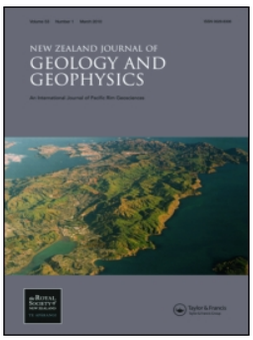

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# Late Holocene geology and archaeology of Parapara Spit, Golden Bay, New Zealand

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ABSTRACT

Parapara Spit is composed of three belts of dune sand, each exhibiting a different stage of soil profile development, which overlie fluvio-glacial outwash gravels. The oldest sand (Division 1), upon which soil formation began about 700 years ago, predates Maori occupation of the spit, and possibly began accumulating less than 1800 years ago. Further sand (Division 2), on which a soil began to form about 300 years ago, started to accumulate about 400 years ago, and overlies archaeological remains. These remains include a garden soil, with which a shell midden containing abundant bone is possibly contemporary. The most recent sand (Division 3), a continuing accumulation which began about 150 years ago, overlies the earlier soil (2) in which are shell middens containing little or no bone.

## INTRODUCTION

Few New Zealand archaeological sites appear to have been continuously occupied for more than 100 years. Cultural sequences are, therefore, normally determined from sequences of sites. It is an advantage to archaeologists if relative ages of sites can be determined prior to a large scale investigation. Radiocarbon dating is unsuitable either if many sites need to be dated, because of the delay in obtaining dates, or if sites are close together in time. However, sites can be ordered chronologically by stratigraphy, which depends on recognising widespread time planes to which sites can be related. This report is an attempt to give relative dates to archaeological sites and determine a sequence of cultural events at Parapara Spit in Golden Bay. It is a result of five days' investigation carried out under the *Historic Places Amendment Act 1975* to record archaeological sites on the spit.

Parapara Spit is a belt of sand between the Parapara River estuary and Golden Bay (Fig. 1A, B). The northern end of the spit, which is discussed in this report, is up to 250 m wide and 1 km long (Fig. 1C). It is composed of dune sands partly overlying fluvio-glacial outwash gravels which rest on mudstone. A lobe of the gravels extends in a north–south direction from the spit into the estuary. The spit was used by the Maori in prehistoric times for gardening and shellfish collecting, and by the European for farming and gold prospecting.

Archaeological sites are located on the outwash gravels and on the dune sands, but only those on the dune sands could be stratigraphically dated. Buried soils and ground soils (soils which are still forming) define ground surfaces on which the Maori lived and are recognised here as time planes. It is assumed that archaeological remains which are part of a topsoil are younger than the beginning of soil formation.

Maori gardens may be identified as soils to which gravel or grit has been added by man to lighten them and make them more suitable for the cultivation of tropical plants. This was a technique commonly used by the Maori after European contact (Best 1925; Challis 1976). Here, such soils of prehistoric age are assumed to have been used for gardening.

Evidence of shellfish collecting comprises shell middens: deposits of shells up to 400 $m^2$ in area, and 30 cm thick, sometimes containing bones, charcoal, and oven stones.

The gardens and shell middens are all in well-drained situations. Soils on the outwash gravels are clay, and are generally poorly drained. The only archaeological site found on the gravels (S3/15*; Fig. 1C) is at the south end of the lobe where drainage is better. No sites were found on low-lying parts of the sand spit.

## FORMATION OF PARAPARA SAND SPIT

Soils on the sand spit show three stages of profile development. Differences between the soils are sharp. The sand spit appears to have formed during three successive stages of sand accumulation. Each deposit of sand and its soil is considered to be a Stratigraphic Division, and to be a time division. The divisions are identified (from oldest to youngest) as 1, 2, and 3. Each division consists of two parts: a time of sand accumulation and a time of soil formation. The parts are possibly caused by variations in the amount of sand carried by long-shore drift: sand accumulation occurring when the amount is large; soil formation when the amount is small. Times of sand accumulation correspond to dune building phases formalised by Cowie (1963) in the Manawatu district. The chronological sequence of Stratigraphic Divisions inferred from the soils is confirmed by stratigraphy: younger sands overlie older sands and soils (Fig. 2).

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*N.Z. Archaeological Association Site Number.

