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INVESTIGATIONS OF TWO SITES ON SLIPPER ISLAND

Michael J. Rowland

Abstract

The analysis of midden material from two sites on Slipper Island is described and recorded. A change in the prehistoric availability of shellfish is proposed to account for the content of the middens. An explanation is sort for the considerable quantities of Tahanga basalt and Mayor Island obsidian in both middens, and the importance of these sites in a regional context is discussed.

INTRODUCTION

The Slipper Island Group, includes Slipper, Penguin and Rabbit Islands about 8km south-east, and Shoe Island about 3kms east, of Tairua Harbour. (Fig. 1). As such, these islands are likely to have been exploited by prehistoric populations living along the east coast of the Coromandel Peninsula and especially by inhabitants around Tairua Harbour. They, might for example, have been exploited as part of a seasonal round of activities within the area.

Previous archaeological investigations on these islands (Fig. 2) include an intensive site survey on Slipper Island in which 8 pa sites were recorded (Atwell et al 1975) along with a midden at South Bay, samples from which have been analysed (Willian 1974).

Recent work involved test excavations in presumed Archaic middens on Slipper Island and the results of this are documented below. The objectives were 1) to detect what, if any, seasonal relationships might have existed between these middens and an autumn/winter occupied Archaic midden camp at Tairua (Rowland 1975) 2) to determine, if in the early stages of New Zealand prehistory the off-shore islands played a complementary role to seasonal settlements on the mainland coast, or perhaps even served as agricultural "home-bases" from which this coast was exploited.

ENVIRONMENT

An Auckland University Scientific camp on Shoe and Slipper Islands in 1973 investigated several aspects of their environments (Tane Vol. 20). Slipper Island is composed of two major volcanic units, one of the Minden Rhyolite subgroup, the other of the Slipper Formation (andesitic) both of which are of Pliocene or Pleistocene age (Hayward, Moore, MacFarlan

