandstone is relatively common. In the basin centre the Sandy Point is absent due to facies change and the Jameson Bay is conformably overlain by the McConnell Island Formation. This contact is placed at the base of a clay-rich shale unit which overlies glauconitic siltstone of the uppermost Jameson Bay.

Lithology

The Jameson Bay consists mainly of medium to dark green-grey shale with siltstone laminae and interbeds. Very fine grained, glauconitic sandstone units up to one metre thick are also present in many sections but comprise only a small percentage of the formation. Shale units are parallel laminated to burrowed and siltstones and sandstones are usually extensively burrowed. Calcareous, dolomitic and sideritic concretions are very common throughout the Jameson Bay Formation.

Thickness and distribution

The Jameson Bay occurs over much of the Sverdrup (Fig. 33.1) and in general it thickens toward the centre of the basin. The maximum recorded thickness is 539 m (central Ellef Ringnes Island, Dumbells E-49 well).

Age

Ammonites collected from the Jameson Bay Formation on Prince Patrick, Borden, Cornwall, Axel Heiberg and Ellesmere islands have been dated as Pliensbachian, Toarcian and Aalenian (Frebold, 1960, 1975; Tozer, 1963b; Tozer and Thorsteinsson, 1964; Balkwill, 1983).

Environment of deposition

The Jameson Bay is interpreted to represent an offshore shelf deposit on the basis of lithology, fauna and stratigraphic relationships.

Intrepid Inlet Member, Jameson Bay Formation

Definition

The Intrepid Inlet Member consists of shale and siltstone with interbeds of very fine grained sandstone. The type section is in the Elf Jameson Bay C-31 well between 820 m (2690 ft) and 855 m (2806 ft) and is 35 m thick (Fig. 33.5). The name is taken from Intrepid Inlet, located on eastern Prince Patrick Island.

Synonyms

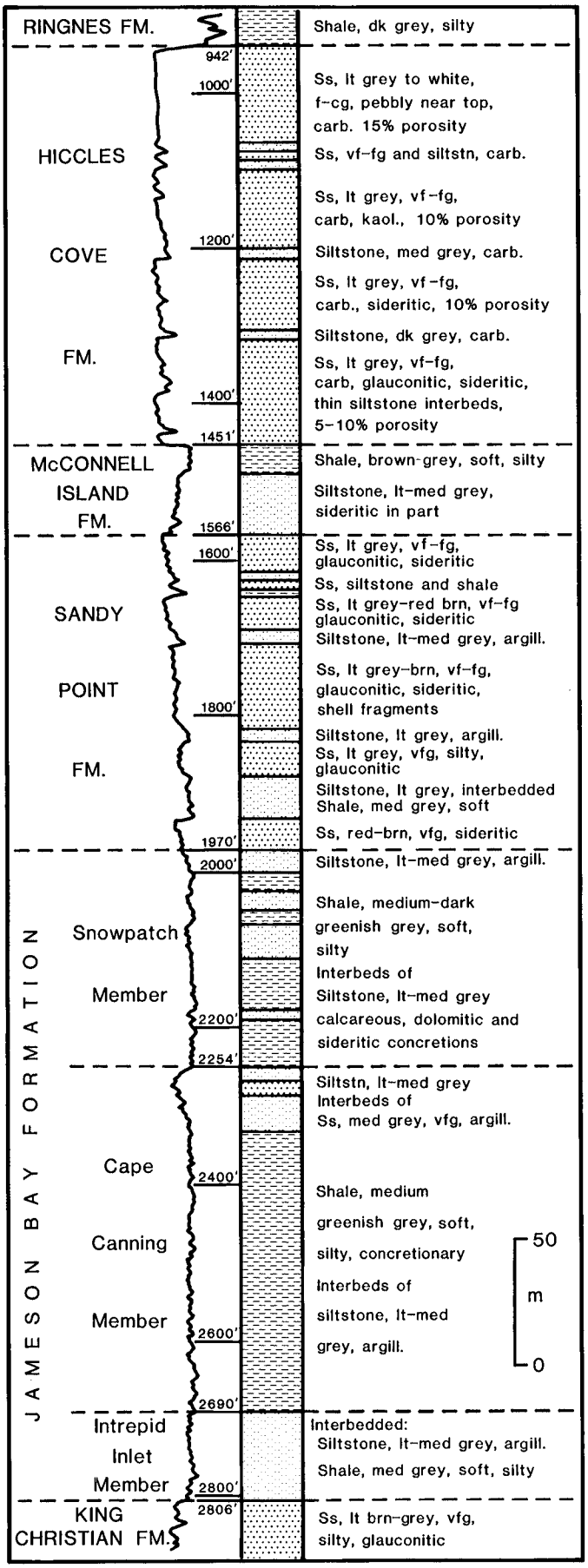
1. Glauconite unit, Borden Island Formation, Sabine Peninsula, Melville Island (Reinson, 1975).
2. Lower Wilkie Point, Sabine Peninsula (Meneley, 1977; Henao-Londono, 1977).
3. Upper portion, Borden Island Formation, Borden Island (Rahmani and Tan, 1978).
4. Unit C, Borden Island Formation, Sabine Peninsula (Douglas and Oliver, 1979).

