BLOCK TERRACES IN THE ADELAIDE ISLAND AREA

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ABSTRACT. Short descriptions of the block terraces of the Adelaide Island area are given and the positions of these features are shown on the accompanying map. All of the block terraces described from the Antarctic Peninsula occur below steep rock walls which probably once contained moving ice, and it is suggested that some of the block terraces may be the remnants of lateral moraines. Some of the terraces described in this paper are thought to be the remnants of the lateral moraines of a former ice stream but they are closely similar to block terraces. The unusually high angle of repose of the rubble forming the terraces may have resulted from undercutting by the sea at formerly higher sea-levels.

BOTH Nichols (1960) and Hoskins (1963) have described typical block terraces in the Marguerite Bay and Neny Fjord areas east of Adelaide Island. Only a few block terraces occur on the coasts of Adelaide Island, but terraces which may be immature forms of block terraces have been found there and they may indicate the mode of origin of some of these features.

Descriptions of the terraces

The only typical block terraces known in the Adelaide Island area (Fig. 1) occur below steep cliffs on the south-western coast of Stonehouse Bay. Between these terraces and the sea

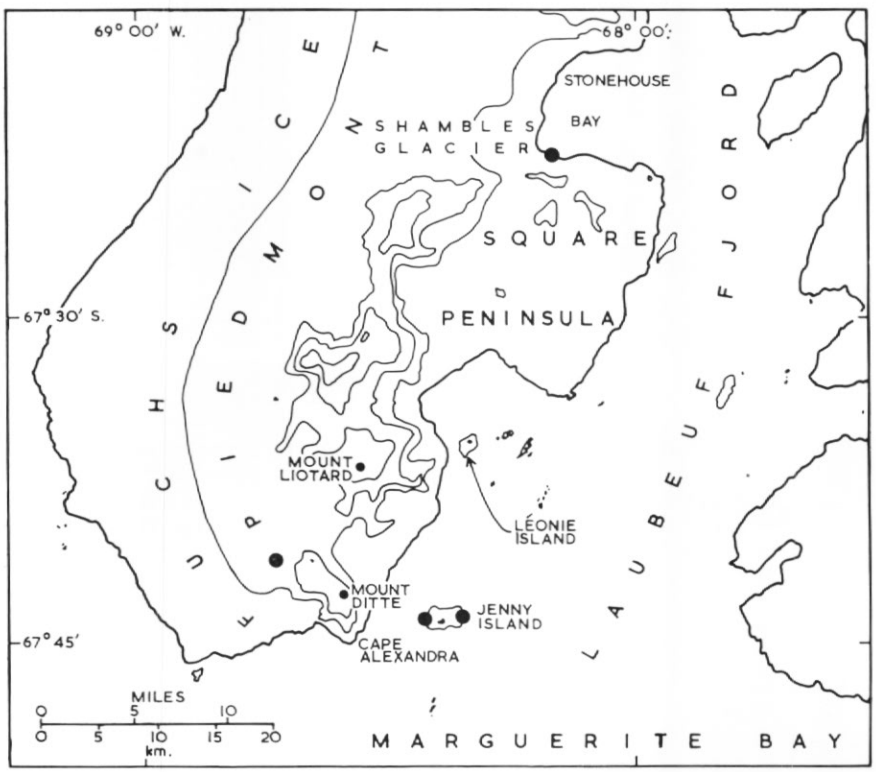

Fig. 1. Sketch map of southern Adelaide Island showing the locations of topographic features mentioned in the text. The positions of the terraces which are described are shown by solid circles (●).

is a raised marine platform at a height of 20 ft. (6·1 m.) a.s.l. (Fig. 2). On the flat tops of the terraces, at 260 ft. (79 m.) a.s.l., rest conelets of a mixture of snow and small scree at its angle of repose, banked up below small gullies cut in the cliff above. The slopes of these conelets pass rapidly into the horizontal terraces, where the angular talus is much coarser; it does not become noticeably coarser towards the outer edges of the terraces. The angle of repose on the forward slopes of the terraces is 38° and that on nearby scree slopes without flat tops is 35°. The difference in angle, although it is slight, suggests that the ordinary scree slopes have formed by accumulation of material from above, but that the terrace piles have been undercut and are in metastable equilibrium, supported largely by the ice which cements the talus in their cones.

