

Towards the Development of Colonial Archaeology in New Zealand. Part 2: Early Settlement Patterns in Southern New Zealand

PETER J. F. COUTTS

This paper is concerned primarily with determining the forms of domestic dwellings associated with Maori, sealing and whaling settlements in southern New Zealand, as well as with the exploration of some of the factors that influenced settlement location. Maori influences on European domestic architecture and vice versa are examined also. Relevant historical sources are surveyed and the author, who is an Honorary Senior Research Fellow in the Department of Archaeology, La Trobe University, Melbourne, summarises the results of his own archaeological researches in southern New Zealand. The aim of this exercise is to establish criteria that will enable archaeological manifestations of these settlements to be identified and interpreted. The results of the study indicate that very little is known about the three forms of settlement generally or in relation to specific settlement sites. The evidence suggests that there were considerable degrees of adoption by both Maori and Pakeha which in some instances (eg. sealing settlements) could have created complex archaeological records that may be difficult to interpret.

INTRODUCTION

In the first of these two papers, published in Volume 1 of this journal, I discussed the range of building materials and their availability to 19th-century colonists, in southern New Zealand. The present paper describes the archaeological and historical evidence for the period *circa* 1773–1850, relating to the siting of Maori, sealing and whaling settlements in southern New Zealand, the major buildings or features associated with them, the relationships between the different forms of settlements and the changes in building styles and functions that have occurred through acculturation and adaptation. The study area is confined to the coastal margins of Otago, Southland and Fiordland (Fig. 1). The objects of this paper are to identify areas of potential archaeological interest and to describe the structural evidence that one could expect to find during archaeological investigations of these settlements.

Sealing commenced in New Zealand in the late 18th century and continued until about 1820, when the seal populations were depleted to the extent that the industry was no longer economically viable. During this period sealing gangs were deposited on the New Zealand coastline near major sealing rookeries for periods ranging from a few months to several years. Some gangs lived in caves, others built houses or occupied Maori houses. Hence considerable adaptation was involved. Contacts with the Maori population were not always amicable. The sealers introduced the Maori population to Pakeha (European) material culture, and there is no doubt that the presence of sealers initiated changes in traditional Maori settlement patterns, though the extent of the impact is still being documented.

As sealing declined, whaling increased and in 1829 the first shore-based whaling station was commenced at Preservation Inlet in Fiordland. A string of shore-based whaling stations was eventually located around the east coast of the South Island from Preservation Inlet to Banks Peninsula. The presence of these stations, together with the growth of bay or shore-based whaling, precipitated dramatic changes in Maori culture, many of which are well documented. For a time, many of the whalers adopted aspects of Maori culture and cohabitation with Maori women was common.

The expansion of the whaling industry around New Zealand contributed to the growth of political, social and racial problems which in the end led the British Government to colonise New Zealand. The whales, like the seals, soon disappeared and by the end of the 1840s shore-based whale industries were finished in southern New Zealand, though they lingered on into the 20th century in other parts of the country. Many of the ex-whalers stayed on to play various roles as pioneers in the new colony.

SOURCES OF INFORMATION

The sources of information for this study are mainly literary. There is little detailed information available on Maori housing for the early period of contact between sealers and Maori in southern New Zealand. The first descriptions of traditional Maori houses were made by Cook's party at Dusky Sound in 1773,¹ but it is not until the 1820s that descriptions of houses and village sites become available for the Foveaux Strait Maori.²

Drawings and descriptions by Barnicoat³ and the Reverend Wohlers⁴ are the best that are available for this area. There are also a number of early maps that show the locations of Maori villages at various times throughout the first few decades of the 19th century, commencing with W. L. Edwardson's charts of Ruapuke,⁵ together with others of Foveaux Strait,⁶ dating from 1823.

Whilst there is much literature on the sealing period in southern New Zealand,⁷ it tends to be of highly generalised nature, lacking the detail useful for the archaeologist. There are references to habitation sites scattered throughout these sources, but with few exceptions details of their locations and construction are rare. Even the recently discovered Boulton journal, which gives us a graphic picture of sealing around Fiordland and Foveaux Strait, covers the dying phases of the industry (1825–1829), and specific details of housing and economy are few.

Documentation for the whaling period is better. General works such as Morton (1982) give the industry context, and McNab's *Old whaling days* (1913) contains detailed information. In addition there were many contemporary observers:

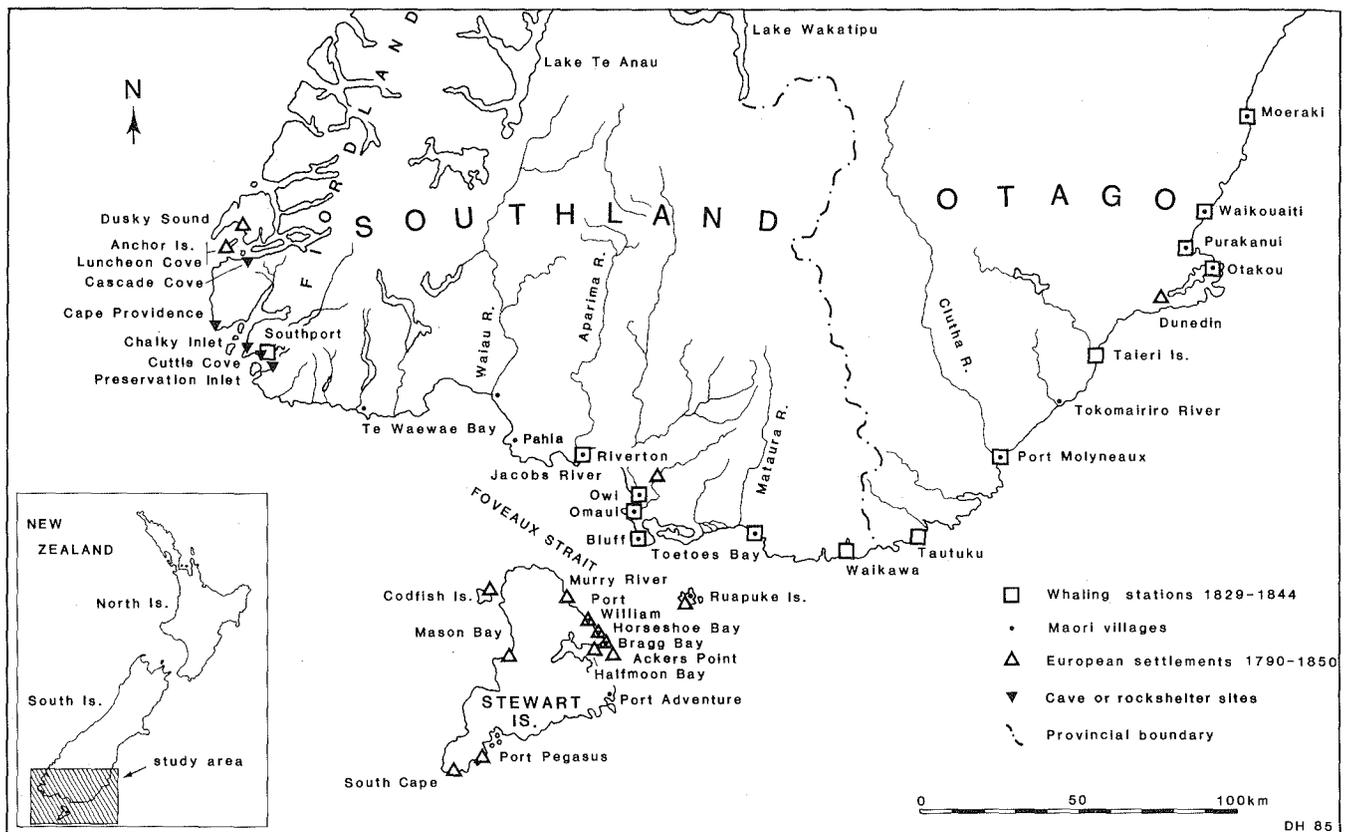


Fig. 1: Location map showing sites mentioned in text.

members of the New Zealand Company such as Monro (1844), Barnicoat (1844), Tuckett (1844) and others such as Shortland (1851) the Protector of Aborigines, and Bishop Selwyn (1844) who journeyed along the coast of the South Island around 1843–1844 and whose journals contain useful impressions of the whaling stations. Contemporary records from the Weller brothers whaling station at Otakou have survived. Then there are several relevant maps showing the precise locations of the stations, a few line drawings and even some photographs.⁸ In spite of this wealth of documentation, much detail is missing. Descriptions of housing are vague, as are details of the domestic economy.