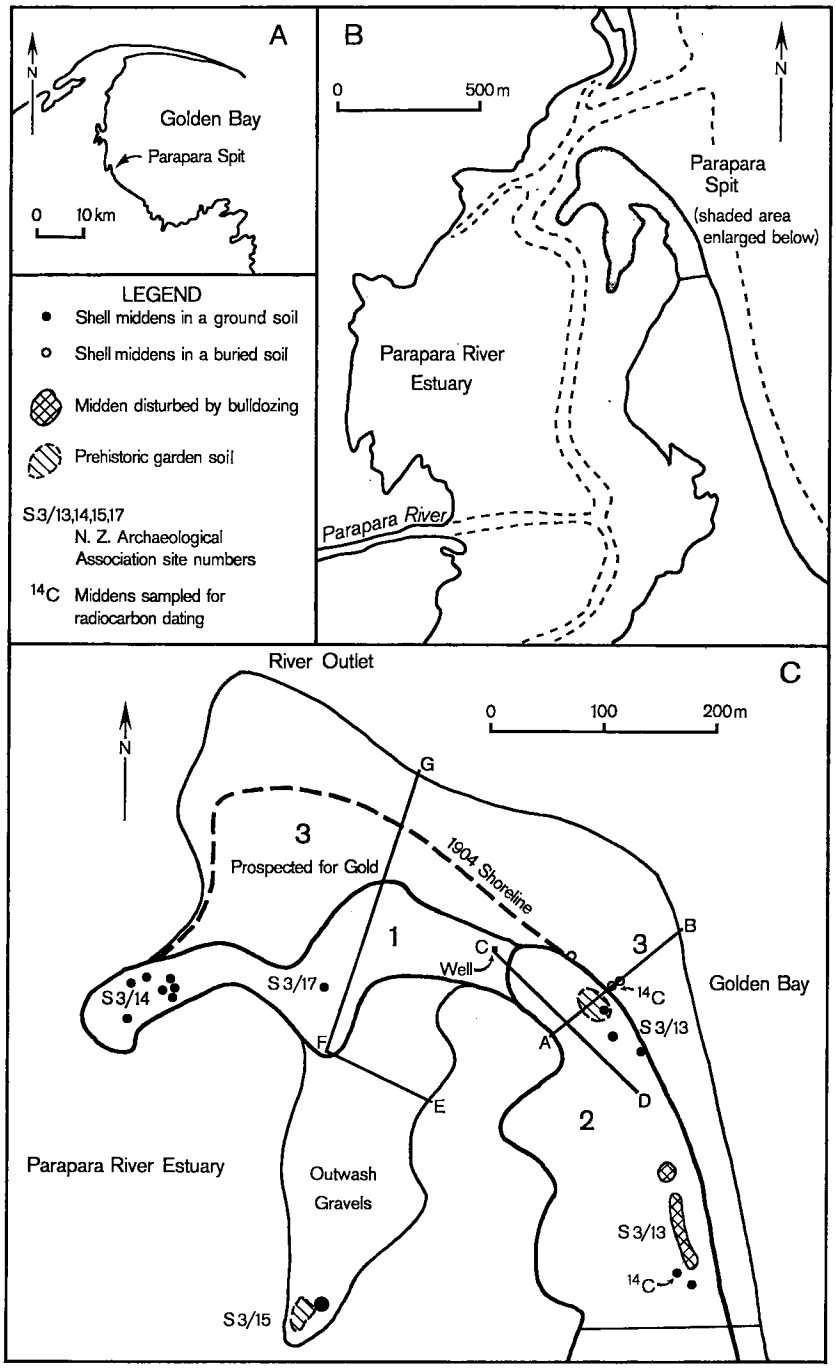


FIG. 1—Parapara Spit, Golden Bay (Grid reference S3/100980).
A & B—Location of the spit.
C—Sketch plan of the study area. 1 = Stratigraphic Division 1 ground soil (up to 700 years old); 2 = Stratigraphic Division 2 ground soil (up to 300 years old); 3 = Stratigraphic Division 3 sand (up to 150 years old). Cross-sections A–B, C–D, E–F–G are shown in Figs 2A, B, and C.