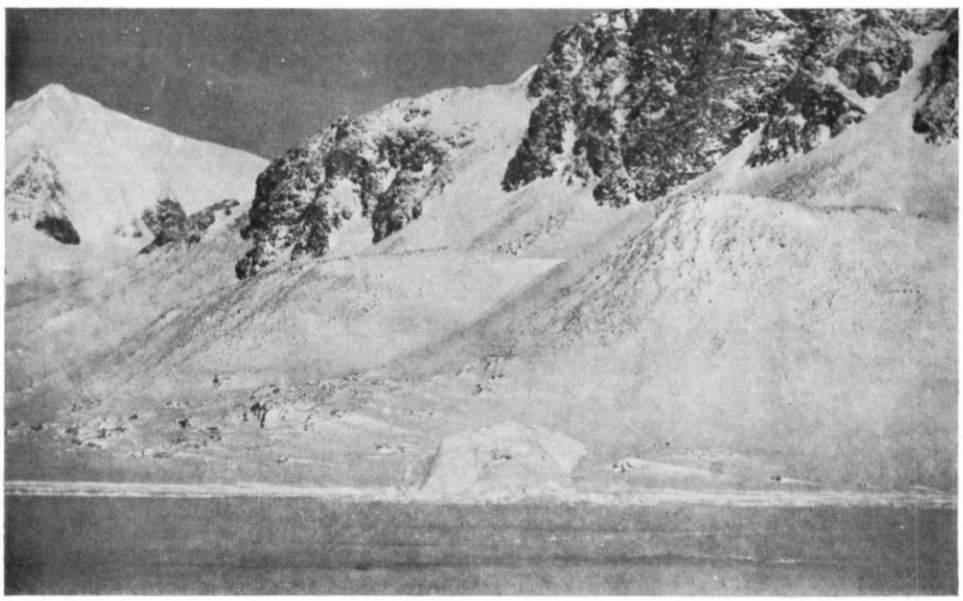

Fig. 2. The block terraces below the cliffs of north-western Square Peninsula, viewed from the sea ice in southern Stonehouse Bay. The flat tops of the terraces contrast with the steep forward slopes. The rock exposed on the locally uneven platform below the talus piles is all *in situ*.

A wide "block terrace" covered with large angular boulders up to 2 ft. (0·6 m.) in diameter is present at approximately 300 ft. (91 m.) a.s.l. on the western coast of Jenny Island (Fig. 3) below steep cliffs which are 1,500 ft. (455 m.) high. A smaller terrace at a similar height has been examined on the eastern side of Jenny Island; it forms a natural step in high talus banks.

The surfaces of the terraces on Jenny Island are similar to those of the lateral moraines of the Fuchs Ice Piedmont, where it is contained by steep cliffs west of Mount Ditte (Fig. 4). These moraines are up to 15 yd. (13·7 m.) wide and boulders up to 6 ft. (1·8 m.) long cover their surfaces. In most places the surfaces of the moraines slope gently away from the adjacent cliffs, but a few of them slope towards the cliffs (Fig. 4). The Fuchs Ice Piedmont moves as a glacier contained by these cliffs but it does not erode the terraces.

Origins of the terraces

Hoskins (1963) has suggested that the formation of block terraces depends on the sudden arrest of talus and snow falling from the adjacent cliffs. Such debris naturally tends to fall down gullies cut in the cliffs and it is below these gullies that block terraces are present. The coarsest material, which travels with the greatest momentum, comes to rest near the outside edges of the terraces, but it may fall farther down the outer terrace slope as scree. When the accumulated snow below the cliff melts, the finer material which it contains becomes com-