Prickett⁹ has recently discussed traditional Maori dwellings at some length, considering the greater corpus of data that are available for the whole of New Zealand. His interest is essentially to determine what features might be anticipated in the archaeological record and how these could be interpreted. To this end he has found some consistency in plan proportions, porch door and interior shapes.

Relatively little relevant archaeological work has been conducted in the study area. I have conducted site surveys and some excavations in Dusky Sound, Southport, Chalky Inlet, Preservation Inlet, Ruapuke and Taieri Islands. In Dusky Sound I have discovered floor depressions of Maori houses and possible archaeological manifestations of sealers' camps.¹⁰ At Southport I have investigated several cave sites which were occupied by Maori who were clearly in contact with sealers, and at Preservation Inlet I have found evidence of a whaling site at Cuttle Cove. On Ruapuke I have located many archaeological manifestations of Maori house sites as well as a few house sites that were probably constructed by Europeans, possibly sealers. On Taieri Island I located four house sites that were occupied by whalers in the late 1830s to early 1840s. I have also examined the sites of the whaling stations that were once situated at Otakou and Waikouaiti.

The Begg brothers have covered much the same ground at Dusky Sound, Chalky and Preservation Inlets, where they found locations of Maori, sealing and whaling sites.¹¹

The net result of this cursory archaeological work is additional knowledge about one of the Taieri Island whaling sites and raised expectations in respect of Maori and sealing domestic sites.

MAORI SETTLEMENTS

In pre-European times southern New Zealand was sparsely inhabited. The first European visitors to the Foveaux Strait area found the Maori living in small permanent coastal villages. These dotted the coastline from the mouth of the Waiau River to the Banks Peninsula. The evidence available suggests that in the Foveaux Strait area prior to 1818 Maori villages were located at Pahia and Toetoes Bay, at the mouths of the Waiau, Clutha (Port Molyneux) and Tokomairiro Rivers, and in Otago, around the harbour entrance.¹² Ruapuke and Stewart Islands do not appear to have had permanent villages until sometime after 1818, but the documentary evidence is somewhat ambiguous.

Until European vegetables and root crops were introduced into New Zealand the economy of the southern Maori was based on hunting, fishing and gathering. During the warmer months of the year the Maori left their villages to embark on expeditions to places such as Stewart, Ruapuke and other offshore islands, Maitai and remote areas including Milford and Dusky Sounds, Lake Te Anau and Lake Wakatipu, where food and raw materials were collected and brought back to the coastal villages.¹³ Much of this food was preserved and stored for consumption during the winter, when inclement weather and diminished food availability reduced opportunities for hunting and gathering.

This highly seasonal settlement pattern meant that Maori were continually moving to and fro from the permanent village sites to food-rich resources areas and this mode of existence was reflected in the different forms of housing used at the

permanent villages and at seasonal stations such as those located in Fiordland. Permanent village sites needed to be carefully selected: they needed safe harbours where canoes could be easily beached and where they could tap the maritime resources in most weathers. Wherever possible it was desirable to make their camps adjacent to major river systems, which gave them easy access to the resources of the interior. They also needed to be located in defensible positions. Later, when agriculture became important, proximity to arable land was essential. Edwardson, describing aspects of the Maori in Foveaux Strait in 1823, summed it up thus: 'In building their villages the natives select the slope of a hillock facing a point on the beach where they can land and remove everything which could prevent their seeing the canoes and ships arrive'.¹⁴

As one might expect, site location whilst on their seasonal rounds was somewhat constrained, depending on the type of resources being sought and where they were located. In general, housing erected during seasonal expeditions was expedient and temporary.

The prevailing weather conditions and the type and availability of building materials were important factors influencing the form of Maori habitations. Today most of the coastal areas of Southland and Otago receive over 900mm of rain annually while mean temperatures fluctuate around 13°C in summer and 6°C during winter.¹⁵ The incidence of rain is fairly even throughout the year (about 70–110mm per month) and there is a marked increase in the average frequency of ground frosts between May and August. It is clear then, that waterproof and warm housing was necessary, particularly during winter. In Fiordland, which has a much higher annual rainfall (in excess of 4000mm) and where extremes of weather produce a very hostile environment, the need for effective housing was even more pressing.

In most coastal areas building materials were readily available. Flax and timber (as well as fuel) were abundant and their degree of exploitation was limited only by the amount of labour and the type of tools available. Before the arrival of European timber was cut and shaped with stone tools, a time-consuming and tedious procedure.

The resources of Fiordland were exploited on a seasonal basis and the huts seen in this area by early observers were an adaptation to counter the extremes of that environment. During Cook's stay at Dusky Sound in 1773 his staff observed several huts. At Cascade Cove they were 1.2 to 1.5m high, made of bark and the leaves of the flax plant.¹⁶ They were circular in plan, round on top like an arched vault and were situated in the thickest part of the bush. There were several fireplaces in front of the huts.¹⁷ Menzies¹⁸ and Raven,¹⁹ slightly later observers, saw similar huts, some associated with shell dumps. They had very small entrances and could accommodate five to six people.

Richard Henry observed the remains of many Maori hut sites on the islands in Dusky Sound during the late 19th century, but these may not all date from the 18th and early 19th centuries and could be later, as it is known that Maori continued to seal in the Sound long after the sealing industry became uneconomic.²⁰ Henry observed hut sites at Luncheon Cove on Anchor Island, around Anchor Island,²¹ on Maori Island where he describes two huts each with a fireplace and built and floored with tree-fern stems,²² and on Indian Island,²³ where he located stone-lined pits. However, until these sites have been investigated there will always be some doubt about whether they are Maori or European sites.

Some Maori chose to occupy the numerous caves and rockshelters found in Fiordland. Small rockshelters at Cascade Cove were used and the many caves around the margins of Southport and Chalky Inlet have abundant evidence of occupation.²⁴ Most of these sites show evidence of adaptation. The floors of the cave sites at Southport and on Long Island in Dusky Sound, have been partitioned for different activities. Similarly, a cave discovered in 1842 at Preservation Inlet was found to be partitioned in the middle, the inner part, presumed

to be a sleeping area, was covered 'with feathers of different birds'.²⁵

During my archaeological surveys at Dusky Sound, I observed many rectangular depressions that are probably sealers' camps or Maori hut sites. However, no circular depressions were discovered. Generally speaking, the rectangular depressions were of the order of 4 × 2.5 to 3m. Those on Indian Island were adjacent to stone-lined pits, no doubt the same ones observed by Henry and later by the Begg brothers.²⁶ If these rectangular depressions are archaeological manifestations of Maori huts, they may reflect a basic change in the settlement pattern during the post-contact period. Round houses may have been associated with highly seasonal but irregular and opportunistic journeys to Fiordland during the late prehistoric period, whereas the rectangular dwellings, the traditional form of Maori dwelling constructed in Southland (see below), may have been associated with task-specific and perhaps more patterned journeys to Fiordland during the colonial era.

There are few early descriptions of the coastal villages further east, and none of these are detailed (Fig. 1). They are available for Port Molyneux in 1830,²⁷ Stewart Island in 1810 and 1826,²⁸ Pahia in 1824,²⁹ and there are some general comments on housing in the Foveaux Strait area for 1822.³⁰ These sources indicate that the villages comprised clusters of huts or *whare*. At Pahia, for example, there were some forty to fifty houses, and there were about sixty houses at a village site on Ruapuke Island.³¹ The houses had rectangular plans with vertical posts which supported central beams, the sides and ends being clad with the stems of the tree fern, and roofs thatched variously with grass, tea tree or flax. At Pahia the side walls of some of the houses were about 60cm high and some 10m long, but they were very high at the centre. Edwardson, speaking generally of the houses found throughout the Strait, claimed³² that they were about 4m long × 3m wide × 5m high, so that there were at least two basic structures: one small, the other large. The houses had very small entrances at one end, which usually served as windows, doors and exits for smoke from interior fireplaces. The entrances were guarded by porches and an illustration of one of these houses at Pahia suggests that some of them may have had windows.³³ The floors were covered with flax or fern fronds. The *whare* were sometimes decorated with 'rude carvings intended to represent the form of a man's head and face hideously distorted'.³⁴ Inside there were 'bed places' which were raised about 90cm above the ground. These appear to have been constructed from flax which was worked into a wickerwork design. Houses were frequently decorated with red ochre.

