

Introduction

Five weeks (mid-July to mid-August) were spent in mapping and stratigraphic study of Mesozoic strata in the west-central part of the Sverdrup Basin (69C, 79D). Mapping was completed on Lougheed and Mackenzie King islands, and at Sabine Peninsula (Melville Island); also, small areas of the Ringnes Islands and northwestern Melville Island were examined (Fig. 35.1a). Widespread snow cover hampered operations until the third week of July. Prolonged fog and high winds brought the field season to a premature end in early August, preventing completion of mapping on Borden and Brock islands. The following paragraphs summarize the surface bedrock geology of Lougheed Island (Fig. 35.1b).

Stratigraphy and Structure

A conformable succession of Lower and Upper Cretaceous strata, assigned to the Isachsen, Christopher, Hassel, Kanguk, and Eureka Sound formations, comprises exposed bedrock on Lougheed Island and neighbouring small islands (Edmund Walker, Grosvenor, and Patterson islands; Fig. 35.1b). The formations are arranged about a shallow syncline – here named Lougheed Syncline – which has a gentle, southeastward-plunging, broad trough, and a subdued, reversed sigmoid trace. The oldest bedrock at the surface of Lougheed Island consists of partly calcite-cemented, carbonaceous and coaly, buff and light grey weathering sandstones of the upper part of the Isachsen Formation (Lower Cretaceous), exposed locally near the northern coast of the island. This incomplete Isachsen succession is estimated to be about 270 m (900 ft.) thick. [A complete Isachsen succession, about 340 m (1130 ft.) thick, was penetrated in the Sun KR Panarctic Skybattle Bay C-15 drill hole, near the southwestern coast of the island (Fig. 35.1b)].

The lower part of the Christopher Formation (Lower Cretaceous) consists of dark olive-grey to dark grey silty shale, with characteristically large and colourful, buff-orange-weathering, calcareous mudstone concretions. Some tan-weathering, calcite-cemented, fine to medium grained, partly fossiliferous sandstones, about 1 m to 3 m thick, are intercalated with shales in the lower part of the Christopher succession. Upper Christopher strata are dark grey to black, partly silty shale, with small, dark brown ironstone concretions and, near the top, upwardly increasing numbers of very thin beds of fine grained, buff, noncemented to weakly cemented, partly glauconitic sandstone, as a transitional succession to overlying Hassel Formation sandstones. About 700 m (2325 ft.) of Christopher strata were penetrated in the Skybattle Bay C-15 drill hole.

The Hassel Formation (Lower and Upper Cretaceous) is the most widely distributed and best exposed unit on Lougheed Island. The formation, which is estimated to be about 300 m (1000 ft.) thick, consists mainly of buff to

tan, mainly medium grained sandstone, weakly cemented by ferruginous clay. There are abundant, very thin, dark grey shale intercalations in the basal part of the formation and, in the upper part, some black, pyritic shales, resembling the black shales of the overlying Kanguk Formation. [In that regard, the Christopher and Hassel formations are transitional over wide areas of central Sverdrup Basin, but the Hassel and Kanguk formations in most places have an abrupt contact (Stott, 1969; Balkwill and Hopkins, 1976)]. The middle part of the Hassel Formation consists of quartzose sandstones, with high-angle, tabular cross-strata, carbonaceous detritus, scour channels, and some pebble lenses; the strata lack marine faunas.

The Kanguk Formation (Upper Cretaceous) underlies a large part of southeastern Lougheed Island. The succession consists mainly of black, cohesive, papery, clay-rich shales, with very thin, yellow-grey, tuffaceous clay beds. The shales are sulphurous, with yellow and white secondary sulphate mineral crusts on many outcrops, and are so acidic that the formation supports almost no vegetation. The lower part of the Kanguk succession contains intervals of buff to yellow-brown, weakly cemented to noncemented, fine grained sandstone. The most prominent of the Kanguk sandstones is a few tens of metres thick, and lies about 100 m (330 ft.) above the base of the shale-dominated succession. Such well-developed sandstones are not common in the Kanguk Formation of central and eastern Sverdrup Basin; but Plauchut (1971, p. 675) indicated that the Kanguk Formation at Eglinton Island (Fig. 35.1a) has abundant sandstones. The Kanguk Formation is estimated to be about 200 m (660 ft.) thick.