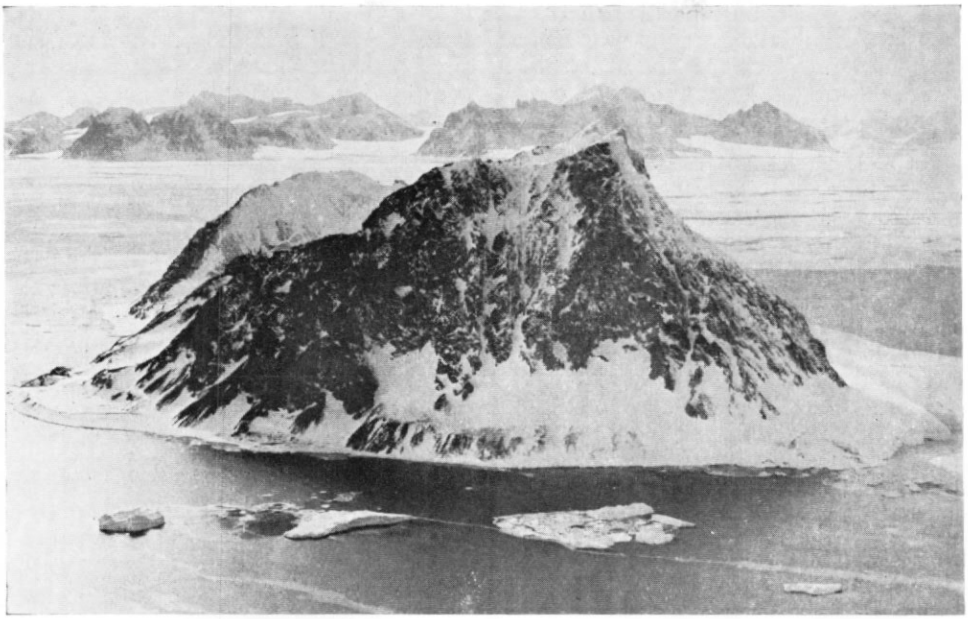

Fig. 3. Air photograph of Jenny Island from the west. The terraces (centre) at 300 ft. (91 m.) a.s.l. are believed to have formed as lateral moraines. The southern cliffs of Jenny Island are much steeper than the visible profile (right). The snow-covered flat surface on the north-western cape of Jenny Island (left) is a raised beach; a raised platform is just visible beyond it on the north coast of the island.

Fig. 4. Lateral moraines of the Fuchs Ice Piedmont west of Mount Ditte. The more distant moraine (beyond the pool of melt water) has a top which slopes towards the containing steep cliff, but the much larger moraines (foreground) slope gently away from the cliffs. If moraines like these were subjected to marine erosion near their bases, the resulting undercut terraces would have many of the features of typical block terraces.

pacted, the back (or inner part) of the terrace is lowered and the typical flat top is formed. Nichols (1960) has suggested that block terraces are the stone-choked remnants of fringing glaciers; "fringing glacier" is the term used by him for the ice foot which fringes the coast in many parts of the Marguerite Bay area.

The block terraces of Jenny Island are thought to be remnants of a lateral moraine. The moraine is believed to have been formed during a recession stage of a very thick mass of ice, which once moved as a glacier down Laubeuf Fjord and which surrounded and may have covered Jenny Island (Table I). The top of the Jenny Island terrace is similar to that of the

TABLE I. EVIDENCE FOR THE FORMER PRESENCE OF A THICK ICE STREAM COVERING THE LAUBEUF FJORD AREA

Height a.s.l. (ft.)	(m.)	*Location*	*Feature*
1,800	550	Jenny Island	*Roche moutonnée* island shape
1,300	395	Jenny Island	Glaciated pavements; striae
1,800	550	Léonie Island	Crag and tail island shape
1,400	425	Léonie Island	Gouged terraces
2,000	610	Cape Alexandra Eastern Mount Liotard	Steep containing walls of glacier valley

lateral moraine of the moving Fuchs Ice Piedmont, and so are the surfaces of the block terraces in Stonehouse Bay. Like the Fuchs Ice Piedmont, which has certainly receded in recent times (Dewar, 1967, table I), Shambles Glacier is also thought to have receded. When this glacier extended farther west, it may have supported the block terraces in Stonehouse Bay in the same way that the Fuchs Ice Piedmont supports its present lateral moraines.

The terraces in Stonehouse Bay and on Jenny Island occur in localities where a rock wall has previously contained moving ice. The block terraces described by Hoskins (1963, fig. 1) occur in similar localities, if it is assumed that a thicker ice cover similar to that once present in the Adelaide Island area (Table I; Dewar, 1967, table I) formerly filled Neny Fjord.

The high angle of repose of the talus on the outer slopes of these block terraces may have been caused by undercutting of the talus piles by marine erosion. So far, no block terraces have been found far above sea-level, and it is significant that loose talus is rarely present on surfaces seaward of block terraces. Talus is absent from the surface of the marine platform at the foot of the block terraces of Stonehouse Bay, and below only one of the block terraces illustrated by Hoskins (1963, fig. 3) is any quantity of talus present. At least two of the terraces in Marguerite Bay slope down to shingle beaches (Hoskins, 1963, figs. 5 and 7). Therefore, it is possible that talus has been removed by marine erosion, and block terraces with steep forward slopes and no talus below them may be indicators of higher sea-levels in former times.

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