The arrival of Europeans in the Foveaux Strait area had a marked effect on the Maori (as elsewhere in New Zealand) who by 1810 had become horticulturalists, adopting the European potato and other vegetables.³⁵ The Maori stored food in store-houses situated on platforms, supported by either one or four tall poles, often heavily decorated.³⁶ This measure was particularly pertinent to protect food against the ravages of the introduced European rat. The store-houses were entered by crude ladders of notched poles.³⁷

The introduction of horticulture made it possible for Maori to remain in villages all year round. The land was cleared, vegetables needed to be planted, plots weeded and harvested at specific times of the year. This trend towards a more stable residence pattern continued after the introduction of the pig into southern New Zealand (before or about 1823). The pig lived on fern root, a traditional Maori food, so that either it or the vegetable gardens had to be fenced in.³⁸ The labour required to construct fences, to keep them in good repair, and the need for constant vigilance and maintenance of gardens and stock, precipitated changes in social organisation. Gardens were usually situated close to the houses.³⁹

With the arrival of Europeans came an increasing demand for their artefacts. Some Maori uprooted themselves from their traditional Maori villages and built new *whare* in close

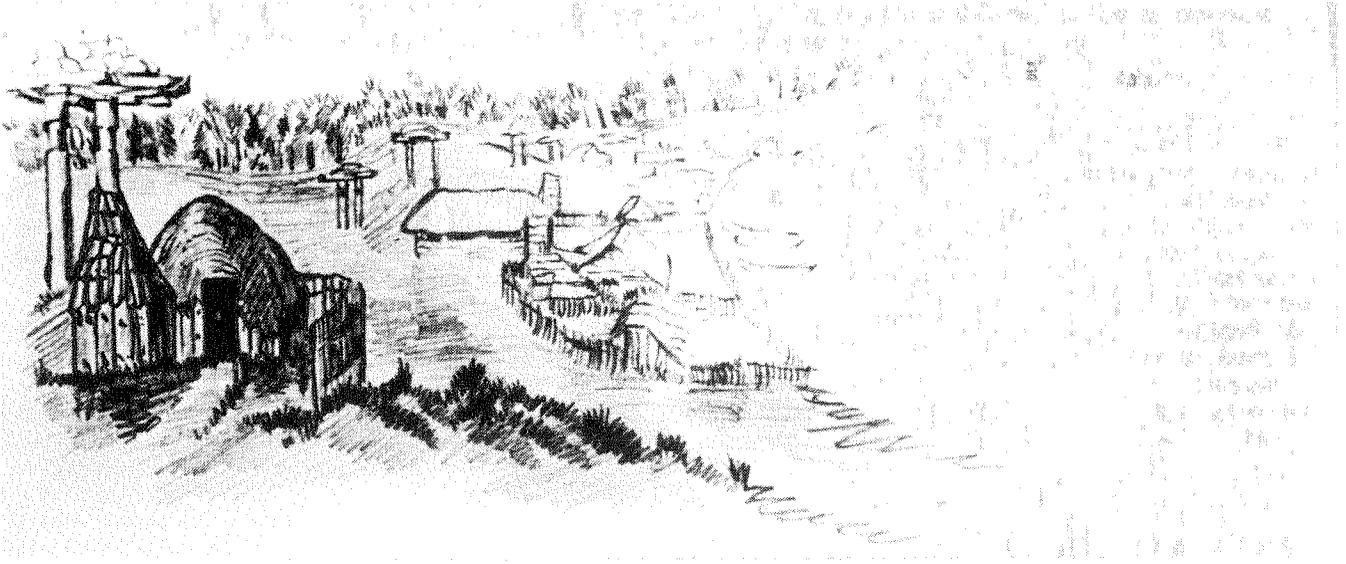


Fig. 2: Ruapuke Island, probably Henrietta Bay, showing houses and Maori food stores. J. W. Barnicoat May 1844. Reproduced by courtesy of J. J. Barnicoat, Wellington, and of the Hocken Library, University of Otago, Dunedin.

Sketches by Barnicoat made in 1844 (G. C. Thomson Collection, Hocken Library) depict two types of house, one corresponding to Wohlers's description, the other differing only in that it has no window. One sketch⁴⁴ shows a traditional type of *whare* with a rectangular plan, 7.6 × 5.5m. The building has a gabled roof and the eaves overhang the walls. There are two central posts which support a ridge beam and rectangular battens are tied to the wall plates at regular intervals around the interior of the *whare*. The roof and walls seem to be clad with bundles of flax or grass that are neatly held in position by external battens. The interior is divided into three sections: a central area about 90–120cm wide running the entire length of the *whare* and on which hearths were located; and two 'sitting and sleeping' areas on either side, which were covered with mats. The house has a narrow front porch and a low doorway that is off-centre. It would thus seem that the smaller *whare* differed from the common houses only in size and in the cooking and heating arrangements within them.

There were at least two other types of building on Ruapuke Island at this time. First there was the chief's house (Tuhawaiki's) which Wohlers described as a:

'rough cottage built of boards, with a thatched roof, and a door and two small square windows in the front. The interior consisted of two small bedrooms, in which the bedsteads were fashioned after those in a ship's cabin, and a lean-to which served as kitchen and dwelling-room.'⁴⁵

Barnicoat sketched this house (31 April 1844) and it is difficult to correlate certain aspects of the sketch with Wohlers's description. Clearly the house was rectangular in plan with a partially enclosed porch, but there does not appear to be a chimney in his sketch. Fortunately in his journal Barnicoat does say that it had a chimney and a glass window.⁴⁶ He also observed that the house was 'much in the style of an European cottage'. Bishop Selwyn, who saw this house in 1844, confirmed that it had two bedrooms, and that one of the rooms had a large fireplace and chimney and the other had a boarded bed place.⁴⁷

The other type of house also had a crude chimney and is likely to have been the type of dwelling occupied by the few Europeans living on Ruapuke Island at the time. Barnicoat sketched a hamlet scene which depicts a total of seven buildings, three of which have chimneys (Fig. 2). The latter

proximity first to the settlements of European sealers and later to those of the shore-based whalers, with both of whom they hoped to trade. In the early days it was the sealing settlements that caused some of these movements; then as sealing declined some of the sealers stayed on, settling in places such as Codfish Island, Ruapuke, Port Pegasus and Pahia. By 1844 there were seven permanent villages and hamlets on Ruapuke Island where there had been only one in the 1820s, at least four on Stewart Island where there had at one time been none, and three villages at Otago harbour instead of only one as had been the case in 1822.⁴⁰

It was not long before Maori architectural styles began to reflect this close contact with Europeans. When the Reverend J. Wohlers arrived at Ruapuke Island to take up residence in 1844, he observed several hamlets on the island. They were situated on dry ground, mostly on sandhills near the sea. He distinguished between family *whare* and common houses. Every hamlet had a common house. It was:

'twice as long as broad, and, on the whole, a roomy building. At the fore-end, roof and side walls reached two or three yards [1.83–2.74m] further than the forward wall, and formed an open porch in front. The pillars and rafters of such houses were ornamented with artistic carving, the figures often as grotesque as those in London Punch.'⁴¹

A passage about 75cm wide extended the whole length of the common house and on both sides there were platforms about 45cm above the ground. They consisted of sticks about finger thickness closely laid together and fastened to a joist, forming a floor similar to basket work. One or two hearths were situated inside the structure, although all cooking was done outside. A series of two or three posts were situated on the right hand side of the central passage. Roofs and walls were thatched on the inside with reeds and the older houses were ornamented with artistic patterns carved on wooden panels. The outside of the walls and roof were thatched with grass.