Boundaries

The Intrepid Inlet Member overlies the King Christian Formation. The contact is placed at the base of the lowest shale-siltstone unit above which shale and siltstone are predominant. This contact varies from conformable to unconformable (Embry, 1983b). The Intrepid Inlet Member is conformably overlain by the Cape Canning Member of the Jameson Bay Formation. The contact is placed at the base of a clay-rich shale unit which rests on arenaceous siltstone of the uppermost Intrepid Inlet (Fig. 33.2, 33.5).

Lithology

The Intrepid Inlet Member consists mainly of medium grey, silty shale and light-to medium-grey siltstone. Thin, argillaceous, very fine grained sandstone beds are present in most sections. The sandstone beds are glauconitic and extensively burrowed.



Thickness and distribution

The member is recognized in the western Sverdrup and has a maximum thickness of 81 m. East of Sabine Peninsula the Intrepid Inlet intertongues with sandstone of the King Christian Formation and the member eventually disappears due to facies change to sandstone (Embry, 1983b).

Age

The Intrepid Inlet Member is interpreted to be Pliensbachian on the basis of ammonites from Prince Patrick Island (Frebold, 1975) and stratigraphc relationships (Embry, 1983b).

Environment of deposition

The lithologies, fauna and stratigraphic relationships suggest an offshore shelf environment of deposition for the member (Embry, 1982).

Cape Canning Member, Jameson Bay Formation

Definition

The Cape Canning Member consists of shale and siltstone with thin interbeds of very fine grained sandstone in the uppermost portion. The type section is in the Elf Jameson Bay C-31 well between 687 m (2254 ft) and 820 m (2690 ft) and is 133 m thick (Fig. 33.5). The name is taken from Cape Canning, on the east coast of Intrepid Inlet, Prince Patrick Island.

Boundaries

The Cape Canning conformably overlies the Intrepid Inlet Member as described previously. The Cape Canning is conformably overlain by the Snowpatch Member of the Jameson Bay Formation. The contact is placed at the base of a clay-rich shale unit which overlies arenaceous siltstone or ironstone of the uppermost Cape Canning (Fig. 33.2, 33.5).

Lithology

The main lithologies of the Cape Canning are medium- to dark-greenish grey shale and light- to medium-grey siltstone. Shale is more common in the lower portion of the member and siltstone content gradually increases upward. In many sections thin, very fine grained sandstone units occur in the uppermost portion of the member. Along the southern margin of the basin a prominent ironstone bed forms the top of the member.

Thickness and distribution

The Cape Canning occurs in the western Sverdrup basin and may be up to 146 m thick. It is not recognized in the eastern Sverdrup. Equivalent strata are in the lower portion of the Jameson Bay Formation and the upper portion of the Remus Member of the Heiberg Formation.