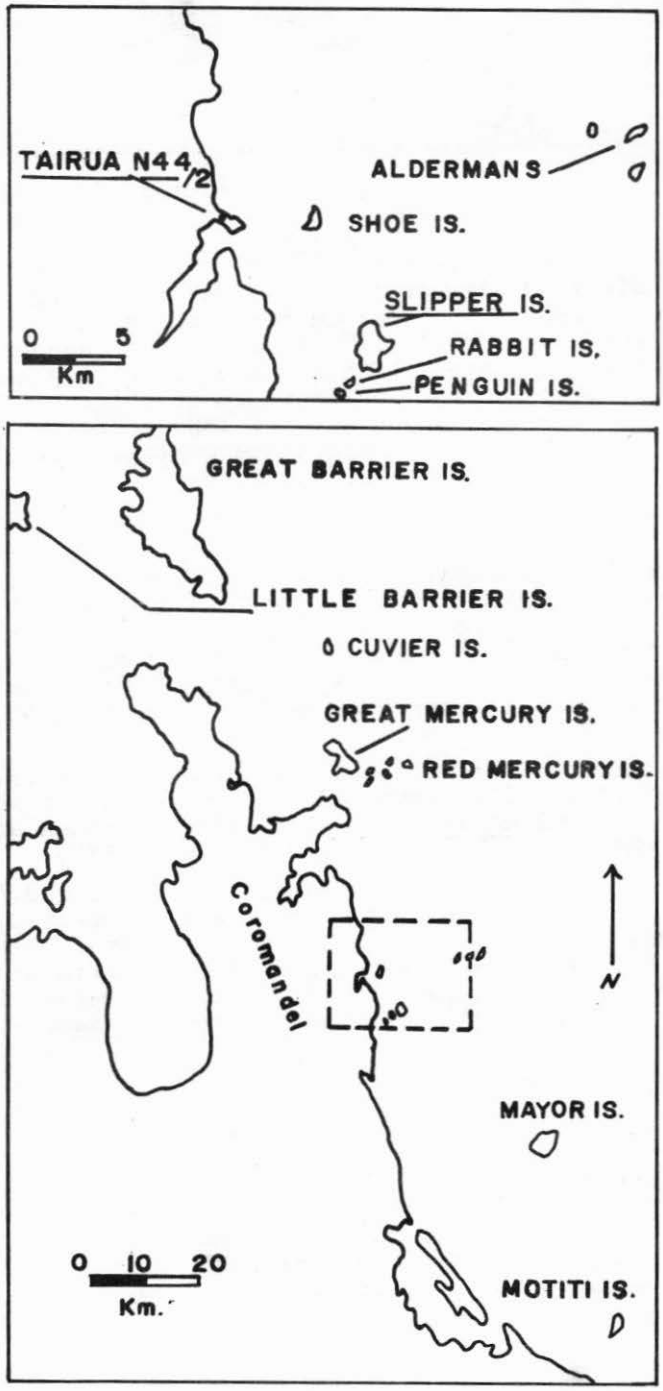

Figure 1. Slipper Island Location

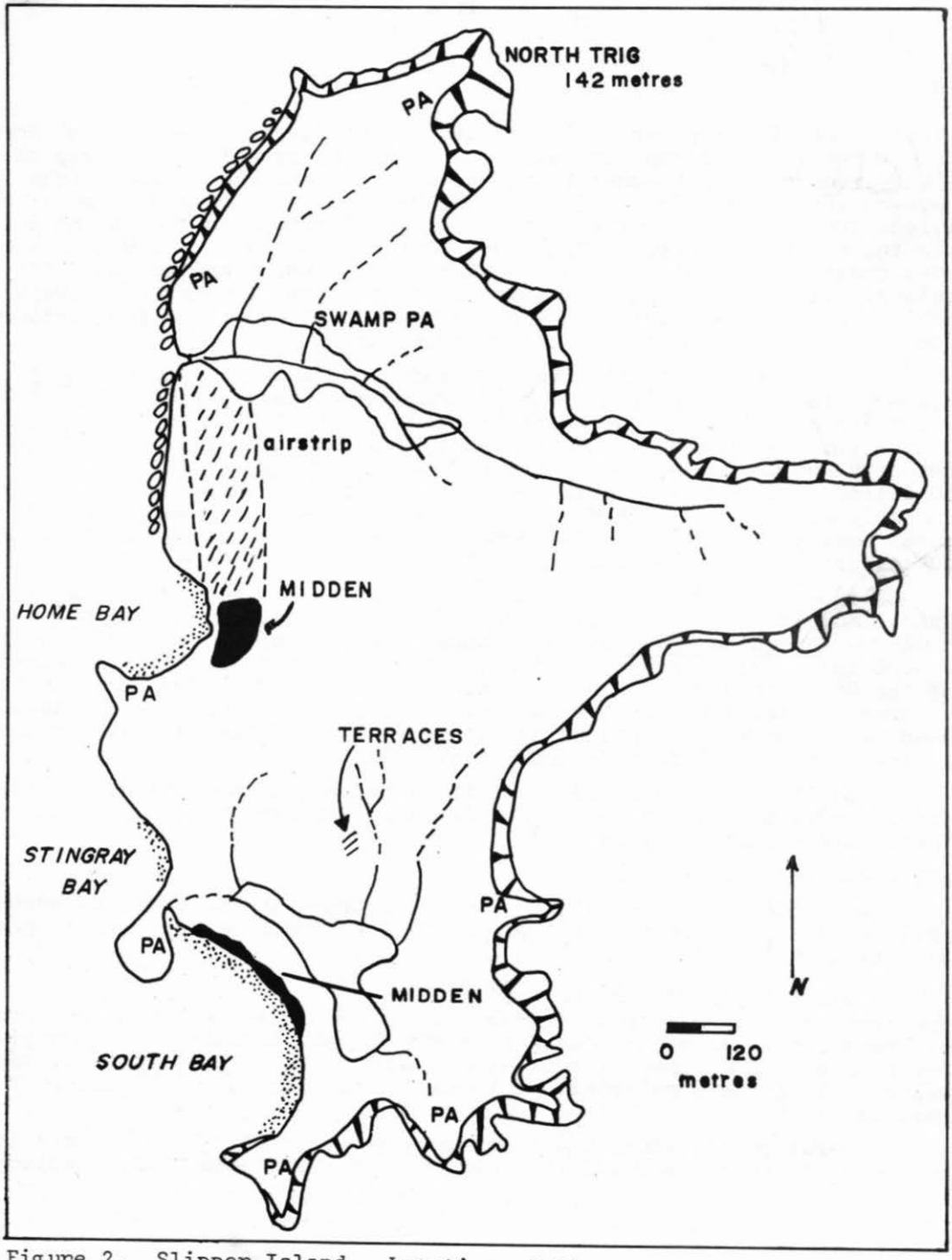

Figure 2. Slipper Island - Location of Sites.

1974; 46 and Fig 4 p. 45). The highest point on the island is the North Trig (142m). The north and east coasts are characterised by steep cliffs, with narrow boulder beaches below, to which access is difficult (see Hayward and Moore 1974: 3 Fig 2). The western and southern areas of the island are more generally rolling to flat and access to the island is via three sandy beaches at Home Bay, South Bay and Stingray Bay on the West coast. Areas of swamp are present in the north and south of the Island. Streams draining the south of the island flow into the swamp behind the dunes at South Bay. An east-west valley drains the northern two-thirds of the island into the northern swamp.

Slipper Island is situated in a rain shadow and a marked summer minimum renders the island prone to droughts at that period. The local micro-climate deduced from other islands is most likely to have featured warmer temperatures than the mainland, less diurnal variation, a higher humidity and an absence of frosts (Edson 1973: 120). These climatic conditions together with semi-mature, friable, free-draining, well aerated and only moderately leached soils of the yellow-brown loam group which cover most of the islands 220 hectares (Edson 1973: 119) would have been advantageous to prehistoric agriculture.

Slipper Island has been farmed for just over a century and most of the island is now in pasture though pohutukawas occur on steep ciffs and rewarewa (Knightia excelsa), and mahoe remain from the original vegetation (Court 1974: 59). Farming activities have resulted in partial draining of the Northern Swamp and a large area of flat land at Home Bay has been cleared and leveled for an airstrip. Access to freshwater would have been easy from most points as there are at least 7 natural water sources on the island. (Alistar Needham pers. comm.)