Earlier literary sources make no mention of common houses and some scholars believe that they were constructed to house European visitors. Alternatively they may have been chief's houses, the function of which was changed to accommodate new demands.⁴²

There are several descriptions of *whare* for this period as well as one detailed plan and elevation. Wohlers described them as 'very low dwellings with doors which were barely two feet [0.61m] high and broad so that one could only crawl in on all fours. A little higher up there was another opening of the same size to let light and air in and the stinks out'.⁴³

are appended to the main buildings. They may have had stone hearths, but the chimneys themselves were made of wooden planks. The other four buildings in his sketch are three *whare* and a form of shed. The latter appears to be an auxiliary structure linked with one of the chimneyed buildings. Each of the chimneyed houses is surrounded by a picket fence, in contrast with the traditional *whare*. The hamlet is situated on a large, open, grassed and slightly undulating area, marginal to the beach. Flax or scrub can be discerned on the horizon. Three canoes or whaleboats are drawn up on the beach and five food stages are associated with the houses.

On Ruapuke Island many rectangular depressions are in evidence, some associated with the remains of stone hearths. Thus two rectangular depressions investigated are $6.5 \times 3\text{m}$ and $6.0 \times 4.5\text{m}$. A test pit in the centre of one of these depressions revealed a small hearth. Hence they are likely to be *whare* sites. They are smaller than the *whare* drawn by Barnicoat, but my length measurements do not include the porch, which would be difficult to detect on the basis of surface features only.

The floor plans of the houses with stone chimney foundations vary, the biggest being $9 \times 5\text{m}$ and the chimney foundations are large affairs that take up most of one wall of the buildings. There is no obvious evidence that the buildings were partitioned inside.

Thus on Ruapuke Island there seems to be archaeological evidence for both traditional and adaptive forms of housing, and the dimensions of these houses are by no means exceptional.⁴⁶ Further investigations are needed to define the archaeological manifestations more precisely.

By 1852 nearly all the Maori houses on Ruapuke had weatherboard chimneys and European style stone hearths. They also had bedsteads and many of the houses were partitioned; some even had wooden floors.⁴⁹

The house styles at other coastal villages appear to have undergone similar changes.⁵⁰ In 1843, for example, Edward Shortland⁵¹ observed a lofty Maori house at Waikouaiti. It had a door opening on wooden hinges, a window, fireplace and chimney, and bed places built like a stage raised about 25cm above the ground. He speculated that these 'peculiarities were probably borrowed from the whalers' huts, to which they bore a general resemblance'. This tendency to borrow elements of European architecture continued as late as 1880 when the Reverend Christie, describing a Maori house at Waikouaiti, noted that its front walls were covered with weatherboards and protected by a verandah about 120cm wide with a paved stone floor.⁵²

Again, when J. T. Thomson visited Riverton (Jacobs River) in 1857, he found that Maori house styles imitated their European counterparts. Each house had a large chimney at one end, the interior of which was lined with clay. The exterior walls of the houses were constructed from planks and the roofs were made from thatch or shingles.⁵³

SEALING SETTLEMENTS

The first sealers began arriving in the coastal areas of southern New Zealand from 1792. Gangs of up to a dozen men were dropped off at strategic points along the coastline and on the islands and inlets near the sealing rookeries, for several months at a time. They were variously supplied with several months provisions, but were frequently forced to live off the land. Since sealers were transient, we might expect this to be reflected in their buildings.

Whilst site location tended to be constrained because of the requirement that they be near the seal rookeries, there were other factors that needed to be considered when choosing camp sites: proximity to water, availability of raw materials such as firewood, and timber, tree fern and flax for constructing shelters, and proximity to safe areas to draw up their boats. Defensive potential of the sites was also a consideration,

particularly in the period 1800–1825 when relations between Maori and European were frequently hostile. In some instances it is even possible that the soils of an area were an important consideration, since sealers often endeavoured to grow their own vegetables.

The approximate locations of many early sealing areas can be determined from historical sources. These include Taumaka Island north of Jacksons Bay;⁵⁴ Anita Bay in Milford Sound;⁵⁵ Dusky Sound and in particular, Luncheon Cove on Anchor Island;⁵⁶ Chalky and Preservation Inlets;⁵⁷ the Solander Islands;⁵⁸ several locations on Stewart Island including Port William, South Cape, Mason Bay and Port Pegasus;⁵⁹ Codfish Island;⁶⁰ and Ruapuke Island.⁶¹ More precise information on the locations of camp sites is rare. Edwardson shows the location of a sealers' camp on a map of Codfish Island made in 1823⁶² and it is well established that sealers camped at the head of Luncheon Cove on Anchor Island in Dusky Bay (see below).

Dry caves were used. When Boulton was at Chalky Inlet in 1826 he camped in one of several caves at the head of Southport and remarked that they formed 'a convenient shelter for boats and crews'.⁶³ Southport was one of two safe anchorages in Chalky Inlet; it was close to the sealing rookeries and there was an abundance of food and natural resources available locally.

I have conducted intensive archaeological investigations in the caves around Southport (Fig. 1) and most contained plentiful evidence of human occupation. The deposits suggest that the caves were occupied by Maori. However, many artefacts are of European origin and bones of European pig and dog were also recovered. Analysis of this material suggests that it dates from the 1820s when sealers are known to have been active in the area and had a camp at the head of Southport. Hence it is possible that many of the European items found in the Southport caves were obtained from sealers. If so, they give some indication of the sort of equipment that sealers possessed. Glass beads found in the caves were presumably used for trading with Maori. There was a mould for making musket balls, axes and spike nails, glass bottles, strike-a-lights, ink bottles, quill-pens, clay pipes, ropes made of imported *Cocus* fibres, and consequently much of what one would expect to find in a sealers' camp. Pig remains may have derived from salted pork (mostly boned, however) which was often issued to sealers as part of their basic provisions.

There is a large cave site located north of Cape Providence at the head of Chalky Inlet, which was used as a sealers' camp.⁶⁴ The site has been examined by the Begg brothers who describe it as 'roomy and spacious, and some 15 feet [4.57m] in from the entrance it divided into two parts, both large enough for comfortable living'.⁶⁵ They found abundant evidence of occupation, including a square area marked out by stones, which they surmised was probably used to store seal skins.

Other detailed descriptions of sealers' camps in the study area are rare. In 1826 Boulton lived in a hut for a short time on one of the Open Bay Islands. At the time it was an established camp with a garden.⁶⁶ Similarly he stayed in a 'crazy hut' at Anita Bay in Milford Sound, as he journeyed southward to Dusky Bay,⁶⁷ where he stayed for seven months on Anchor Island in another hut.⁶⁸

Luncheon Cove on Anchor Island in Dusky Sound proved to be one of the best and most consistent anchorages for sealers coming to Fiordland. Richard Henry⁶⁹ described the merits of the cove many years later: 'it is sheltered and sunny and close to the best fishing grounds and the last haunts of the seals; it is also very central and the very nearest to the sea'. It also had the added advantage that there were no sand flies.⁷⁰ In 1792 Captain Raven in the *Britannia* deposited William Leith and eleven other sailors at Luncheon Cove on Anchor Island.⁷¹ Before leaving, he supervised construction of a house for his gang. It was $12.19 \times 5.49 \times 4.57\text{m}$ high,

thatched with flax and leaves. During their stay at Dusky Sound, Raven's gang also built a wharf and a try house.

Considerable archaeological evidence of early European activity has been observed at Dusky Sound, and in particular at Luncheon Cove, by Henry during the late 19th century, and by the Begg brothers⁷² and myself in recent times. Henry⁷³ saw a number of areas that had been deliberately flattened and rectangular impressions some $2.44 \times 1.83\text{m}$ in area, which he described as hut areas. The dwellings appear to have been made from tree ferns, and Henry noticed that they did not seem to be associated with fireplaces or ovens as was usual with Maori huts. For this reason he was inclined to attribute their construction to the sealers. This is an interesting point and certainly one that needs to be investigated archaeologically. We do know from Boulton's journal⁷⁴ that at least one of the sealers' houses had an internal fireplace, but it is possible that sealers had their own huts for sleeping, and shared a central one for cooking and eating.

