

Letters to the Editor

Recent uplift at Raoul Island, Kermadec Group, Southwest Pacific

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Comment

From observations in 1977 Schofield (1981) argued that there is a raised beach at Low Flat, Raoul Island (Kermadec Group) which has been uplifted 3.5 m during the last 440 years. However, during a brief archaeological expedition in 1978, we located an extensive prehistoric Polynesian settlement site at Low Flat (Anderson 1979, 1980), and I now argue that the existence of this site invalidates Schofield's particular conclusions and that there remains no convincing case for uplift at Low Flat.

The archaeological site can be observed as a layer of very coarse sand containing abundant wood charcoal, scorched and heat-cracked cobbles and boulders, and some *umu* (Polynesian earth ovens), food remains, and prehistoric Polynesian artefacts, situated at about 3 m above the modern storm beach, in the beach-front cliffs. Test excavations at various localities showed that an almost continuous layer occurred along most of the Low Flat coast and up to 120 m inland. Towards the eastern extremity of the site there occurs a second cultural layer at about 0.5 m above the main layer (for details of the excavations and cultural materials see Anderson 1979, 1980.).

Figure 1 shows the location of our sections and test excavations and the approximate location of

the sections observed by Schofield. In Fig. 2 are Schofield's sections and three of ours for comparison. In drawing the latter I have assumed that the material called "unconsolidated tephra" in Anderson (1980, fig. 3), and which comprised fragments of basalt, obsidian, and pumice of gravel size and larger, all in a matrix of very coarse sand, is equivalent to Schofield's "well-rounded very coarse sand" plus "round pumice gravel". The distinction between these was, in our observations, one of degree, and lenses of the latter can also be observed encapsulated by the former. Conversely, in the Schofield category "breccia/fanglomerate", I have included three types of deposit recorded in 1978 as a basal breccia (the breccia below the lowest disconformity), and an unweathered clay/silt and a heavily weathered clay/silt, both containing abundant basalt and pumice fragments. There was also at least one paleosol horizon not recorded in Schofield's sections (see Anderson 1980, fig. 3, for the unmodified section drawings).

Another potential source of difference is that our sections were measured by reference to datum points on the surface, as is usual in archaeology, and only approximately in relation to the storm beach. However, the disconformity between the

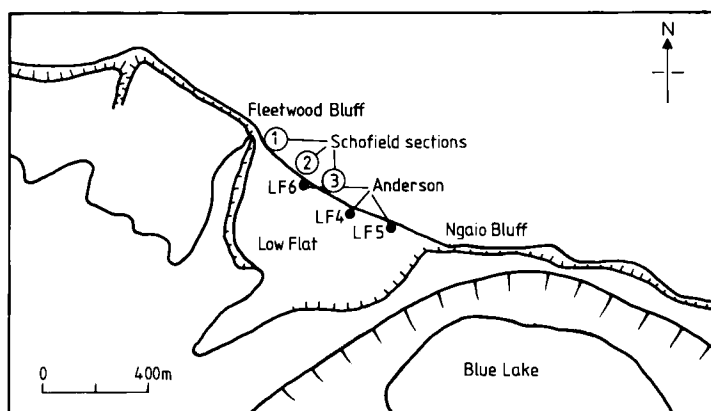


Fig. 1 Low Flat showing location of sections in Fig. 2.

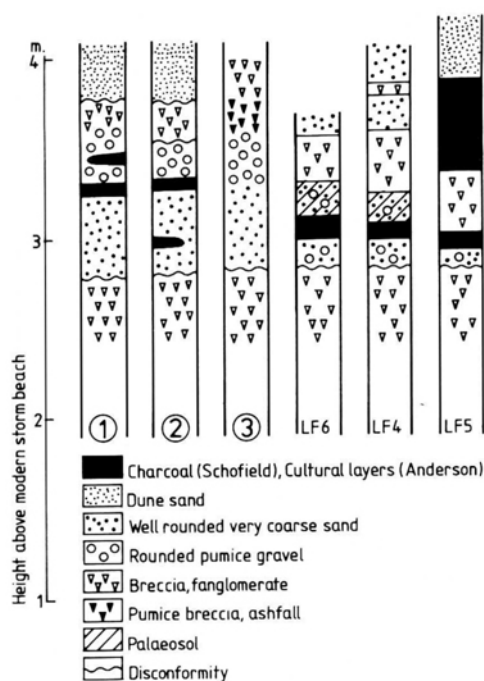


Fig. 2 Selected coastal sections at Low Flat.

basal breccia and the overlying deposits is very clear in our sections and photographs, and its position can be directly compared against Schofield's sections. In Fig. 2 all the sections have been drawn with that disconformity at +2.8 m, as shown in Schofield (1981, fig. 2). Several measurements on our scale photographs show an agreement within ± 0.3 m of this height.