From Slipper Island, Paku and the mainland, Mayor Island, the Alderman Islands, Shoe Island and the Islands of the Mercury group to the North, are clearly visible.

ARCHAEOLOGICAL INVESTIGATIONS

Two middens were investigated, one recorded in the previous survey (N49/48) at South Bay and another (N49/43) at Home Bay recorded as part of this work.

South Bay Midden (N49/48) Fig.3:

The surface of the South Bay midden was covered with extensive amounts of stone material, mainly Tahanga basalt flakes, obsidian, large pipis and cockles and a range of rocky-shore shellfish. Midden material was exposed along the dune front but there was no clear stratification of this material.

Several points along the beach were excavated (Fig. 3). The volume of depth of midden material thickens towards the exposed beach section

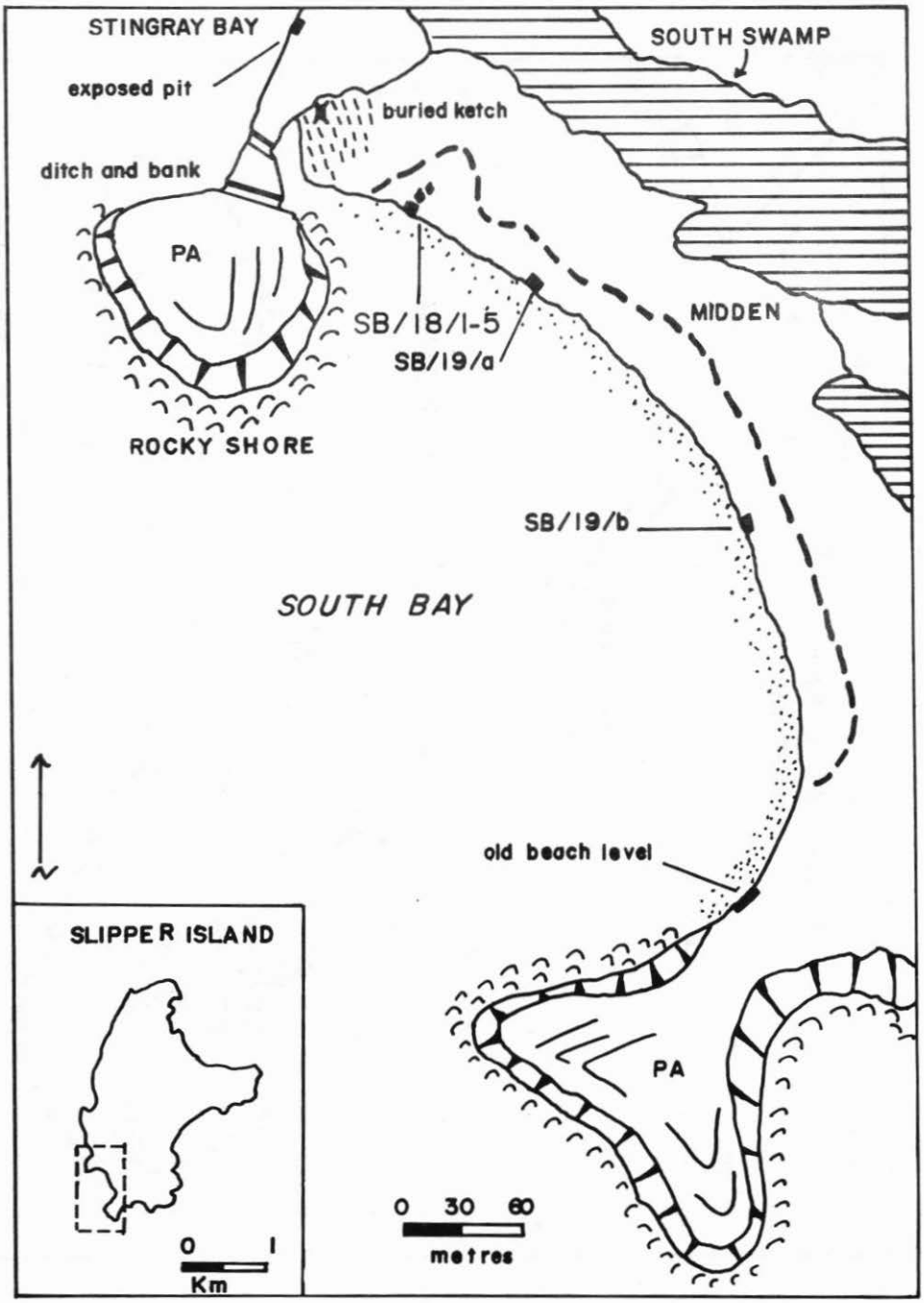

Figure 3. South Bay Midden.