At the head of the Cove, Henry found evidence of a dwelling some $4.88 \times 3.66\text{m}$ in plan with a packed clay floor 'which was carried there from a hole some dozen yards away'.⁷⁵ Nearby he found a 'little midden of charcoal and cinders with some scraps of iron and clinkers to indicate the site of a forge'. He concluded that the dwelling had probably been constructed by the sealing gang from the *Britannia*, that the clinker was from the try-pot, and the scrap iron was from hoops for casks.⁷⁶

Henry observed other archaeological evidence he ascribes to sealers in Cascade Harbour,⁷⁷ Goose Cove⁷⁸ and Woodhen Cove.⁷⁹ My own fieldwork in this area has confirmed the presence of many areas of potential archaeological interest at Luncheon Cove and Cascade Harbour where there is also evidence of slipways.

As sealing declined, many sealers stayed on to become permanent settlers in southern New Zealand. They obtained Maori consorts and ended up living in various localities throughout Foveaux Strait. In the 1820s there were at least two Europeans living on Ruapuke Island: John Kelly⁸⁰ and James Caddell;⁸¹ Jack Price resided at Pahia in 1826,⁸² William Spencer settled at the Bluff between 1830 and 1832,⁸³ and Codfish Island was settled by sealers from 1825. By 1844 a significant number of Europeans was living on Codfish and Stewart Islands.⁸⁴ These settlers no doubt endeavoured to build houses in more traditional European styles (with windows and chimneys) and as I have argued above, they probably influenced Maori architectural styles.

A search for archaeological evidence of the residence of James Caddell on Ruapuke has not been successful, but other sites have been located on the island that are early, and may be residences of sealers.

WHALING SETTLEMENTS

The locations of the coastal whaling establishments were dictated almost solely by the frequency with which whales entered adjacent coastal waters. The shore-based whalers were unable to stray too far from their home bases, their range of operation being restricted by the field of vision from lookouts that were invariably located on the highest hills nearest each station. However, within each bay, stations had to be chosen so that boats and whale carcasses could be hauled ashore safely. Charles Enderby, a well-known sealing magnate, listed a number of criteria which he considered were important in selecting a site for a whaling station:

'a temperate to cool climate (to lessen leakage from the wooden oil casks); a reasonable distance from settlements from which plunderers might come; plentiful wood and water; good soil for gardens and good pasturage for cattle; easy sailing distance from supply boats; a reasonably nearby source of recruits; and, most important of all, a good harbour'.⁸⁵

Almost without exception, the sites chosen for shore-based whaling stations on the east and southern coasts of the south island of New Zealand satisfied these criteria. Between 1829 and 1844 some dozen shore-based whaling stations were established around the coastline of Southland and Otago (Fig. 1). Most were fleeting events.

Although it is not made explicit in any of the documents available on the southern whaling stations, a number of buildings and other structures were constructed to meet the needs of the industry: houses for the whalers and the head of the station; a store for stowing equipment, alcohol, food and for giving out slops (clothes); sheds for storing other forms of equipment; plus those which were required to cover the try-works and boiling-down equipment; a forge for repairing equipment; a carpenter's shop (for carrying out repairs, making barrel staves and making and assembling barrels etc.) and possibly a shed for storing whalebone and barrels of oil.⁸⁶

The first shore-based whaling station in southern New Zealand was established at Cuttle Cove in Preservation Inlet in 1829. It consisted of a large dwelling for Peter Williams, the manager of the station, six houses to accommodate the staff, a store capable of holding three tons of trade goods, and a large boat shed which could house 16 boats.⁸⁷ No details are available about the type of construction of these dwellings, though it may be surmised that they were made from both imported and local materials. Quantities of timber were cut for export when whales were scarce and it seems likely that some of this timber was used locally.⁸⁸ cursory field surveys of the whaling station have been conducted by myself in 1969 and others at a later date.⁸⁹ Several former building sites have been located, including that of Peter Williams's house. The area is littered with archaeological debris, including imported bricks, hoop iron and bottle glass. Otherwise the site appeared to be relative undisturbed.

The whaling station at Jacobs River, now Riverton, was established about 1838 and was a substantial enterprise.⁹⁰ The residents, numbering forty-eight in 1844, founded their village on the southern slope of some well-wooded hills on the western side of the Aparima River. At the time of Bishop Selwyn's visit to Riverton in 1844 there were fourteen neat and tidy white-washed houses and each occupant had an enclosure of wheat and potatoes.⁹¹ As with the station at Preservation Inlet, little is known about the mode of construction of these dwellings. One source⁹² suggests that they were made from tree fern and a plant called 'wi-wi' (possibly *Oi-oi* (*Leptocarpus similis*), the Jointed rush)⁹³ which grew along the margins of the estuary. The walls were white-washed and plastered. This description seems to tally with that of the Reverend Wohlers, who visited the settlement in 1846. The wiwi was used to thatch the roof, and the walls were made of tree fern trunks. Lime was manufactured locally by burning mussel shells from nearby middens.⁹⁴ Well before this date, Captain Howell, the leader of the little community, had imported substantial quantities of Tasmanian hardwood and constructed a fine house, said to be the best in Southland.⁹⁵

The Bluff whaling station was started in 1836 and managed by William Stirling.⁹⁶ It consisted of a large shed which was used for storing boats as well as for manufacturing barrels, and there were several houses for the whalers. Stirling's house was reported to be a striking building. It had three rooms and a loft. The outside was clad with white-washed weatherboards and it was roofed with totara bark and thatch. The other huts, although smaller, also appear to have been weatherboarded.

The Weller brothers' whaling station at Otakou was one of the earliest shore-based whaling establishments and one of the best documented.⁹⁷ The disposition of the station: the whaling village, Wellers' residence and the three main Maori villages, is shown on an 1843 plan of Otago Harbour by S. C. Brees.⁹⁸

Established in 1831, it went through a period of growth and then decline leading to abandonment by the Wellers in



Fig. 3: Sketch of buildings at the Otakou whaling station made by J. W. Barnicoat in 1844. Reproduced by courtesy of J. J. Barnicoat, Wellington, and of the Hocken Library, University of Otago, Dunedin.

December 1840, when they went bankrupt. However, the station continued to operate for at least another five years.⁹⁹ Earlier, in 1832, the station was destroyed by fire and eighty houses were said to have been lost.¹⁰⁰ The station was then rebuilt and in 1835 eighty-five men were employed there, three quarters of whom were Europeans.

In 1840 the station comprised a large store, run by Octavius Harwood, two public houses, a special store for whalebone called the 'bone house', a carpenter's shop, 'the Big House'—possibly Wellers' house, a blacksmith's shop, a store, many out-houses, a try-works and a number of dwellings occupied by the whalers.¹⁰¹ There was also a yard for ship building, with a large workshed, saw-pit, blocks, launching ways, steam box etc., plus a large quantity of seasoned timber.

Although goat houses were built, pigs seem to have been allowed to wander in the bush, or were released on one of the islands in the harbour, before 1841. After this date sties were built.¹⁰² Indeed the years 1841 and 1842 were notable for the amount of time spent in fencing, perhaps in the hope of enhancing claims for Crown grants.

After the Wellers abandoned the station at least twenty Europeans stayed on to become the nucleus of a permanent population in the harbour area.¹⁰³

Although there are no detailed descriptions of the whaling station, two drawings of it have survived: one completed in 1840 and the other in 1844. Details in both drawings are poor.¹⁰⁴ The 1844 sketch depicts two styles of building (Fig. 3). The first is a large rectangular two-storeyed structure with a hipped roof. This building, reputed to be the store, was still extant in the 1860s and is shown clearly in a photograph of the area taken at that time.¹⁰⁵ In the 1844 sketch, it has an annex, also with a hipped roof. A small covered porch protects the entrance to the building. A few small windows provide light for the interior. The exterior walls are clad with sawn weatherboards set vertically. The roof overhangs slightly the margins of the house and there is no spouting. The roof consists of either shingles or planks. The chimney has a plank flue.

The second type of building is single-storeyed with a gable roof. One of these buildings has a chimney on a cobble base and a plank flue at one end. The wall of the flue nearest to the house is curved away from it, presumably to prevent sparks falling onto the roof and to minimise the amount of smoke being blown back through the roof into the house. The roof at the other end seems to have a slight overhang. There are no eaves. The roof is thatched with flax or grass which is secured by horizontal battens running the length of the roof. The external walls are clad with horizontal planks of

sawn timber. The walls of one of the huts may be thatched in traditional Maori fashion, as battens are visible.