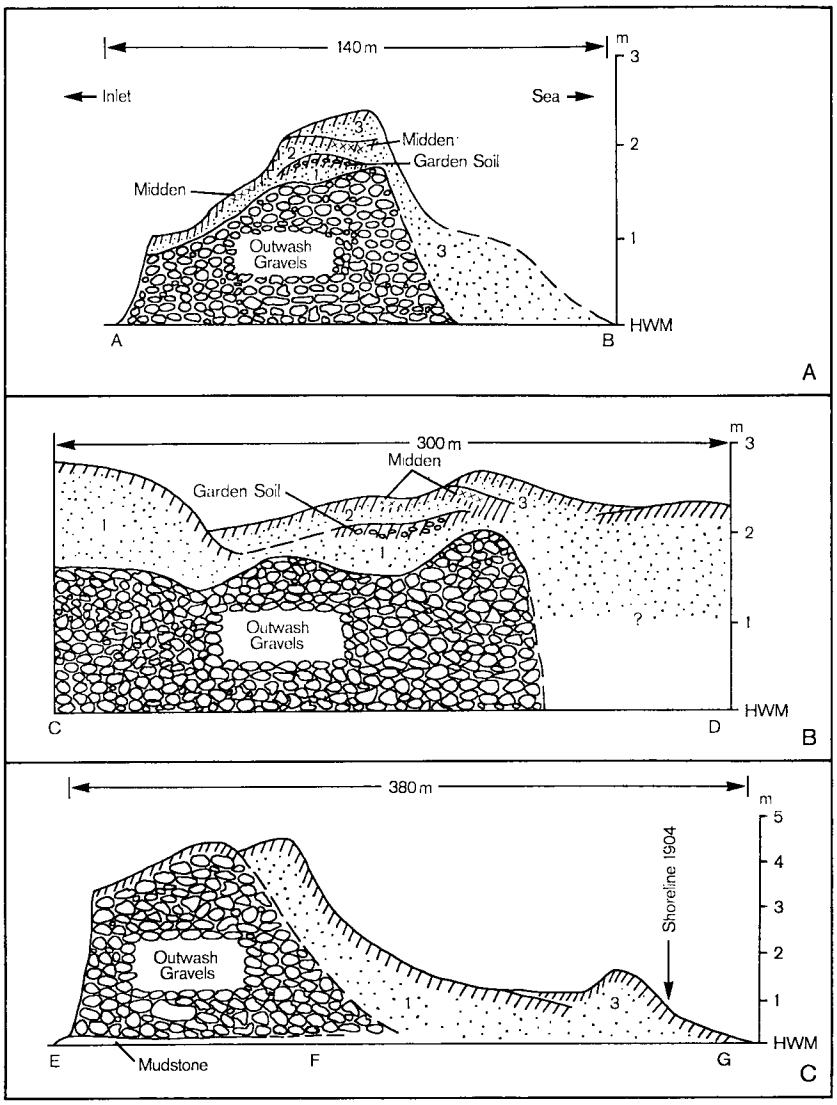


FIG. 2—Generalised cross-sections (see Fig. 1C for locations). Soils are shown by line-shading.
A — Cross-section A–B. Note garden soil in Division 1 soil; shell midden in Division 2 soil; and truncated seawards edge of outwash gravels and Division 2 sand and soil.
B—Cross - section C–D. Note garden soil in Division 1 soil; and shell midden in Division 2 soil.
C—Cross-section E–F–G. Note position of 1904 A.D. shoreline.

### *Stratigraphic Division 1* (oldest)

Sand of Stratigraphic Division 1 is a belt up to 70 m wide towards the north end of the spit (Fig. 1C), and rests directly on the outwash gravels (Fig. 2). Present vegetation is pasture, but Division 1 soil is black suggesting a former scrub vegetation.

Ground soil on Stratigraphic Division 1 sand is a well-defined topsoil over a subsoil defined by its colour. A typical profile is:

(cm)

0–30 Black (10YR 1·7/1) very friable to friable sand; weakly to moderately developed fine and medium crumb, granular, and fine nut structure; indistinct, irregular boundary.

30–55 Dark brown (10YR 3/4) with many fine distinct black (10YR 1·7/1) mottles, weakly coherent sand; single grain; indistinct, irregular boundary.

55–70+ Brown (10YR 4/6) sand; single grain, loose.

Division 1 ground soil profile development is similar to that of ground soils on Motuiti dunes in the Manawatu district. Motuiti soils, described by Cowie (1963; 1967), began forming a little less than 800 years ago, dated by radiocarbon (Cowie 1963); and a little more than 600 years ago, dated by radiocarbon from an archaeological site excavated by one of the writers (B.G.McF.) near Foxton. Division 1 ground soil, because of its similar degree of profile development to Motuiti soils, is thought to have begun forming from 600 to 800 years ago.