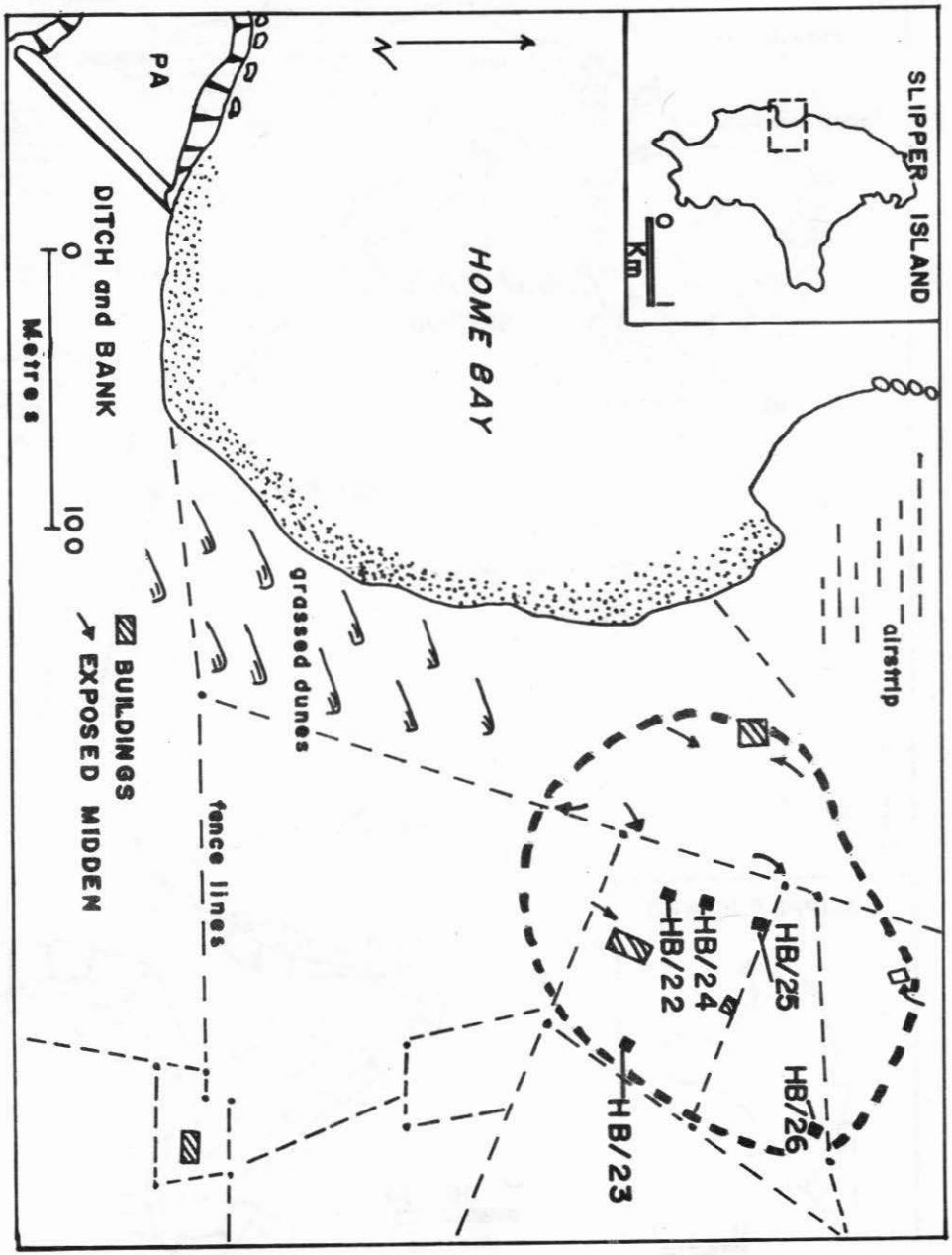

Figure 5. Location of Home Bay Midden.

and thins out towards the inland dunes suggesting that much of the midden has been exposed and washed away by tidal and/or wind erosion.

Two other test excavations further south along the beach were also conducted, one (SB/19/a)in an area where Cellana denticulata shells had previously been identified, the other (SB/19/b) where cockles and pipis were of a smaller size range than elsewhere in the midden.

A shell sample was also collected from what appeared to be an old beach level at the southern end of the beach. This was 50cm above the present beach level and contained 2-3cm of fragmented, water-worn and sun-bleached shells including cockle (Chione stutchburyi) and pipi (Amphidesma australe).

A pit, exposed in a beach section north of pa N49/23 contained large pipis (Amphidesma australe) and cat's-eye (Lunella smaragda) similiar to material from the South Bay midden and which contrasts with the more common tuatua (Amphidesma subtriangulatum) and rarity of pipis on the pa site.

Home Bay Midden (N49/43) Fig. 5:

The dune area of Home Bay is more stable than that of South Bay and is covered in pasture. Basalt, obsidian, and shell were exposed in a number of localities on the surface. Material was not exposed in the beach section and the midden did not appear (at least on the surface) until 20 metres inland.

Five test squares were excavated in the area of Home Bay. Variation was apparent in the quantity of material from these squares with some minor variation also in composition but no stratification of material was revealed. Square HB/24 excavated below the cultural material revealed a brown compacted sandy soil with shell on the surface. Below this again was a light brown-golden sand which was presumed to be an old sand dune.

