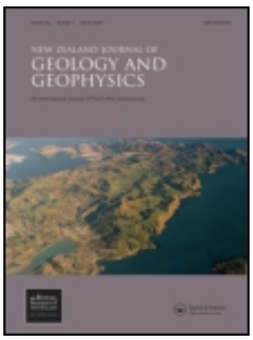

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R. P. Suggate

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THE THIRTY-FOOT RAISED BEACH AT RAPAHOE, NORTH WESTLAND

R. P. SUGGATE

New Zealand Geological Survey, Christchurch

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ABSTRACT

The altitude of a post-glacial coastal terrace is revised to 29 ± 1 ft above mean sea level. A log dated at 4,720 ± 70 yr B.P. was found in estuarine gravel 7 ft below the terrace surface ¼ mile inland. Tectonic uplift is certain, probably at a rate of about 6 ft/1,000 yr.

INTRODUCTION

At Rapahoe (Lat. 42° 23′ S, Long. 171° 15′ E), 7 miles north of Greymouth on the west coast of the South Island, a stream aggradation surface is graded to a tectonically-raised post-glacial beach. Dissection by Seven Mile Creek has made the aggradation surface into a terrace. A log in estuarine deposits 7 ft below the terrace surface ¼ mile from the beach was sampled by the writer in 1952. The radiocarbon age of the log has been quoted by several authors.

The sample (S44/800, NZ13) was radiocarbon-dated at 4,600 ± 70 yr B.P. (Fergusson and Rafter, 1955) and the description given was ". . . wood from a large tree in gravels 15 ft above sea level. . . . It seems probable that the marine terrace that runs along the coast at about this height for a very considerable distance represents a rise of sea level after . . . the last major advance of the glaciers." The implication that the terrace was at 15 ft was incorrect, since the tree was some distance below the top of the terrace. No accurate measurement of altitude had been made.

In 1956 Stevens quoted the 4,600-year date, stating "A 15-ft terrace at Rapahoe . . . has been dated at 4,600 ± 70 years B.P. . . . but has perhaps been elevated by movements on the Alpine Fault." His assumption that the terrace was at an altitude of 15 ft was justified, in view of the original description; "movements on the Alpine Fault", however, seem improbable as a primary cause of uplift of the area, but the suggestion of tectonic uplift was justified.

In 1957 Fergusson and Rafter noted the necessity for adjustment of the date to 4,720 ± 70 yr B.P. because of the Suess effect. In 1961, Fairbridge, in his generalisation of world sea-level changes, stated (p. 163): " A late date of this high sea level (Older Peron Submergence) is for wood in a fluvial gravel near Greymouth, New Zealand, which gives 4,600 ± 70 B.P. (Fergusson and Rafter, 1954); the gravel rests at 5 m above sea level on a marine terrace of approximately 3 m". The correction for the Suess effect was neglected, and the stratigraphic data is a barely justifiable inference from published data. The confusion between 1954 and 1955 for the date of Fergusson and Rafter's original publication arises from the publication of the *New Zealand Journal of Science and Technology 36 (4)* in January 1955 although the first three numbers were published in 1954.

In 1963 the date was republished by Grant-Taylor and Rafter in the consolidated list of New Zealand dates in "Radiocarbon". The description is, "Wood from a large tree trunk, 15 ft above sea level, imbedded in marine gravel terrace . . . terrace apparently represents deposition at post-glacial sea level higher than present one, but tectonic uplift is also probable."

In 1964 Schofield criticised Fairbridge over the Rapahoe date, stating: "One of these dates, NZ13 (Fergusson and Rafter, 1955) is from the tectonically rising area of the west coast of the South Island.

Later in 1964 Wellman and Wilson stated, "At Rapahoe, near Greymouth, wood 4 ft below the surface of a marine bench 15 ft above present sea level has been dated by radiocarbon as about 4,720 yrs old (Grant-Taylor and Rafter, 1963). . . The age is that of the 'Climatic Optimum' and corresponds to a high sea level in many parts of the world." No mention was made of the possibility of tectonic uplift.

STRATIGRAPHY AND ALTITUDE

The section at the corner of the main road and the road to the beach on the south side of the bridge over Seven Mile Creek shows:

	ft
Grey clay, grading down to	2
Grey sand with coal-measure fragments increasing downwards in size to 2 in.; grades laterally into granite, quartz and coal-measure gravel, to 3 in.	3
Fine gravel of granite and coal-measure fragments, from which the log came	3

Coal-measure fragments are rare on the present-day beach, but are common in the tidal part of Seven Mile Creek. The presence of granite and quartz could result from occasional storm waves throwing gravel across a bar at the mouth of the creek. The log was removed when the road was widened about 1960. Its former depth below the top of the terrace is estimated to have been 7 $\pm$ 1 ft.

The terrace deposits are not exposed along the road leading to the lagoon at the mouth of Seven Mile Creek $\frac{1}{4}$ mile to the west. A face of well bedded, well rounded gravel interbedded with sand, undoubtedly marine, is seen to underlie the terrace to the east of the lagoon where the terrace has been cut back about 50 yd to form a car park. The top part of the section, well bedded sand with discontinuous pebble bands, does not correspond to the present-day coarse storm beach gravel and is probably a foreshore deposit. Thus because of the continuity of the terrace surface, marine deposits at the present coast appear to pass inland into estuarine deposits.

The writer is indebted to Mr W. A. Sara, New Zealand Geological Survey, Greymouth, for stadia theodolite observations based on the position of Trig New D, about $\frac{1}{4}$ mile away. Trig New D was not located, but any error in position will not give rise to an error in altitude of more than 1 ft. Mr Sara determined the altitude of the terrace above the log and also at the back of the car park at 30 ft, based on an altitude of 10 ft for Trig New D. A check was made to high tide level, and the tidal range for the day

obtained from the Greymouth Harbour Board. This suggested the terrace top above the log was at 29 ft, thus giving confirmation within reasonable limits.

The altitude of the terrace top is accepted as 29 ± 1 ft, and that of the log 22 ± 2 ft.

CONCLUSIONS

The aggradation of about 7 ft above the log, up to the terrace surface at 29 ft, almost certainly resulted from sea level rising faster than tectonic uplift, culminating at some time less than 4,720 yr ago. This culmination could well be the high sea level of 7 ft inferred for 3,900 yr ago by Schofield (1960) from Firth of Thames data. Accepting this, the uplift has been 22 ft in 3,900 yr, representing an average of 5·65 ft/1,000 yr or 1 ft/177 yr. Alternatively, however, if sea level is accepted as having been at −4 m (−13 ft) when the log at 22 ft was deposited 4,720 yr ago, which would be consistent with the school of thought (e.g., Jelgersma, 1966) that denies a post-glacial sea level higher than that of the present day, then uplift has been about 35 ft in 4,720 yr, representing an average of 7·4 ft/1,000 yr or 1 ft/135 yr.

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