Age

Ammonites collected from the Cape Canning on Borden Island indicate a Toarcian age for the member (Tozer and Thorsteinsson, 1964).

Figure 33.5. *Lithology (from samples) and gamma-ray curve for type sections of Jameson Bay, Sandy Point, McConnell Island and Hiccles Cove formations and Intrepid Inlet, Cape Canning and Snowpatch members; Jameson Bay C-31 well.*

Environment of deposition

Lithologies, fauna and stratigraphic relationships are indicative of an offshore marine shelf depositional environment for the Cape Canning Member.

Snowpatch Member, Jameson Bay Formation

Definition

The Snowpatch Member consists of interbedded shale and siltstone with minor very fine grained sandstone. The type section is in the Elf Jameson Bay C-31 well between 601 m (1970 ft) and 687 m (2254 ft) and is 86 m thick (Fig. 33.5). The name is taken from Snowpatch Point, on the west coast of Intrepid Inlet, Prince Patrick Island.

Boundaries

The Snowpatch conformably overlies the Cape Canning Member as described previously. The Snowpatch is conformably overlain by the Sandy Point Formation and the contact is placed at the base of the first sandstone unit above which sandstone is relatively common.

Lithology

Medium to dark green-grey shale and light- to medium-grey siltstone are the predominant lithologies in the Snowpatch Member. Thin units of very fine grained sandstone are locally present in the upper portion of the member. Overall the member displays a coarsening-upward trend, with siltstone content increasing upwards (Fig. 33.2, 33.5).

Thickness and distribution

The member is recognized in the western Sverdrup and may be up to 232 m thick. In the eastern Sverdrup equivalent strata are in the upper portion of the undivided Jameson Bay Formation.

Age

Ammonites collected from the member on Prince Patrick Island and stratigraphically equivalent strata are Toarcian to Aalenian in age (Tozer and Thorsteinsson, 1964).

Environment of deposition

The lithologies, fauna and stratigraphic relationships of the Snowpatch Member indicate that it was deposited in an offshore marine shelf setting.

Sandy Point Formation

Definition

The Sandy Point Formation consists of interbedded very fine- to medium-grained sandstone, siltstone and shale. The type section is in the Elf Jameson Bay C-31 well between 477 m (1566 ft) and 601 m (1970 ft) and is 124 m thick (Fig. 33.5). The name is taken from Sandy Point, on the northwestern coast of Melville Island.

Synonyms

1. Lower portion Jaeger Member, Savik Formation, western Ellesmere Island and southern Axel Heiberg Island (Tozer, 1963b).
2. Unit 4, Section S1 and Unit 5, Section S2, Savik Formation, western Axel Heiberg (Fricker, 1963).
3. Units 1-4, Wilkie Point Formation, Intrepid Inlet section, Prince Patrick Island (Tozer and Thorsteinsson, 1964).
4. Units 5 and 6, Savik Formation, northwestern Ellef Ringnes Island (Stott, 1969).
5. Upper Wilkie Point, Sabine Peninsula (Henao-Londono, 1977).
6. Jaeger Member, subsurface King Christian Island (Balkwill and Roy, 1977).
7. Member JjD, Jaeger Formation, Cornwall Island (Balkwill, 1983).
8. Jaeger Member, Savik Formation, subsurface Amund Ringnes Island (Balkwill, 1983).

Boundaries

The Sandy Point Formation conformably overlies the Jameson Bay Formation as described previously. The Sandy Point Formation is usually overlain by the McConnell Island Formation with the contact placed at the top of the highest sandstone bed above which shale and siltstone are predominant. This contact varies from conformable to unconformable. Occasionally, a thin basal conglomerate overlies the unconformity surface. This unit is included in the overlying McConnell Island Formation. In some areas along the margin of the basin the Ringnes Formation (Upper Jurassic shale-siltstone) unconformably overlies the Sandy Point.