North of Home Bay and inland from the boulder bank on the seaward edges of the airstrip there were a number of scatters of stone material interspersed with black soil and shells. This large flat area would be the most likely to provide evidence of prehistoric agriculture but has been thoroughly cleared for an airstrip. Some of this stone material does form regular patterns but it would be unduly optimistic to call them stone wall remains. The outlet from the north swamp revealed in section a dense build-up of very black soil, bone, obsidian, and shell including large pipis (Amphidesma australe).

MIDDEN ANALYSIS

Midden samples were sorted in detail and the results are presented in Appendix A. All samples except SB/19/b (358 gms) and HB/23 (480 gms)

were over 1000 gms. The percentage of composition of each midden component of the total sample is summarized below. (Fig. 6). The quantity of stone at Home Bay is marked. At South Bay stone material predominates in samples from the northern end of the beach but this predominance is replaced by shell at the southern end of the beach.

Shellfish: -

Some variation in the shellfish composition is apparent in the South Bay midden, as was expected from field observation. From the northern end of the beach cat's eye (Lunella smaragda) are the predominate shellfish in the samples. Further along the beach cat's eyes are less abundant while pipi (Amphidesma australe) and cockle (Chione stutchburyi) are more common. These differences may reflect discrete periods of collection within a similar period of time or non-contemporaneity of various areas of the midden. Four of the Home Bay samples have a predominance of pipi and one has a predominance of cat's eye. There appears to be more variation here than was initially thought on observation alone, however it is difficult to interpret the true significance of this, or the differences noted at South Bay, because of the few samples taken, and the small size of these relative to the size of the middens.

When the total weight of each shellfish species from all samples is presented as a percentage of the total shell sample for each site a relative order of importance of shellfish species can be established (Table 2): -

Table 2 Shellfish species as percentage of total site sample:

Home Bay	% of total shell	South Bay	% of total shell
pipi	35	pipi	25
cat's eye	24	cat's eye	21
cockle	11	Dark Rock shell	13
mussel	7	Black Nerita	11
White Rock shell	5	Cellana radians	9
Black Nerita	5	Cockle	8
Dark Rock shell	3	paua	3
Cellana radians	3	mussel	2
Cooks Turban	2	C. denticulata	2
C. denticulata	1	White Rock shell	2
C. Ornata	1	C. ornata	2
tuatua	1	tuatua	2
		Cooks Turban	1

Thus pipis (Amphidesma australe) and cat's-eye (Lunella smaragda)

are the two most important shellfish species in both sites, together comprising around 50% of the shellfish composition. It was this importance of pipis, and to a lesser extent cockles (Chione stutchburyi), which proved to be an unexpected feature of the middens and this will be discussed below.

Although not investigated microscopically some of the pipis and cockles from both middens showed evidence of their use as scrapers. Many shells were sun-bleached and/or sandbrown suggesting they may have been collected from beach surfaces for industrial use, though their appearance could equally result from their exposure in the middens prior to being covered up.

Bone:

Bone material was not noticably abundant in either site, the % by weight varying from 1% to 11% - the highest attributed to the presence of two complete right mandibles of dog.

Minimum numbers of species have been estimated where possible by counting re-occuring bones and bones from immature individuals and these are listed below (Table 4):

Table 4 Minimum numbers of animals

		Minimum numbers Home Bay	South Bay
Southern Fur Seal	Arctocephalus forsteri	3	1
Dog	Canis familiaris	1	2
Kiore	Rattus exulans	1	1
Lizard	Gecko? sp.	1	1
Red-fronted Parakeet	Cyanoramphus n.novaezelandiae	1	-
?N.Z. Muttonbird	Puffinus griseus	1	-
Black backed gull	Larus dominicanus	-	1
Moa	Dinornis sp.	worked	worked
Snapper	Chrysophrys auratus	6	2
Barracoutta	Thyrsites atun	-	1
Kawhawai	Arripis trutta	1	1
Leatherjacket	Navodon scaber	1	1

A considerable amount of the bone material was fragmented and worn and thus could not be identified. The nature of this material suggested it had been used for industrial purposes and such activity was reflected in the fishhook pieces, tabs and other utilized bones.

The amount of bird bone in the midden samples was surprisingly small, since Douglas and Gubb (1974) note a number of species with breeding grounds on these islands. Only two positive identifications were made, a Red-fronted Parakeet (Cyanoramphus n. novaezelandiae) from Home Bay and a Black-backed gull (Larus dominicanus) from an immature anterior

premaxillia from South Bay. Both are noted for the area today by Douglas and Gubb (1974).

Worn fragments of moa bone were quite common in both the South Bay and Home Bay middens. Four of the largest pieces are tibio-tarsi and two of these are identified as belonging to Dinornis sp. (R. Scarlett pers. comm.) The moa material is very fragmented and worn and this must result largely from its use for industrial purposes.

Fish species identified from the middens include snapper (Chrysophrys auratus), Leatherjacket (Navodon scaber), Kawhawai (Arripis trutta) and Barracouta (Thyrsites atun). The last two species are the only ones identified from the South Bay midden while all are present in the Home Bay midden. Grace (1974) has recorded 40 species of marine fish from around Slipper Island and Barracoutta is not included in her list. The presence of Leatherjackets suggests that either trapping (Witter 1969: 51) or netting (Law 1972: 98) were methods of fishing along with line fishing and trolling.