It is not known for certain when Division 1 sand began accumulating. No pumice from the 1800-year-old Taupo Pumice eruption was found within it. Sands which appear to have accumulated since the Taupo eruption at Mount Maunganui (Stage 2 dunes; Pullar & Cowie 1967), and in the Manawatu district (Motuiti dunes; Cowie 1963), carry soils with a similar degree of profile development to Division 1 soil. It is thus possible that Division 1 sand has also accumulated since the Taupo eruption.

### *Stratigraphic Division 2*

Sand of Stratigraphic Division 2 is a belt up to 200 m wide and 400 m long on the southeast part of the spit (Fig. 1C). At its northern end the belt overlies Division 1 sand; at its southern end the base of the sand was not reached at 1 m above high water mark (Fig. 2B). Present vegetation is pasture.

Ground soil on Stratigraphic Division 2 sand is a well defined topsoil on loose sand. A typical profile is:

(cm)
0–18 Brownish black (10YR 2/2) weakly coherent sand; fine to medium weakly developed granular and crumb structure, with some single grain; distinct irregular boundary.
18–55 Dark olive-brown (2·5Y 3/3) sand; single grain, loose; rare charcoal.

There is no direct date for the beginning of Division 2 sand accumulation, or of Division 2 soil formation. From the degree of development of the Division 1 buried soil, Division 2 sand is estimated to have begun accumulating about 400 years ago. From the degree of profile development of the Division 2 ground soil, Division 2 soil is estimated to have begun forming about 300 years ago.

The estimated dates for Division 2 sand accumulation and soil formation are in general agreement with radiocarbon dates of shells taken from middens in Division 2 soils: pipis (*Paphies* (*Paphies*) *australe*), from a midden in soil buried by Division 3 sand, gave a radiocarbon date of 480 ± 50 years B.P. (NZ 4506A); tuatuas (*Paphies* (*Mesodesma*) *subtriangulatum*), from a midden in ground soil, gave a radiocarbon date of 510 ± 40 years B.P. (NZ 4505A). The pipi and tuatua dates, after a shell standard correction of −55 years (McFadgen 1978) and half-life correction, give a minimum date for Division 2 sand accumulation and subsequent soil formation of 575–315 years ago (NZ 4506 ± 2 standard errors), and 575–355 years ago (NZ 4505 ± 2 standard errors).

Division 2 sand is absent seawards of the outwash gravels, and Division 2 soil appears to have been cut back along the seaward edge of the outwash gravels (Fig. 2A). Division 2 soil is overlain by Division 3 sand which mantles the seaward edge of the outwash gravels. The spit is thus thought to have been eroded by the sea after Division 2 soil began to form, and before Division 3 sand was deposited.

### *Stratigraphic Division 3* (youngest)

Sand of Stratigraphic Division 3 is a belt up to 250 m wide around the seaward edge of the spit. According to local residents, gold was prospected immediately north of the boundary between Division 1 and Division 3 soils (Fig. 1C) using a dragline. Parts of the dragline still remain, and Division 3 soils and sand in the area are badly disturbed. The outer edge of the belt is bare of vegetation; the inner part is under pasture.

Ground soil on Stratigraphic Division 3 sand has a topsoil less well-defined than that of Divisions 1 and 2. A typical profile from an area unaffected by the dragline is:

(cm)
0–8 Brownish black (10YR 3/2) loose sand; single grain and very weakly developed crumb structure; distinct irregular boundary.
8–25 Olive-brown (2·5YR 4/3) loose sand.

About half of the belt of Division 3 sand has accumulated since 1904 A.D., indicated by an old shoreline shown on a contemporary cadastral plan, 763/40BI, held in the Nelson District Office of the Department of Lands and Survey. Assuming a constant rate of sand accretion, the inner part of the belt is less than 150 years old.

## ARCHAEOLOGICAL REMAINS

European archaeological remains include a well, 1·5 m deep, dug into Division 1 sand (Fig. 1C). The well has a layer of stones at the bottom in which were found two rusty nails.

