



Evidence for a low sea level 9900 years ago

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EVIDENCE FOR A LOW SEA-LEVEL 9900 YEARS AGO

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Summary

It is tentatively submitted that radiocarbon dating of *Podocarpus* wood from a well at Foxton suggests that sea-level may have risen about 150 ft during the last 9900 years, but there is no decisive evidence to indicate whether the land at the well site has been stable or tectonically elevated or depressed in recent times.

INTRODUCTION

In most parts of New Zealand, attempts to decipher the record of Pleistocene eustatic changes of sea-level are hampered by ignorance of precise dates of late tectonic movements. Prior to the advent of radiocarbon dating, the New Zealand geologist, faced with the task of interpreting rise and fall of sea-level and elevation and depression of the land, did not have a single reliable "time-plane" to serve as a reference datum, so that detailed correlation of late geological events in one district with those of adjacent districts has been highly speculative. It now seems probable that systematic work with radiocarbon dating will eventually enable separation of the effects of eustatic movements of sea-level from those of tectonic movements.

¹⁴C SAMPLE FROM FOXTON

Locality

In November 1953, Mr Victor Richardson drilled a well to increase the water supply for the Borough Council at Foxton, 62 miles north-north-east of Wellington. The well is sited 15 chains north-west of the Foxton Water Tower, on the east (right) bank of the Manawatu River, 3.5 miles from its mouth; grid reference: Provisional One Mile Map Series, Tangimoana Sheet N 148/796206.

Bore Log

The ground surface at the top of the well is 5 ft above mean sea-level. In the following bore log, the figure in brackets represents the thickness, in feet, of individual beds.

Feet	Thickness (feet)	
0 to 5	(5)	Silt
5 to 25	(20)	Sandy gravel
25 to 41	(16)	Coarse sand and gravel with shells and shell fragments
41 to 71	(30)	Coarse sand
71 to 80	(9)	Clay and sand
80 to 109	(29)	Sand
109 to 110	(1)	Sand with shells and shell fragments
110 to 155	(45)	Clay and sand
155 to 157	(2)	Log of wood (^{14}C age: 9900 ± 150 years)
157 to 182	(25)	Clay and sand
182 to 218	(36)	Gravel; pebbles well rounded, mostly less than 2 inches in diameter

Mr Richardson noted that all sediments in the well were very soft and not rusty (unoxidized).

Wood Sample

The top of the dated log of wood, 2 ft in diameter, was encountered 150 ft below present mean sea-level. Mr H. R. Orman, of the New Zealand Forest Service, identified the wood as *Podocarpus* sp. (probably *P. totara*). The age of the wood (Grid, ref. N 148/796206, N.Z. Fossil No. N 148/503) was determined at the Isotope Laboratory, Nuclear Sciences Division, D.S.I.R., to be 9900 ± 150 years.

Comments

It is tentatively assumed that the dated log was drift wood probably stranded in the intertidal zone and later buried beneath estuarine and/or shallow water marine sediments when sea-level rose as an accompaniment of the melting of the last ice sheets. If the land has been stable at the well site for the last 9900 years, it would appear that sea-level has risen 150 ft during this period; but this simple assumption is unsupported by any evidence. At present along the Manawatu coast the land is gaining at the expense of the sea due to both progradation and general emergence brought about by tectonic uplift. Terraces of the lower reaches of the Manawatu River near Palmerston North suggest that the later geological history has been characterized by general uplift. If there has been recent uplift at the well site, it would appear that sea-level has risen more than 150 ft in the last 9900 years. It must be emphasized, however, that there is no decisive evidence to indicate whether the land under discussion has been stable or tectonically elevated or depressed in recent time. Until further information becomes available, it may be tentatively submitted that study of the dated wood from the Foxton well suggests that sea-level may have risen about 150 ft during the last 9900 years.

In an overseas radiocarbon study of postglacial rise of sea-level, Shepard and Suess (1956, Fig. 1, p. 1083) show "radiocarbon ages relative to depths below sea-level" of 34 "samples

of wood and shell . . . believed to have been deposited essentially at sea-level." These authors note that in their figure "no correction has been made for compaction or subsidence from other causes," and also point out "that many more measurements from a variety of locations must be made before it will be possible to distinguish conclusively between eustatism, tectonic movements, and compaction." In their diagram, Shepard and Suess show several samples that may be compared with the Foxton sample, i.e., 3 samples about 9000 years old from about 70 ft below sea-level, 1 sample about 10,000 years old from about 120 ft to 130 ft below sea-level, and 1 sample about 11,000 years old from about 170 ft below sea-level. Brannon *et al.* (1957, pp. 921-2) discuss samples from southern Louisiana and the adjacent continental shelf that suggest that sea-level stood about 75 ft lower than at present 8800 years ago, about 110 ft lower than at present 8950 years ago, about 150 ft lower than at present 10,700 years ago, and about 165 ft lower than at present 11,200 years ago.

From Australia, Gill (1956, p. 136) has reported that "there is evidence in Melbourne of a lower sea-level which ^{14}C analysis shows to be synchronous with the Mankato glaciation. About 9000 years ago, the sea was at least 73 ft lower than now, and the climate was colder and wetter. The channels cut by the rivers as a result of the low sea-level reached at least 100 ft below the present level of the sea and may be as much as 150 ft."

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