The youngest strata on Lougheed Island are light grey, medium to coarse grained, weakly cemented sandstones of the Eureka Sound Formation. The unit, which is present only in the eastern part of Lougheed Island, is not more than about 60 m (200 ft.) thick, and contains large fragments of carbonized wood. Palynomorphs from the Eureka Sound beds indicate that the rocks are Maastrichtian, and thus approximately coeval with the formation on the Ringnes Islands, in those places where the Eureka Sound Formation lies conformably on the Kanguk Formation (Balkwill, 1974; Balkwill and Hopkins, 1976).

Lougheed Syncline has a nearly flat trough region that plunges southeastward about 1 degree (20 m/km or 100 ft./mile). The northeastern flank dips about 4 degrees toward the trough. The southwestern flank is locally interrupted by a system of low-amplitude regularly spaced folds. Some disharmonic, flexural-flow folds are particularly well developed in the upper part of the Christopher Formation on Edmund Walker Island. Folds there are asymmetric northward (some have overturned forelimbs), and have wavelengths as great as several tens of metres. Near Skybattle Bay, the Christopher/Hassel contact is locally overturned toward

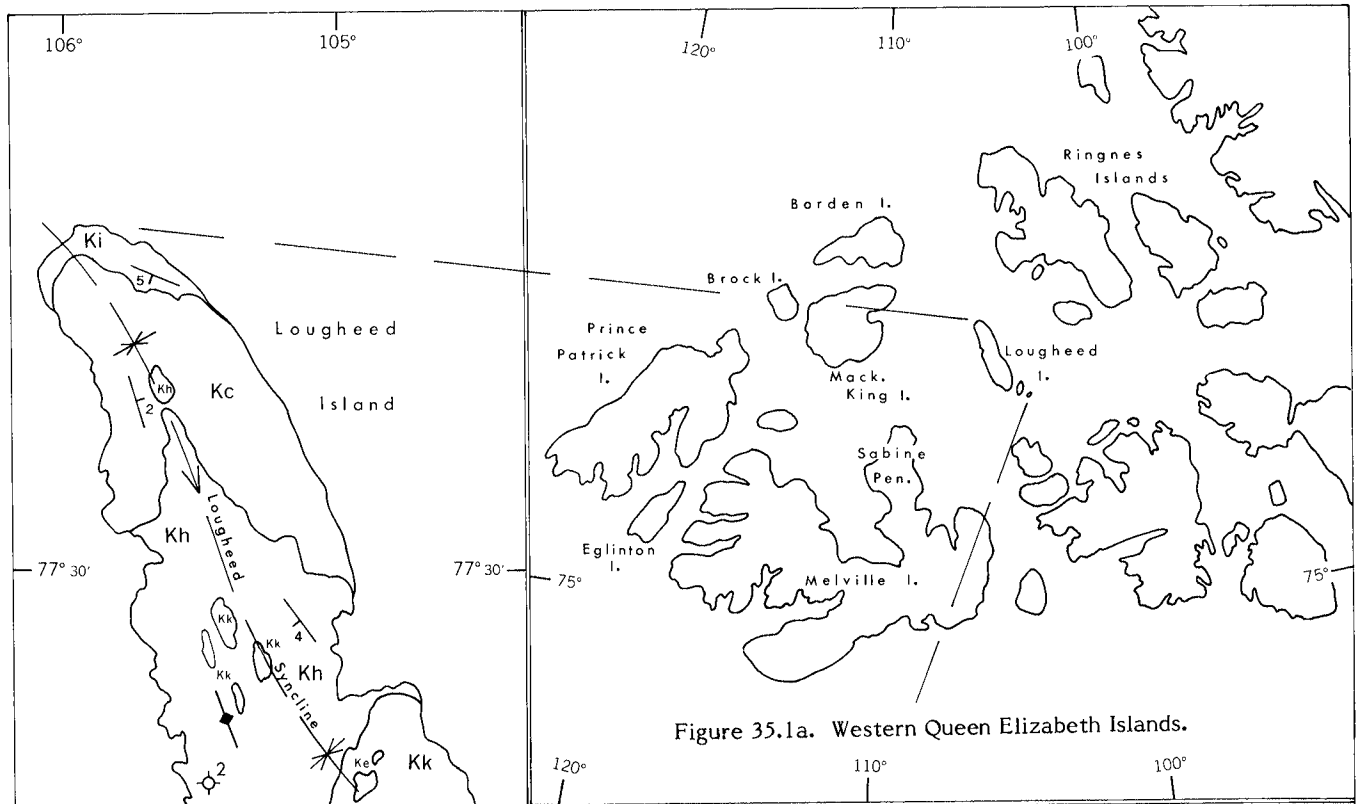
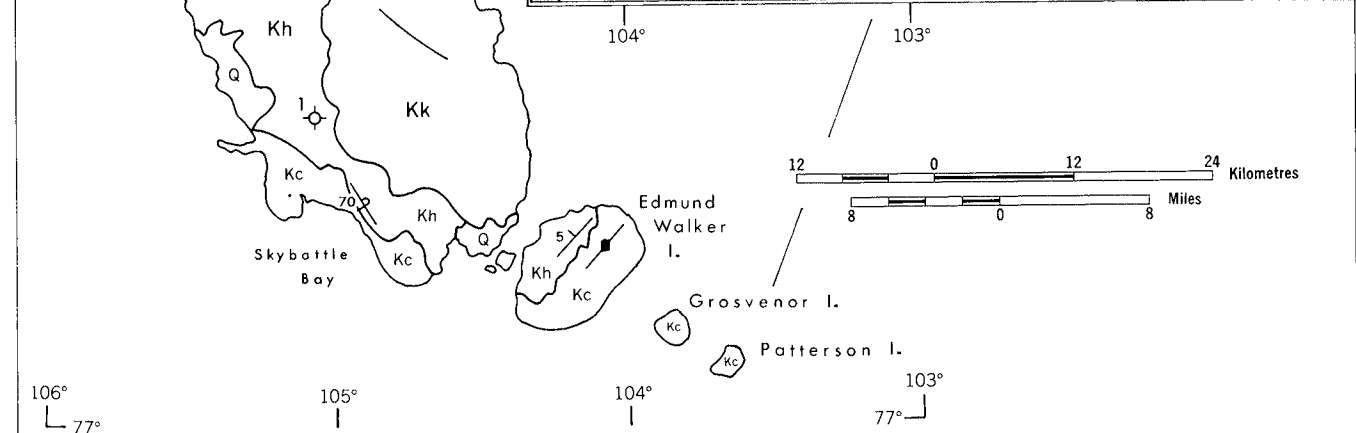


Figure 35.1a. Western Queen Elizabeth Islands.



- Q Quaternary: sand and mud
- Ke Eureka Sound Formation: sandstone
- Kk Kanguk Formation: shale
- Kh Hassel Formation: sandstone
- Kc Christopher Formation: shale
- Ki Isachsen Formation: sandstone

- Strike and dip of bedding
- Overturned bedding
- Syncline: approximate axial trace and plunge
- Trend of small folds
- Sun KR Panarctic et al. Skybattle Bay C-15
- Panarctic Tenneco et al. Pat Bay A-72

Figure 35.1b. Geology, Lougheed Island.

the northeast. The general structural style is suggestive of large-scale, slope-induced, northeastward- and northward-directed flow of ductile upper Christopher pelites toward the trough region of Loughheed Syncline. This would require the existence of a structurally high domain peripheral to the southwestern and southern coasts of Loughheed Island and adjacent small islands.

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