The central complex of buildings is enclosed by a rude paling fence tied with a single wooden rail.

Today there is no trace of the Weller brothers' station at Otakou; the site has vanished under a huge sand drift, and hopefully its manifestations have been preserved.

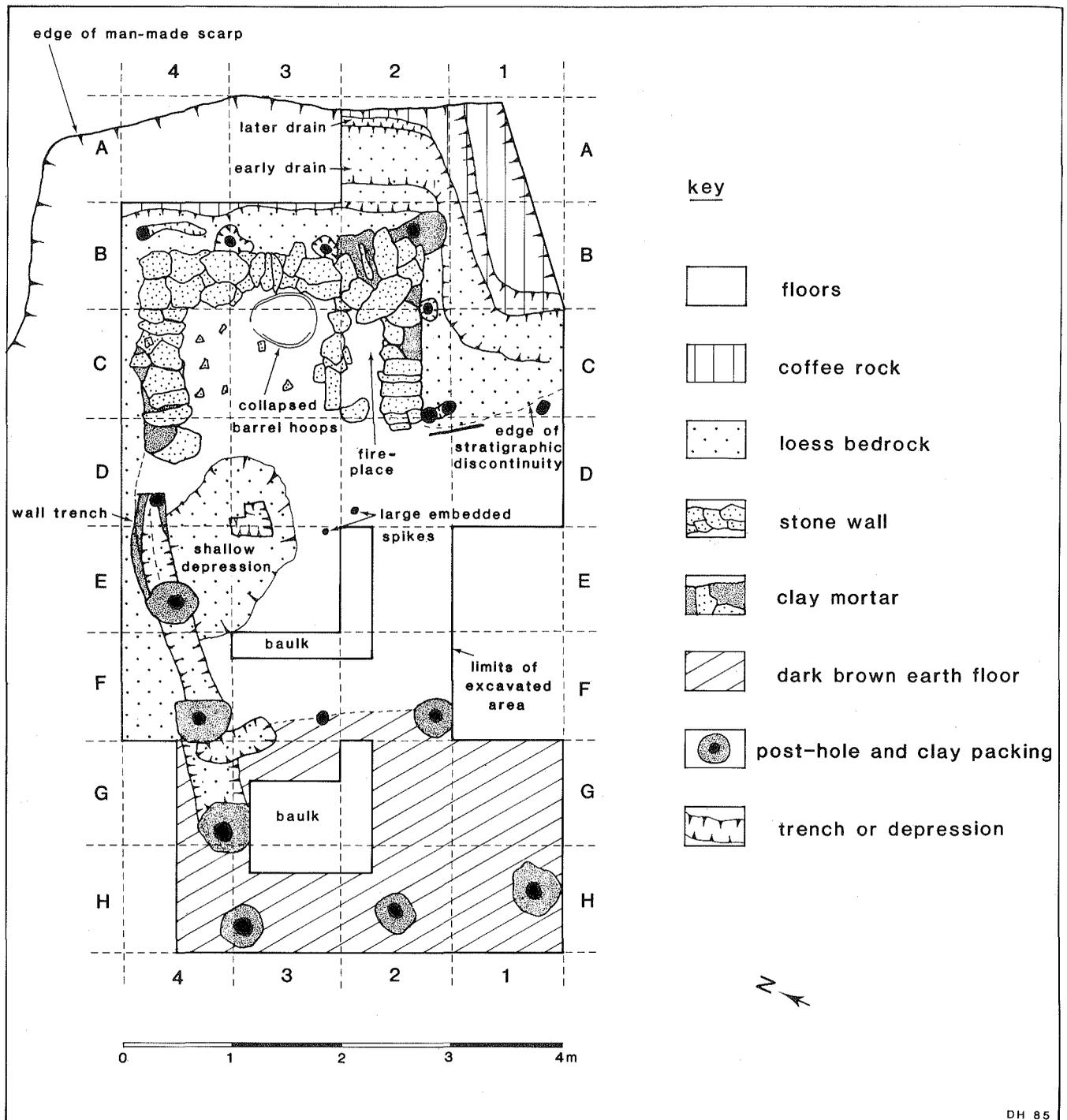
The Weller brothers also established a satellite whaling station at Taieri Island, about 32km south of Dunedin, in 1838 (Fig. 1). The station was situated on the western side of the island. The try-pots and whaling gear were located on a small beach below the settlement at about the middle of the island.¹⁰⁶ The beach was so small that the whales had to be anchored or tied to the shore while they were being cut up, to prevent them from being carried out to sea.¹⁰⁷ Freshwater was obtained from a nearby cave. At its peak, the station appears to have supported a modest population, varying between nine and twenty men, sufficient to man three whaleboats.¹⁰⁸

The historical evidence suggests that there were two phases of occupation: the first phase ended before 1843 (and probably in 1840/41, concurrent with the bankruptcy of the Wellers), as Shortland found the station deserted when he was there in that year.¹⁰⁹ The second phase began in 1844, when it was reoccupied by Thomas Chaseland for a number of years.¹¹⁰ The station was abandoned before the end of the decade.

During the second phase of occupation, the whalers' huts could be reached from the beach via a rickety staircase which was situated along the edge of a steep cliff. The habitations of the whalers were described by Monro¹¹¹ as 'grass huts' and an old whaler who once worked there claimed that they were 'flimsy'.¹¹²

Around 1900 the remains of this site were still visible, including one of the try-pots.¹¹³ Recent archaeological research on the island has revealed the remains of four of the whalers' huts.¹¹⁴ The house locations were indicated by the presence of concentrations of medium-sized waterworn beach pebbles, which could not have been deposited there by natural means. The stones were used to construct hearths and chimneys and in one house they were used to pave the floor.

Excavation of one of these house sites revealed a number of features. The site for the house had been carved out of the hillside to create a flat area. The house was approximately rectangular in plan and the wall nearest the back of the



cutting was constructed of large stones carefully fitted together and cemented with a clay mortar (Fig. 4). The first couple of metres of the side walls were constructed similarly. It is not clear whether stones were used to form the wall to its full height. However, this does not seem likely as four post-holes located behind the wall suggest that the roof was supported by wooden studs, rather than on a stone wall. Consequently, the stone wall was probably carried up some distance above the ground and completed with timber or clay. Clay was certainly used, as significant quantities of it fell from the structure after it was abandoned.