Kiore Rattus exulans is identified from both the South Bay and Home Bay midden samples, but is apparently absent on Slipper Island today. Hayward and Moore (1974: 2) recorded Rattus exulans on Penguin and Rabbit Islands but only Rattus norvegicus (Norway Rat) on Slipper Island.

Gecko (species not identified) is noted from South Bay and Home Bay. Towns (1974) investigation of lizards from the group found the giant gecko Hoplodactylus duvauceli on Penguin and Rabbit but not on Slipper Island. Only the skink Leiolopisma s. smithi was found on Slipper Island. The usually more common gecko species H. pacificus was absent from all islands. The Gecko may be like the moa and perhaps the limpet Cellana denticulata, which due to some biological features such as slow breeding rates or inability to escape predators, appear to have suffered extinction in some areas. Although there is no evidence from these sites that Gecko species were collected in large numbers they may have suffered reduction in numbers and been unable to stabilize their population levels becoming extinct on this island. The Gecko because of its biological attributes is worthy of further investigation in terms of its present and prehistoric distribution.

Land molluscs:

Land molluscs were included in the samples collected from both middens. However, because they were few and time was limited they were not identified and Willans (1974: 32) has already established a land snail sequence from South Bay suggesting that initially South Bay was covered in coastal forest indicated by the presence of Delos jeffreysiana, Rhytida greenwoodi, and Laoma phrynia. This was followed by a presumed dry period when coastal forests died allowing the formation of drifting dunes and the development of a sand-grass community with the snail

Austrosuccinea archeyi, the sedge Demoschoenus spiralis and grass Spinifex hirsutus. Finally, Austrosuccinea archeyi was eliminated under conditions leading to a fully developed scrub dune community of Comprosma, Meuhlenbeckia, and Cassinia indicated by the presence of the landsnails Paraloama pumila and Thalassohelix zelandiae. This succession could have been contributed to by the Maori, extensively clearing coastal forest to meet timber requirements and to satisfy the need for cleared arable land (Willan 1974: 32-33). Such changes however need not only be man induced. For example, changes in the presence of landsnails typical of coastal forest to those typical of a sandgrass community could presumably result from the deposition of new dunes and through changes in ocean currents, among other factors. Nevertheless, in the case of Slipper Island these changes are associated with initial occupation, and the change from forest to dune communities to developed dune communities suggests that once the forest was removed dune communities were maintained, most probably by agricultural clearance.

Fishhooks:

A number of fishhook pieces and fishhook tabs were collected from the Home Bay midden. They are of moa bone, very fragmented and worn, but are of the early one piece fishhook variety.

Crosby has described some fishing equipment from Slipper Island; a shank belonging to the early grooved series (Fig. 9), [Crosby's figures]; a North Cape type of early grooved shank (Fig. 14); a Horoera type of the late dorso - ventral shank series (Fig. 19) and a specimen of the North Island straight trolling hook (Fig. 27). The shank of the early grooved series, interestingly, belongs in a similiar typological group to the 'pearl-shell' lure from Tairua (Crosby 1966).

Stone material:

A most impressive aspect of both the South Bay and Home Bay middens was the considerable amount of stone material that both contained, especially Tahanga basalt, Mayor Island obsidian, and Kuaotunu sinter (identified by S. Best). Despite the exaggeration given stone material by comparing weights of midden components, the over all importance of stone material cannot be doubted.

There were a total of 453 pieces of obsidian collected from the three square metres sampled at Home Bay weighing a total of 834 gms. Tahanga basalt flakes and chips were not counted but were numerous and weighed a total of 6,369 gms. Obsidian was not as common at South Bay (24 pieces/126 gms) as Home Bay but nevertheless obsidian and Tahanga basalt were well represented. Sinter was poorly represented at South Bay compared with Home Bay.

SEASONALITY

As with the midden material from Tairua (Rowland 1975: 56-72) an attempt was made to determine evidence for seasonality from the Slipper Island middens.

No conclusive evidence of seasonality comes from the bird bone. The Sooty Shearwater (Puffinus griesus) may have bred on Slipper Island in the past as it does on many of the offshore islands today. The species comes ashore about October and eggs are laid mid November to December. The young hatch in January and leave in April or early May (Falla et.al. 1970). The Sooty Shearwater would most probably have been collected between October and December but since there is only one individual no period of the year when it could have been collected can be excluded. The Red-fronted Parakeet (Cyanoramphus n. novaezelandiae) from Home Bay was probably abundant on the offshore islands in the past as it is today and could have been collected at any period of the year. The Black-backed gull (Larus dominicanus) is abundant all along the coast of New Zealand and November is the usual month for laying eggs (Oliver 1955: 311). Although an immature premaxillia of the Black-backed gull is represented at South Bay without knowing the degree of maturity it does not provide a useful indicator.

The immature bone of a Southern Fur Seal (Arctocephalus forsteri) from Home Bay suggests that collection could have occured anytime between January and March to the following summer depending on the degree of maturity as Leahy has suggested on similiar evidence from Hotwater Beach.