Since it is apparent, in Fig. 2, that our main cultural layer lies in the same place in the sequence as the charcoal bands in Schofield's sections, it

follows that his samples were very probably from the archaeological site. If so, the radiocarbon estimates need not precisely date any natural event; indeed centuries may have elapsed between the formation of the deposit in which the charcoal occurs and the habitation which was responsible for the charcoal. Furthermore, as is suggested by Schofield's dates, and is readily apparent in ours (Table 1), there is a lengthy period represented in the occupation of the main cultural layer. Occupation may have been continuous, but concentrated upon different parts of the site, over 400–500 years, or there may have been discrete occupations. An analysis of our radiocarbon dates indicated a bimodal curve with peaks at A.D. 960 and A.D. 1360 (Anderson 1980, p. 140).

Another observation which Schofield (1981, p. 569) regarded as indicative of a raised beach was "... a layer of **very well rounded** andesite boulders ... exposed above the local **well rounded** modern boulder beach" on the eastern part of the coast. However, very well rounded cobbles and boulders, of the same basaltic material as occurs on the beach, are found throughout the archaeological site as ovenstones. At LF 5, which must be very close to, if not actually at, the location of Schofield's observation, there was a large oven exposed. This contained numerous boulders of 100–250 mm diameter, bones from the hindquarter of a phocid seal, and a broken adze, all in a matrix of charcoal. The oven lay at about 3 m above the modern storm beach, and above it, at about 3.5 m, was a second cultural layer containing some sparse evidence of oven remains.

Schofield (1981) also argued that there is a close similarity between the well-rounded pumice gravel on the modern beach, and its apparent analogue in his sections. But rounded pumice gravel occurs in drifts over many parts of the surface of Low Flat, including at distances of more than 200 m from the beach in the central part of the coast where the

Table 1 Radiocarbon dates from Low Flat, Raoul Island.

N.Z. ^{14}C	Old $T_{1/2}$	New $T_{1/2}$	New $T_{1/2}$ corrected	Reference
4315	580 ± 80	600 ± 80	610 ± 80	Schofield (1981)
4316	380 ± 80	400 ± 90	440 ± 40	Schofield (1981)
4785	735 ± 47	757 ± 48	718 ± 48	Anderson (1980)
4786	620 ± 47	638 ± 58	644 ± 58	Anderson (1980)
4787	648 ± 56	667 ± 58	660 ± 58	Anderson (1980)
4788	635 ± 57	654 ± 58	655 ± 58	Anderson (1980)
4789	1035 ± 60	1065 ± 65	1015 ± 65	Anderson (1980)
4790	493 ± 56	507 ± 58	518 ± 64	Anderson (1980)
4791	530 ± 57	546 ± 58	555 ± 63	Anderson (1980)

surface lies at about 12 m above the storm beach. It seems more likely that the rounding is due to fluvial action than to wave action.

I would conclude that, since there is an archaeological site situated about 3 m above the modern storm beach at Low Flat, there cannot be a fossil beach at the 3.5 m level as Schofield argues. Uplift of less than 3 m could have occurred but, in view of alternative explanations for the more important of Schofield's observations, there remains no convincing case in favour of it. Moreover, since Schofield's radiocarbon dates are most probably on samples from cultural fires, there exists no means to measure the rate of any proposed phase of uplift.

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Reply

Polynesian sites are often found on alluvial flats close to the coast and at or just above high-tide level, and hence I am not questioning the presence of true archaeological strata on Low Flat. However, as a long-standing student of stranded "raised" beach deposits, I am well aware of the need to be careful when distinguishing them from man-made or man-associated strata. The latter are distinguished by the common presence of charcoal; a mixed presence of sharply angular stone flakes used for cutting tools (often of local stone and sometimes obsidian) and round umu or haangi stones, many broken by fire (a most unnatural clast shape rarely found in natural sediments); and by "disturbed" or cut-and-fill structures such as post holes and haangi diggings. No such distinguishing characteristics were present in the three sections I examined at the western coastal edge of Low Flat. Instead, at a consistent level of 3.5 m above its

modern analogue, there existed the same sequence of strata consisting of a coarse pumice bed on top of clean sand, as is found in the modern storm beach.

The well-rounded boulder bed, found along the seaward edge of Low Flat near its eastern end, and at the same level as these beach sands, was not well exposed but I found no broken and fire-burnt stones to suggest it was a haangi site.

The charcoal in the three western sections differed from that found normally in man-made strata. Normally, such charcoal is angular, often in fragments above 10 mm in diameter, patchy in distribution, plentiful, and associated with haangi stones. The charcoal in the three western Low Flat sections that I studied was well rounded and generally less than 5 mm in diameter. Also it was so sparsely scattered that it required a long period of time to collect sufficient for dating purposes. No haangi stones were present. I agree that the charcoal may have been derived from man-made fires but that it was water transported to its present sites. This may have been some time after the charcoal had been formed and thus the rate of uplift at Raoul could have been greater than I have postulated — perhaps closer to the much faster rates of uplift recorded from Curtis and Cheesman Islands.

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