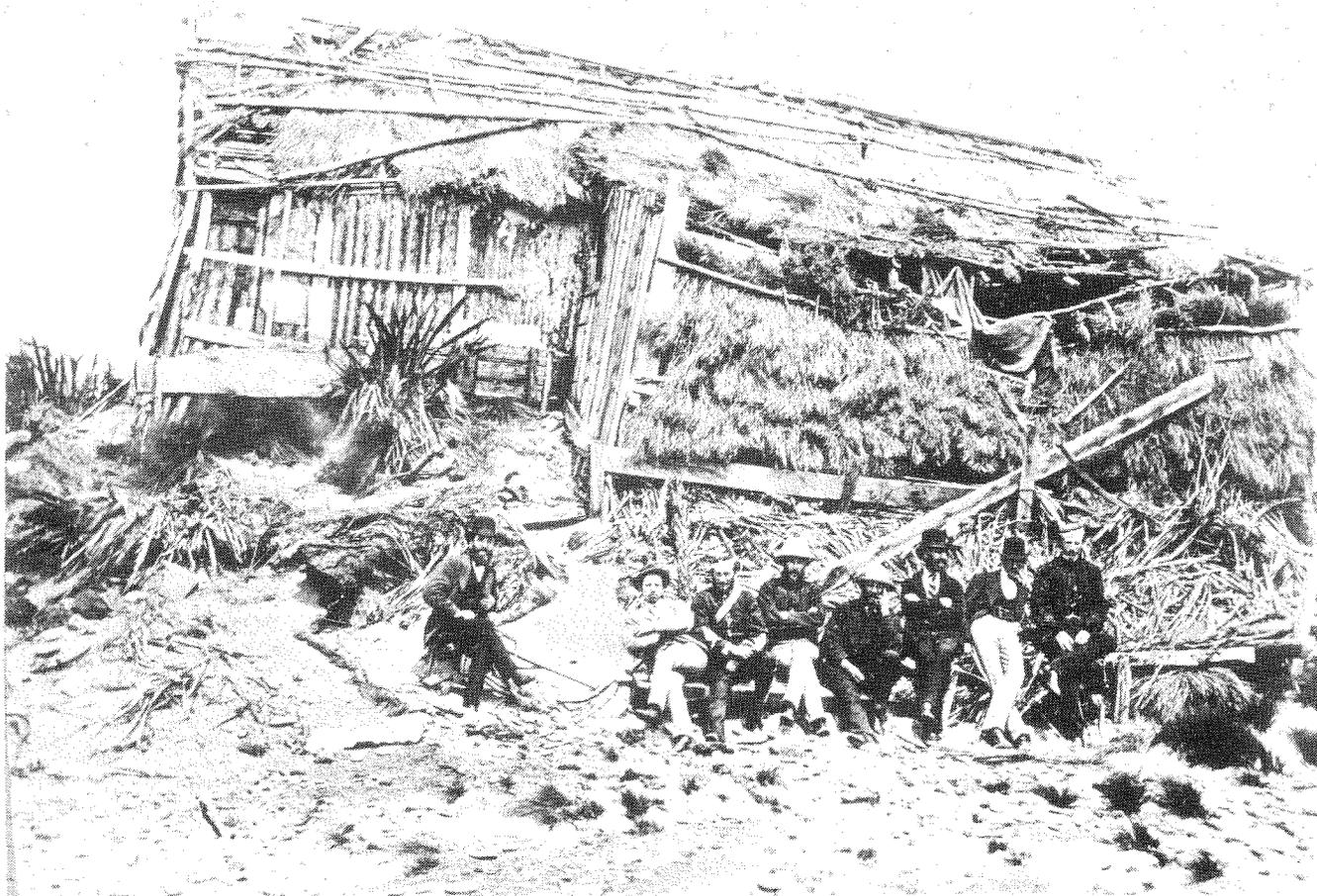
The remainder of the walls were constructed differently. Circular pits about 30cm deep and 30-40cm wide were dug into the bedrock every metre or so around the margins of the house. Round to square-sectioned posts (10-15cm in diameter) were placed in these holes and kept in position by packing clay around them. Some kind of wall-plate must have been

Fig. 4: Plan of a whaler's house (TI/4) excavated on Taieri Island.

nailed to the upper ends of these posts. Shallow trenches were dug between the posts for the purpose of seating the lower ends of sawn or rough timbers placed vertically and nailed or tied to the upper wall-plates. Earth and clay were packed around the bottom of the wall timbers to keep them in position and the interstices between the timbers were probably packed with clay.

A variety of nails was used during construction of the house. Many of these were brass, ranging in length from 2.5 to 16.5cm. Some of these are boat nails, no doubt used for maintaining the boats that supported the maritime operations from the island. Others were made from wrought iron, with lengths in excess of 5cm.¹¹⁵

The roof type is not certain. It could have been skillion, hipped or gabled. The corner posts at the eastern end of the



house were very deeply embedded, while the intermediate posts were buried in shallow holes and probably supported a beam which spanned the end of the house. No matter what type of roof covered the house, some large beams would have been necessary and these must have been imported, either from the nearby mainland, or from Otakou. The roof was probably thatched with grass or flax. The original house probably looked something like the one shown in Fig. 5. The presence of fragments of window glass suggests that the house may have had one or more glazed windows.

The interior of the house appears to have been divided into two areas: a cooking and living compartment separated from a storage/sleeping area by a partition. The cooking area had a fireplace with stone walls on either side. A barrel was situated next to the fireplace on a slightly raised clay platform. The floor was very hard and compact: built up from hearth ashes; artificial accumulations of soil, sand, ashes and clay possibly brought in from outside the house to even up the floor; and numerous broken artefacts such as clay pipes, glass beads, bottle glass, crockery, strike-a-lights and fragments of metal. The living area was associated with fewer artefacts and a floor which was much less compact. The entrance to the house must have been located on the southern side, though its exact position is not certain. Numerous fragments of burnt whalebone were found, suggesting that it may have served as a fuel when wood was scarce.

The stratigraphic evidence suggests that the house had at least two phases of occupation, a finding which is in accord with the historical evidence. During the first period a shallow drainage channel was cut out of the bedrock behind the house. This would have been necessary to drain water coming down the hillside behind the site. After some time the ditch silted up and was buried beneath a mixture of ashes, charcoal, sand and soil. These materials may have been washed into the drain during a period of abandonment or thrown there by

Fig. 5: A crude, expedient example of a mid-19th-century dwelling erected in Otago, possibly similar to those constructed by the whalers on Taiari Island. Reproduced by courtesy of the Hocken Library, University of Otago, Dunedin.

the whalers, possibly when the house was repaired or altered. At a later date, probably coincident with a reoccupation of the house, a new drain was cut through these layers at the back of the site and butted against the scarp. Then came a layer of clay material which almost certainly derived from the house itself, after it was finally abandoned.

The fireplace and part of the south-eastern stone wall were rebuilt at least once. The hearth area was lined with a thick layer of clay before rebuilding the external wall of the house and the northern wall of the fireplace. The floor stratigraphy also suggests two phases of occupation. There were two very compact layers in the cooking and living area which were separated by a loose layer of diverse material.

Eventually the stone walls collapsed. Midden refuse, which had been thrown onto the bank outside and to the south-east of the house, along with earth and other material, was washed down the bank and gradually settled over the site.

A localised flat area of very compact clay-like material was excavated on the south-east side of the house (Square C1, Fig. 4) and it is likely that the compaction was caused by trampling. This layer ended abruptly on the north-east and west margins of the square. Given the location of the layer, the disposition of associated post-holes and the stratigraphy of this part of the site, a pathway leading to a door would be an appropriate explanation. If this was the case, then the door belonged to a later phase of occupation, when the house may have had a lean-to on the southern side with a sandy floor. The fact that the floor of the main house rose sharply, coincident with the east-west line of the stone wall, lends support to an hypothesis that the house may have had an annex.

One of the best-known whaling stations, located at Waikouaiti, was owned by John Jones. However, details of the actual station are scant. It was established in 1837 by Wright and Long and bought by Jones in the following year.¹¹⁶ In 1844 there were about 100 men employed at the station. The station was only a few hundred metres south of the local Maori village.¹¹⁷ The men lived in primitive conditions; in rickety huts with no gardens. The better-made dwellings were clad on the outside with sawn timber, but there were others with clay walls. Dogs, pigs and poultry were abundant.

Even less is known about the other whaling stations such as Purakanui, Port Molyneux, Tautuku, Waikawa, Toetoes Bay, Omaui and Owi.

CONCLUSION

In the foregoing I have presented a brief but incomplete survey of Maori, sealing and whaling settlements in southern New Zealand for the period 1773–1850. Nevertheless, sufficient ground has been covered to suggest that:

1. Maori house types varied according to locality and function (e.g. permanent village sites as opposed to seasonal camp sites).
2. Maori house styles changed over time and major changes were apparent by 1844.
3. The locations of most of the late prehistoric/colonial period permanent Maori village sites are known with reasonable accuracy.
4. Whilst most evidence of Maori village and intermittent camp site locations have probably been obliterated with time, archaeological manifestations still remain in some of the remote areas of Southland, such as on Ruapuke Island and in Fiordland. Some information is available on floor plans and dimensions.
5. There may be some difficulties in distinguishing between the archaeological manifestations of later Maori and non-Maori houses of this period and this question needs to be examined by more intensive investigations.
6. Archaeological manifestations of traditional Maori sites should be relatively easy to interpret on the basis of plan, configuration of post-holes and position of fire-places.
7. Almost nothing is known about the dwellings constructed by sealers, and this aspect requires further investigation.
8. Very few sealing camp site locations are known with any accuracy.
9. Fiordland, particularly Luncheon Cove, and other remote areas such as Ruapuke Island and possibly Codfish Island, may have archaeological manifestations of sealing camps which are amenable to intensive investigation.
10. The approximate locations of all the shore-based whaling stations in southern New Zealand are known.
11. Few details are available about the shore-based whaling stations in southern New Zealand, and there is likely to be little in the way of archaeological evidence at these sites. The best hope for elucidating these sites is to focus on the stations that were in areas that are little frequented today, for example Preservation Inlet and Taieri Island.
12. On the basis of the historical and archaeological evidence at hand it is not possible to adequately characterise the archaeological manifestations of either sealing or whaling settlements, but the evidence is sufficient to enable concrete hypotheses to be framed.