Prehistoric archaeological remains include two garden soils (S3/13, 15), 14 shell middens with little or no bone (S3/13, 14, 17), and one shell midden with abundant bone (S3/15; see Fig. 1C). All shell middens contain species locally available. All bones are of fish and, in the midden with abundant bone, post-cranial bones indicate several species both large and small. One garden soil (S3/15) abuts the midden with abundant bone and covers 152 m². It is composed of fine beach gravel and grit added to the clay soil on the outwash gravels. The midden and garden are probably both the same age. The other garden soil (S3/13) covers about 400 m² and is composed of outwash gravels added to Division 1 soil (Figs 2A and B).

Of the 14 shell middens with little or no bone, 8 can be fairly accurately dated by stratigraphy. Three are in the Division 2 buried soil, and five are in the Division 2 ground soil, which indicates an age for the middens of less than about 300 years.

The other six shell middens with little or no bone are all on the Division 1 ground soil, which gives them a maximum age of about 700 years. No shell middens were found in the Division 1 buried soil, nor in the Division 3 ground soil. It is, therefore, thought likely that all shell middens with little or no bone are between 300 and 150 years old.

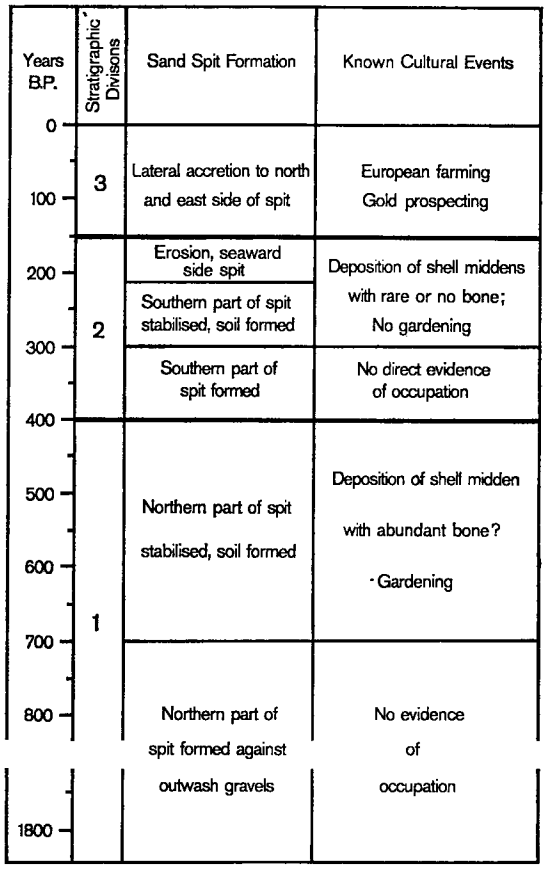


FIG. 3—Summary of late Holocene geology and archaeology, **Parapara Spit.**

Of the two garden soils, that in the Division 1 soil can be dated by stratigraphy. It is covered by Division 2 sand and is between about 700 and 400 years old.

The shell midden with abundant bone, and the second garden soil are not on, or covered by, sand and could not be dated by stratigraphy. Division 2 soil nowhere showed evidence of added gravel or grit and is thought to have been uncultivated in prehistoric times. It is, therefore, considered likely that the second soil is the same age as that in the Division 1 soil, and that the associated shell midden with abundant bone is also between about 700 and 400 years old. This age should be confirmed by radiocarbon.

## CONCLUSIONS

The sequence of spit formation, and of known cultural events determined by the field work, is summarised in Fig. 3.

The northern part of Parapara sand spit formed first when sand (Stratigraphic Division 1) began accumulating against old fluvioglacial outwash gravels more than 700 years ago, and possibly as early as 1800 years ago. Sand accumulation stopped, or slowed down, about 700 years ago and a soil (Division 1) formed.

The southern part of Parapara Spit formed next, when sand (Stratigraphic Division 2) accumulated, between 400 and 300 years ago. After sand accumulation stopped, or slowed down, a second soil (Division 2) formed.

The seaward edge of the spit was eroded less than 300 years ago, and probably as recently as 150 years ago.

The present seaward edge of the spit (north and east sides) formed most recently by lateral accretion of sand (Stratigraphic Division 3) within the last 150 years.

Earliest evidence of prehistoric occupation, a garden in Division 1 soil overlain by Division 2 sand, is between about 700 and 400 years old. A shell midden, tentatively dated to this time, contains abundant fish bone. Younger evidence of prehistoric occupation, shell middens with rare or no bone in Division 2 soil overlain by Division 1 sand, is between 300 and 150 years old. There is no evidence of prehistoric gardening within the last 400 years.

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