Lithology

The Sandy Point Formation consists of interbedded sandstone, siltstone and shale. The lithologies are arranged in coarsening-upward cycles which may be up to 120 m thick. Shales are usually medium green-grey and are silty. Siltstones are light- to medium-grey and vary from very argillaceous to arenaceous. Sandstone units may be up to 30 m thick, and coarsen upward from very fine- to medium-grained. Pebbly, medium- to coarse-grained sandstone is present in the Sandy Point in basin margin sections. Sandstone units are usually extensively burrowed and glauconitic. Massive- to horizontally-bedded sandstone occurs interbedded with burrowed sandstone in some basin margin sections.

Thickness and distribution

The Sandy Point Formation is widespread in the Sverdrup Basin. Its erosional edge is shown in Figure 33.1. The formation is absent due to facies change to siltstone and shale in the central portion of the Sverdrup (east-central Ellef Ringnes, northern Amund Ringnes and west-central Axel Heiberg). The maximum recorded thickness of the formation is 162 m.

Age

Ammonites recovered from the Sandy Point on Prince Patrick, Mackenzie King, Cornwall, Axel Heiberg and Ellesmere islands are Toarcian and Aalenian in age (Tozer, 1963b; Tozer and Thorsteinsson, 1964; Balkwill, 1983).

Environment of deposition

The lithologies, sedimentary structures, fauna and stratigraphic relationships of the Sandy Point indicate a nearshore marine shelf environment of deposition.

McConnell Island Formation

Definition

The McConnell Island Formation consists of shale and siltstone with thin interbeds of very fine grained sandstone. The type section is in the Elf Jameson Bay C-31 well between 442 m (1451 ft) and 477 m (1566 ft) and is 35 m thick (Fig. 33.5). The name is taken from McConnell Island, a few kilometres west of Mackenzie King Island.

Synonyms

1. Units 6-9, Savik Formation, Strand Fiord section, western Axel Heiberg Island (Tozer, 1963b).
2. Units 5-10, Section S1 and Units 6-11, Section S2, Savik Formation, western Axel Heiberg (Fricker, 1963).
3. Unit 7, Savik Formation, northwestern Ellef Ringnes Island (Stott, 1969).
4. Lower portion Upper Savik, Cornwall Island, Amund Ringnes Island and King Christian Island (Balkwill and Roy, 1977; Balkwill, 1983).

Boundaries

As previously described, the McConnell Island Formation overlies either the Sandy Point Formation or Jameson Bay Formation. Along the margins of the basin the McConnell Island is conformably overlain by the Hiccles Cove Formation, and the contact is placed at the base of the first sandstone above which sandstone is predominant. Basinward, the Hiccles Cove passes laterally into McConnell Island shale that is conformably overlain by the Ringnes Formation. The contact is placed at the base of a dark grey to black, clay-rich shale unit, which rests on an ironstone or siltstone of the uppermost McConnell Island.

Lithology

The main lithologies of the McConnell Island are medium- to dark-grey shale and light- to medium-grey siltstone. A thin basal conglomerate is present in marginal sections, and in these areas the lower portion of the formation consists predominantly of siltstone and very fine grained sandstone. In basinal sections the basal strata are commonly highly glauconitic and siltstone content gradually increases upwards. Beds of brown-red weathering ironstone up to 0.5 m thick are common within the McConnell Island Formation, and are usually interbedded with shale.

Thickness and distribution

The McConnell Island Formation is widespread in the Sverdrup, being absent only on the extreme basin margins due to erosion and facies change, and in the northwestern portion of the basin. In the northwestern Sverdrup Basin equivalent shales and siltstones are placed in the Mackenzie King Formation, which occurs between the Sandy Point (or Jameson Bay) and the Isachsen Formation. The maximum recorded thickness of the McConnell Island Formation is 300 m (western Axel Heiberg).

Age

Bajocian, Bathonian and Callovian ammonites have been recovered from the McConnell Island Formation on Prince Patrick, Ellef Ringnes, and Axel Heiberg islands (Tozer and Thorsteinsson, 1964; Stott, 1969; Tozer, 1963b).

Environment of deposition

The lithology and fauna of the McConnell Island Formation indicate an offshore shelf environment of deposition.