Cockles from Home Bay and South Bay were investigated for seasonality applying methods described more fully elsewhere (Rowland 1975: 56-60 and Appendix G). Briefly this involved cutting the shell through its central margin and estimating the date of death of the individual by observations of the extent of growth between the last winter band and the shell margin. (Table 6)

Table 6 Estimations of seasonality from cockle shells

	South Bay	Home Bay
Early Winter	1	7
Mid Winter	1	2
Late Winter	3	3
Early Summer	12	6
Mid Summer	3	6
Late Summer	2	-
Indistinguishable	5	6
Total	26	30

Only a few whole shells with intact edges were available for investigation. The evidence from South Bay indicates collection during a spring/summer period as a high possibility. The results from Home Bay did not produce any clear indication of seasonality. Whereas, at Tairua the seasonal dating of shells was supported by similiar evidence from other species from different habitats (Rowland 1975: 60-69), at South Bay this control has not been achieved. Because of this and the small number of shells investigated classification of South Bay as a spring/summer occupation must be seen as a first step in a broader investigation.

DISCUSSION

A number of problems are presented by the above results, all of which bear closer examination.

Firstly, the predominance of pipis and to a lesser extent cockles, in both middens calls for some explanation when the present day distribution and composition of shellfish resources on the island is considered. Grace and Whitten (1974) have recorded the present day distribution of shellfish communities around Slipper Island (see their Fig. 5 p. 13). Rocky-shore shellfish species would have been gathered from the Ecklonia radiata - Carpophyllum sp. community and associated rocky-shore communities which surround a large part of the island.

The origin of pipis and cockles however proves something of a problem since the two middens from which they come are immediately adjacent Amphidesma subtriangulatum beaches. Furthermore 'species such as Chione stutchburyi and Amphidesma australe are typical dwellers of harbours and estuarine flats, and not offshore islands'. (Willan 1974: 32). Since these bivalves are not present on Slipper Island, it is probable that large quantities of them were gathered on the coast and brought to offshore islands to be used as an additional food source (Willan 1974: 32). Edson has reiterated this point, suggesting "some contact between the island and the mainland (?Tairua) is evidenced in the occurence of estuarine shellfish in the lower stratum of the South Bay midden"(Edson 1973:130) and this is supported by Atwell et.al. (1975). Pipis and cockles have also been recorded from middens on the Alderman Islands (Moore 1973: 26; Edson 1973: 32); Coppermine Island (Peters n.d.); Mayor Island (Edson 1973: 108); Cuvier Island (Edson 1973: 58 and 60) and the Poor knights (Edson 1973: 75) and have in all cases been interpreted as imports from adjacent maindlands. Such an explanation however is not entirely satisfactory.

Firstly, it is strange that the most numerous shellfish species (i.e. pipis) in both middens is not among those presently available on the island. In terms of the simple economics of availability it would have been more reasonable to expect one of the locally available rocky-shore shellfish or in fact the tuatua to be predominate in the middens.

Nevertheless, Tairua Harbour is only 8 km distant and a few trips to that coast to collect pipis and cockles might account for their importance.

However a further problem arises. Among all the shells collected from Home Bay only one tuatua was present and only seventeen from South Bay. This is odd since both sites presently front immediately on to tuatua (Amphidesma subtriangulatum) beaches. It could not be argued that the exploiters of these areas were unfamiliar with the methods of taking tuatua, since pipi and cockles are taken in a similiar way. A strong preference against tuatua might be argued, but it would have to be strong indeed if the prehistoric distribution of this species did in fact resemble the present distribution. Furthermore, droughts during summer and the not very productive rocky and soft-shore areas (Edson 1973: 122) would suggest resources would not be so abundant as to allow a wide preference, and in fact, one would expect all resources (especially one so close as tuatua) to be exploited.

On the above evidence there would seem a greater likelihood that pipis and cockles were available on the island and tuatuas less abundant at the period of deposition of these middens. If this were so then the next problem is to explain the presence of the few tuatua in the middens.

This might be accounted for by suggesting that initially harbour and estuarine conditions, supporting pipis and cockles, did exist on the island. Ecological changes then occured enabling the formation of tuatua beaches. Support for this proposition might be seen in the abundance of tuatuas and rarity of pipis and cockles on the later pa sites. Changes in shellfish availability may be caused by a number of factors, One obvious possibility is changes resulting from vegetation clearance perhaps for agriculture. Rapid erosion, silting and deposition of more sandy beaches might have resulted from such clearance providing a habitat suitable for tuatua. Silting up of some areas remains a feature of the island today ie a ketch sunk in 1876 is now covered by 2 metres of sand. The abundant pipi and cockle in the middens at South Bay and Home Bay might reflect initial occupation of a new environment, the few tuatua represented might reflect the beginnings of changes induced by this initial occupation and the abundant tuatua on the presumably later pa sites might reflect the consolidation of these changes.