Since it is most unlikely that new and illuminating historical records will become available on sealing and whaling sites in the near future, it is incumbent upon the archaeologist to provide additional information about them. Consequently,

there is an urgent need to preserve those few sites which still have relatively intact archaeological manifestations. Already the original site of the Waikouaiti station is covered with homes and Wellers' station at Otakou is buried under immense sand drifts, and therefore possibly well preserved. Most of the other coastal stations have disappeared or been built over, and curio seekers plunder the stations at Cuttle Cove, Preservation Inlet and Taieri Island from time to time. There is no doubt that many aspects of this important formative period in New Zealand's history deserve far more attention in the future than they have received in the past.

ACKNOWLEDGEMENTS

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NOTES

1. These observations are discussed in detail in Coutts 1969b: 192.
2. Kent in Howard 1940: 345; Boulton in Begg & Begg 1979; Shepherd in Howard 1940: 365; *S.G.* 25/8/1810; Edwardson in McNab 1907: 215.
3. Barnicoat 1844.
4. In Houghton 1895.
5. Begg & Begg 1973: 137.
6. *ibid.*: 140; Howard 1940: 51.
7. e.g. McNab 1907; Howard 1940: Chapter 5; Begg & Begg 1973: Chapter 6.
8. See Tod 1982.
9. Prickett 1982.
10. Coutts 1969b; 1972; 1976; Coutts & Jurisich 1972.
11. Begg & Begg 1966: 1973.
12. Begg & Begg 1979: 271.
13. Coutts 1969a; 1969b; 1972.
14. In McNab 1907: 215; however, there is some doubt whether this was universally true for all villages in Foveaux Strait (A. Anderson pers. comm.).
15. Weather data extracted from New Zealand 1960.
16. Wales 1961: Vol. 2, 777.
17. Murray in McNab 1914: Vol. 2, 516.
18. In McNab 1907: 305.
19. In McNab 1907: 326.
20. Henry MHL M 1/540: 57, 61; Henry, letter to Melland 22/8/1898 MHL M 1/705 A.
21. For locations see Fig. 1 in Coutts 1969b.
22. Henry MHL M 1/540: 17, 69–70.
23. *ibid.*: 94.
24. Begg & Begg 1966: 54; 1979; Coutts 1972.
25. Roberts 1895: 35.
26. Begg & Begg 1966: 64.
27. Morrell in McNab 1907: 264.
28. Shepherd in Howard 1940: 365; Murray, *S.G.* 25/8/1810.
29. Begg & Begg 1979: 170.
30. Edwardson in McNab 1907: 215.
31. *ibid.*: 180.
32. Edwardson in McNab 1907: 215.
33. Begg & Begg 1979: 180.
34. Kent in Howard 1940: 345.

35. Coutts 1969a; see also McNab 1907: 215.
36. See Begg & Begg 1979: Plate 111; McNab 1907: 215.
37. Begg & Begg 1979: 170.
38. Begg & Begg 1979: 178–9. Boulton saw potato gardens and wild pigs on Ruapuke in 1826 and specifically mentions that pigs periodically raided the gardens.
39. McNab 1907: 215.
40. Coutts 1969a; see also McNab 1907: 215; Bathgate 1969.
41. Houghton 1895: 123.
42. Groube 1965 and 1969 in Prickett 1982: 127.
43. Houghton 1895: 102.
44. In Prickett 1982: 118.
45. Houghton 1895: 102–3.
46. Barnicoat 1844: 17/5/1844.
47. Selwyn 1844: 29/1/1844.
48. Prickett 1982: Fig. 4.
49. Wohlers, Letters to Tuckett, 13/1/1852: 14.
50. McLintock 1949: 116.
51. Shortland 1851: 116–7.
52. Christie 1929: 46–7.
53. In Hall-Jones 1944: 96; see also Beattie 1909: 82.
54. Begg & Begg 1979: 140.
55. *ibid.*: 157.
56. *ibid.*: 163; McNab 1907: 84–5; 1908: 178; 1914: 512.
57. Begg & Begg 1979: 165; McNab 1907: 200.
58. McNab 1907: 148 ff.; 1908: 459; *S.G.* 24/7/1813.
59. Howard 1940: 35 ff.
60. *ibid.*
61. McNab 1907: 204.
62. See Howard 1940: 63.
63. Begg & Begg 1979: 165.
64. Begg & Begg 1973: Fig. 16, Plate 44.
65. *ibid.*: 110.
66. Begg & Begg 1979: 140.
67. *ibid.*: 157.
68. *ibid.*: 163.
69. Henry MHL M 1/540: 69.
70. These insects are a menace in the Sounds and make life extremely unpleasant in an already hostile environment.
71. McNab 1908: 182, 197; 1914: 512.
72. Begg & Begg 1966: 72–3.
73. Letter to Hocken cited in Beattie 1949: 69; Henry 1898.
74. Begg & Begg 1979: 163.
75. Henry, letter to Melland 22/8/1898 MHL M 1/705A.
76. Henry MHL M 1/540: 57.
77. *ibid.*: 17.
78. *ibid.*: 50, 60.
79. *ibid.*: 60.
80. Begg & Begg 1979: 219 footnote.
81. See map of Henrietta Bay, Ruapuke Island, by Captain W. L. Edwardson 1823 in Begg & Begg 1973: 137.
82. Begg & Begg 1979: 169.
83. *S.T.* 3/9/1928.
84. Howard 1940: 379–81.
85. Morton 1982: 229.
86. cf. Harwood's sketch plan of the Otakou whaling station in 1858 (in Tod 1982: 98) and Shortland's sketch plan of the whaling station at Waikouaiti in 1843 (in Tod 1982: 57).
87. *S.T.* 6/10/1933.
88. *ibid.*
89. Begg & Begg 1973: 158–9.
90. *S.T.* 25/5/1934; Shortland 1851: 149.
91. Selwyn 1844.
92. Theophilus Vol. 2.
93. A. Anderson pers. comm.
94. Wohlers Reports 23/10/1846: 6.
95. *S.T.* 9/12/1925.
96. *ibid.*
97. See McNab 1913: 98 ff.
98. Tod 1982: 102.
99. McLintock 1949: 77; 1951: 13. On 25/2/1841 Harwood got letters from Sydney stating that the firm of G. and E. Weller had failed. E. Weller left Otago on 18/12/1840 (Harwood 1838–1899).
100. McLintock 1949: 74.
101. Harwood 1838–1899. See journal entries for 20/10/1840, 21/10/1840, 22/10/1840. Two thousand bricks were imported from Sydney for the construction of the try-works (McNab 1913: 99). See also *N.Z.G.W.S.* 15/12/1841.
102. Harwood 1838–1899. Journal 6/1/1841 (commenced sties) and preceding entries.
103. Tuckett Diary 1844 in Hocken 1898: 213.
104. Mouillage d'Otago 1840. A lithograph by P. Blanch, based on a drawing by Le Breton, reproduced in McLintock 1949. The other is a Barnicoat sketch 1/5/1844, original in Turnbull Library, Wellington.
105. Tod 1982: 103.
106. *O.D.T.* 8/2/1936; 22/2/1936.
107. Monro in Hocken 1898: 247.
108. Harwood 1838–1899.
109. Shortland 1851: 168.
110. Tuckett Diary 1844 in Hocken 1898: 214.
111. Monro op. cit.
112. *O.D.T.* 22/3/1936.
113. *O.D.T.* 8/2/1936.
114. Coutts 1976.
115. They all have square to rectangular cross-sections with round heads and chisel-shaped points. Some appear to be cast, tapering from just below the head, while others may be cut, since they are fairly uniform in cross-section until near the point where they suddenly converge.
116. Eccles & Reed 1949.
117. Tod 1982: 56, Shortland's map dated 1843.

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