Hiccles Cove Formation

Definition

The Hiccles Cove Formation consists mainly of sandstone with interbeds of shale and siltstone. The type section is in the Elf Jameson Bay C-31 well between 287 m (942 ft) and 442 m (1451 ft), and is 155 m thick (Fig. 33.5). The name is taken from Hiccles Cove, on the eastern side of Intrepid Inlet, Prince Patrick Island.

Synonyms

1. Upper portion, Jaeger Member, Savik Formation, western Ellesmere and southern Axel Heiberg (Tozer, 1963b).
2. Units 5-8, Wilkie Point Formation, Intrepid Inlet section, Prince Patrick Island (Tozer and Thorsteinsson, 1964).
3. Jaeger Formation, northwestern Ellef Ringnes Island (Stott, 1969).
4. Medial sandstone unit, Upper Savik, Cornwall Island (Balkwill, 1983).

Boundaries

The Hiccles Cove conformably overlies the McConnell Island Formation as previously described. The Hiccles Cove is overlain by the Ringnes Formation. The contact is placed at the top of the highest sandstone unit above which shale and siltstone are predominant. This contact is conformable in most areas but is unconformable at the basin margin.

Lithology

In the Prince Patrick - western Melville Island area the Hiccles Cove consists mainly of fine- to medium-grained quartzose sandstone. Thin shale and siltstone beds are present, and they become thicker and more frequent northwards and northeastwards (Fig. 33.2) as the Hiccles Cove shales out. The formation consists of stacked coarsening-upward cycles, and the sandstones are burrowed in the lower portion and massive- to horizontally-bedded in the upper portion. Thin units of coal and coaly shale occur near the top of the formation on central Prince Patrick Island. Associated sandstones are carbonaceous.

Other exposures of the Hiccles Cove along the southern, eastern and northwestern basin margins consist of extensively burrowed, argillaceous, glauconitic, very fine- to fine-grained sandstone. An exception to this is in the Lake Hazen area of northeastern Ellesmere, where massive to crossbedded fine- to medium-grained, carbonaceous sandstone dominates the formation.

Thickness and distribution

The Hiccles Cove Formation occurs only along the basin margins. The formation has been recognized in the following areas: central Prince Patrick, Eglinton, western Melville, Cornwall, southern Axel Heiberg, Fosheim Peninsula, Lake Hazen, northwestern Ellef Ringnes and northern Mackenzie King islands. Basinward the Hiccles Cove changes facies to the shale and siltstone of the McConnell Island Formation. It is truncated by the Ringnes Formation on the basin edges. The maximum thickness of the Hiccles Cove is 176 m.

Age

Ammonites collected from the Hiccles Cove on Prince Patrick and Ellef Ringnes islands are Bathonian and Callovian (Tozer and Thorsteinsson, 1964; Stott, 1969). On the basin margins the basal beds are probably as old as Bajocian based on their equivalence with dated McConnell Island strata. Uppermost strata are as young as Oxfordian according to palynological data (unpublished GSC report).

Environment of deposition

The lithologies, sedimentary structures, fauna and stratigraphic relationships of the Hiccles Cove indicate a shallow shelf to strandplain origin for the formation. Lagoonal strata are present near the top of the formation on Prince Patrick Island.

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Appendix

Selected well tops, formations of Wilkie Point Group, Sverdrup Basin. Location of wells shown on Figure 33.1.

Elf Cape Norem A-80

Sandy Point Formation	1009 m	(3310 ft)
Jameson Bay Formation	1039 m	(3409 ft)
Snowpatch Member	1039 m	(3409 ft)
Cape Canning Member	1256 m	(4120 ft)
Intrepid Inlet Member	1399 m	(4590 ft)
Lougheed Island Formation	1467 m	(4812 ft)

Elf Jameson Bay C-32

Hiccles Cove Formation	287 m	(942 ft)
McConnell Island Formation	442 m	(1451 ft)
Sandy Point Formation	477 m	(1566 ft)
Jameson Bay Formation	601 m	(1970 ft)
Snowpatch Member	601 m	(1970 ft)
Cape Canning Member	687 m	(2254 ft)
Intrepid Inlet Member	820 m	(2690 ft)
King Christian Formation	855 m	(2806 ft)

