16. AN UNUSUAL SEA STACK AT HIGH ELEVATION ON NORTHWEST DEVON ISLAND

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An unusual sea stack (Fig. 16.1) was observed on northwestern Devon Island in the course of a bedrock study in 1971. It is located 1.45 km (0.9 mile) northeast of the coast of Prince Alfred Bay (Fig. 16.2, Loc. 4). Judging from the 1:250 000 topographic map of the area, it was estimated to be at about 100 m (350 ft) above sea level, and plotting in a Zeiss stereotope by G. Mizerovsky gave an elevation of 108 ± 5 m (354 ± 16 ft).

The pinnacle has a characteristic sea stack form and is associated with former marine beaches. The work of waves on a shoreline seems to be the only means of developing such a feature.

The stack stands about 5.5 m (18 ft) above the surrounding terrain (Fig. 16.1) and is the only stack in the region. It is located at 505600mE, 8460200mN in UTM Zone 15X. On aerial photograph A16147-164 it occurs at -6.1X; -3.8Y, using the grid system described by Norris (1972).

The stack is a slender pinnacle and is narrower at the base than at the top. The surrounding terrain is a plateau of rather flat to gently rolling topography, with shallow, narrow stream valleys. Nearly all of the land surface nearby is felsenmeer of the underlying bedrock. Small frost shattered bedrock outcrops project out of the felsenmeer in places on the uplands, but all other large outcrops are restricted to stream valleys.

The stack occurs in a bedrock unit of thick undivided Devonian carbonates (Morrow and Kerr, 1975). In the vicinity of the stack this unit is thick bedded dolomite, commonly with steep jointing. It occurs in a gentle syncline, where the beds at the stack are close to horizontal. The stack is composed of dolomite similar to the surrounding bedrock, but is highly jointed and probably sheared. It probably is in a fault zone or major joint zone. Since no lineament was observable on the ground or on aerial photographs, displacement, if present, was minor. The resistant nature of the stack probably is due to silicification in this incipient shear zone.

It generally has been considered that most of the islands in the central Canadian Arctic were covered by ice and depressed below sea level during late Pleistocene (Wisconsin) time, and that the ice retreated in Holocene time, which began about 10 000 years ago. Since the region was subjected to Wisconsin glaciation, the stack must have developed after the disappearance of ice from that location in Holocene time.

It does not seem likely that this stack developed simply by solution because the process is too slow. Smith (1972) concluded that denudation by removal of dissolved solids from limestone in northwestern Somerset Island is about 2 mm per 1000 years. If this is representative of Holocene rates, only about 2 cm of denudation would have occurred by that process operating alone. It is equally unlikely that the stack formed by normal erosional processes on land.

Raised beaches formed on the Arctic Island during the Holocene in the period of upward rebound which followed the breakup and disappearance of the Innuitian Ice Sheet (Blake, 1970). Prominent raised beaches occur inland from the present shoreline of Prince Alfred Bay, and features that appear to be raised beaches occur close below the stack. The stack is regarded here as the highest indication of the upper limit of postglacial marine submergence on the east side of Prince Alfred Bay.

Figure 16.1. A sea stack near Prince Alfred Bay on northwestern Devon Island. GSC Photo 199291. It is located at Locality 4 (Fig. 16.2).

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The minimum upper marine limit on parts of Devon Island now has been established as follows (Fig. 16.2); all elevations are approximate.

1. Head of Barrow Harbour	(Grosswald, 1973)	125 m (410 ft)
2. Northwest of Stewart Point	(Grosswald, 1973)	150 m (492 ft)
3. Southern Sheills Peninsula	(Grosswald, 1973)	150 m (492 ft)
4. East of Prince Alfred Bay	(this report)	108 m (354 ft)
5. Norfolk Inlet	(Blake, 1975)	123 m (405 ft)
6. Cape Hawkes	(Blake, 1975)	120 + m (400 ft)
7. Wellington Channel	(Roots, 1963, p. 177)	91 m (300 ft)
8. Eastern Jones Sound	(Barr, 1971)	76 m (250 ft)

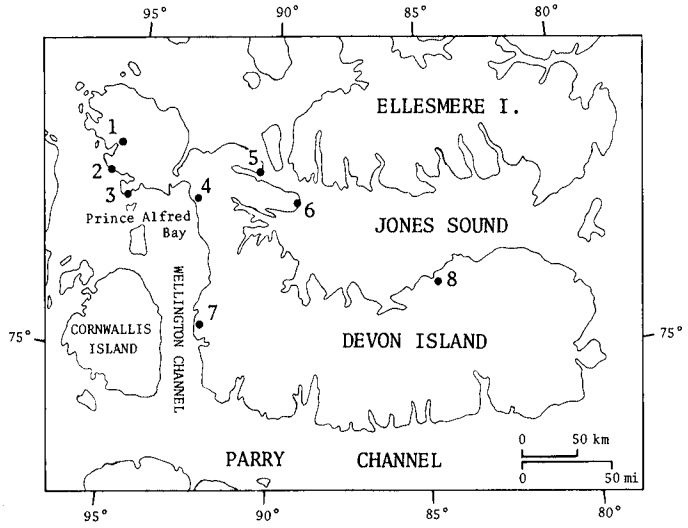

Figure 16.2. Index map of Devon Island showing localities mentioned in the text.

The marine limit appears to ascend westward on Devon Island as pointed out by Grosswald (1973). The sea stack near Prince Alfred Bay (Loc. 4) at about 108 m (345 ft) above sea level is compatible with the earlier observations. It confirms the data derived from raised beaches, which indicate that northwestern Devon Island has emerged a greater amount than eastern Devon Island. The pattern of differential uplift on Devon Island is similar to the situation in southern Ellesmere Island, where Blake (1970) reported that a pumice level, representing a time horizon in the sediments of the raised beaches, ascends westward.

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