Panarctic Eglinton P-24

Hiccles Cove Formation	948 m	(3110 ft)
McConnell Island Formation	1095 m	(3590 ft)
Sandy Point Formation	1111 m	(3645 ft)
Weatherall Formation (Devonian)	1165 m	(3822 ft)

Panarctic Depot Island C-44

Hiccles Cove Formation	354 m	(1160 ft)
McConnell Island Formation	457 m	(1500 ft)
Sandy Point Formation	475 m	(1558 ft)
Jameson Bay Formation	497 m	(1630 ft)
Snowpatch Member	497 m	(1630 ft)
Cape Canning Member	561 m	(1840 ft)
Intrepid Inlet Member	618 m	(2026 ft)
King Christian Formation	635 m	(2084 ft)

Panarctic Drake Point D-68

Sandy Point Formation	945 m	(3100 ft)
Jameson Bay Formation	972 m	(3188 ft)
Snowpatch Member	972 m	(3188 ft)
Cape Canning Member	1027 m	(3368 ft)
Intrepid Inlet Member	1100 m	(3607 ft)
King Christian Formation	1124 m	(3687 ft)

Panarctic North Sabine H-49

McConnell Island Formation	2619 m	(8590 ft)
Sandy Point Formation	2696 m	(8844 ft)
Jameson Bay Formation	2726 m	(8940 ft)
Snowpatch Member	2726 m	(8940 ft)
Cape Canning Member	2844 m	(9329 ft)
Intrepid Inlet Member	2954 m	(9690 ft)
King Christian Formation	3014 m	(9887 ft)

Sun Skybattle Bay C-15

McConnell Island Formation	1711 m	(5612 ft)
Sandy Point Formation	1767 m	(5797 ft)
Jameson Bay Formation	1784 m	(5850 ft)
Snowpatch Member	1784 m	(5850 ft)
Cape Canning Member	1869 m	(6130 ft)
King Christian Formation	1932 m	(6338 ft)

Dome Sutherland O-23

McConnell Island Formation	171 m	(561 ft)
Sandy Point Formation	238 m	(779 ft)
Jameson Bay Formation	252 m	(826 ft)
King Christian Formation	388 m	(1272 ft)

Panarctic Mocklin Point D-23

Sandy Point Formation	1192 m	(3910 ft)
Jameson Bay Formation	1313 m	(4308 ft)
King Christian Formation	1567 m	(5140 ft)

Sun Linckens Island P-46

McConnell Island Formation	814 m	(2670 ft)
Sandy Point Formation	855 m	(2805 ft)
Jameson Bay Formation	870 m	(2852 ft)
Heiberg Formation	980 m	(3215 ft)

Imperial East Amund M-05

McConnell Island Formation	1442 m	(4730 ft)
Sandy Point Formation	1602 m	(5256 ft)
Jameson Bay Formation	1610 m	(5280 ft)
Heiberg Formation	1701 m	(5580 ft)

Imperial Sherwood P-37

Hiccles Cove Formation	363 m	(1192 ft)
McConnell Island Formation	377 m	(1236 ft)
Sandy Point Formation	390 m	(1280 ft)
Jameson Bay Formation	407 m	(1334 ft)
Thrust fault to Ringnes Formation		
Hiccles Cove Formation	502 m	(1648 ft)
McConnell Island Formation	514 m	(1687 ft)
Sandy Point Formation	523 m	(1717 ft)
Jameson Bay Formation	540 m	(1770 ft)
Heiberg Formation	631 m	(2070 ft)

Panarctic Romulus C-42

Hiccles Cove Formation	1350 m	(4428 ft)
Sandy Point Formation	1381 m	(4530 ft)
Jameson Bay Formation	1415 m	(4640 ft)
Heiberg Formation	1436 m	(4711 ft)