Alternatively sea-level changes might have been a primary agent in such changes. The 'old beach-level' containing fragments of pipis and cockles in the beach section at South Bay about 50cm above the present tuatua beach is suggestive. The sea may have eroded on old estuarine beach-level exposing a lower more sandy level, which was subsequently colonized by tuatuas. The extremely eroded nature of the whole coast might give some support to this very tentative possibility.

The first proposition that vegetation clearance may have been

important is not supported by any direct evidence for agriculture/ activities, but indirect evidence is revealing. Firstly, there is Willan's evidence from analysis of the landsnail sequence at South Bay that coastal forests were removed at the time of initial occupation and that once removed, this clearance was maintained.

Settlement of any duration on Slipper Island would have undoubtedly been dependent on the highly fertile soils and favourable climatic conditions (Edson 1973: 120). The two most favourable areas for agriculture are an area of flat to rolling land with dark-brown sandy and peaty loams immediately to the north of the Home Bay midden and the area around the southern swamp backing the South Bay midden. The scattered piles of stone interspersed with shell fragments and black soil, on the edges of the airstrip north of Home Bay might well be the remains of agricultural activities.

Unfortunately, a long history of ploughing, and clearance for an airstrip north of Home Bay has destroyed any satisfactory evidence. Stone field systems may not have been a feature of the island since apart from the boulder bank there are no extensive stony areas. No investigations of soils was undertaken, so modified soils were missed if they existed. A stone wall "possibly of European origin" (Atwell et.al. 1975) is almost certainly of European origin.

More direct evidence of agriculture is apparent in the presence of rectangular pits on five of the pa. This does not however assist in defining an early period of agricultural activity since the pa are presumably later than the middens. The pit below the pa N49/23 and adjacent to the South Bay midden contained large pipis and cat's eye comparable to the South Bay midden, while the middens on the pa itself contained largely tuatua. The pit may have been in use at the same time as the midden was deposited but this is indeed tentative evidence. No material was collected for radiometric dating so it is not possible to accurately date the initial settlement. However some temporal indicators allow placement of the middens in a general time period. For example, the presence of large numbers of Cellana denticulata of a large size range may indicate a site is early, at least for the local area. (Rowland 1976). At least 14 specimens of Cellana denticulata were present at Home Bay and 10 at South Bay. The samples taken represent only a fraction of the total middens so they could be relatively common. In two cases they comprised over 5% of the shell weight of individual samples. Where specimens could be measured from South Bay, a size range between 20mm and 65mm was obtained with an average of 43mm and this compares with an average of 47mm for those from Tairua.

The identification of moa bone, especially of Dinornis sp., the largest and possibly first moa to become extinct, may be an indicator of

an early date for the Home Bay site. However, at least some of the moa bone was used for industrial purposes (though not the particular bone identified) and could be re-utilized material from an earlier period. The moa bone has been used in making fishhooks among which are one-piece types characteristic of an early period of New Zealand Prehistory. Crosby's (1966) identification of a shank of the early grooved series, belonging to a similar typological group as the pearl-shell lure from Tairua, does suggest an early date for occupation. Artifactual material previously provenanced to the island includes 17 adzes among which are a Duff type 4 and 2 1A type adzes housed in the National Museum (Atwell et.al 1975) further evidence for early occupation or visits to the island.

Line-fishing for snapper is one economic activity characteristic of the early settlement of the North Island (Law 1972: 98) (although it is also important later, for example at Galatea Bay). Both seal and dog appear to be more numerous in early middens than later ones (Green 1963: 52 + 56). Line-fishing for snapper is evident at both Home Bay and South Bay and seal and dog remains are relatively common. Both middens have limited shellfish remains in relationship to other components and this is a feature typical of Archaic middens.

The presence of Tahanga basalt and Mayor Island obsidian in considerable quantities appears to be a feature of early sites (Best 1975). However considering the proximity of both these sources to Slipper Island they would have been the most likely ones to have been exploited at any period. One interesting factor was the quantity and size of the obsidian waste material. For example, very few (18) of the 453 pieces of obsidian from Home Bay showed evidence of having been used and waste flakes were particularly large. Mayor Island obsidian must have been easily available, not a rare resource and probably not traded at this point.

There are enough indicators to suggest that both the South Bay and Home Bay middens are sites typical of the earliest periods of prehistoric occupation in New Zealand. Just how early remains unproven.

The large volume of stone material in both sites, but especially in the Home Bay site, requires discussion. When all points where midden material was exposed at Home Bay are connected, a minimum size for the site is estimated at 1,700 square metres. Next, taking the highest weight value of Tahanga basalt from the metre square HB/22 of 4,164gms and multiplying this by the total area of the site gives a total of 7,078kg (or approximately 7 tons in the old measure). The lowest weight value of 169gms for the 1/2 metre square HB/23 gives a total of 574kg (.5 tons). When all samples are treated in this way an estimate of 2 tons is produced. Tahanga basalt was found in all squares excavated and these were chosen over a broad area. Thus there was variation in quantity but not in the presence or absence in any of the squares. Where midden material was naturally exposed basalt was also common. Despite this simple picture

of the distribution of material, there are likely to be differences in quantity and presence or absence of basalt throughout the site. Nevertheless, from the samples taken and from the quantity of surface remains observed, Tahanga basalt must be considered a very abundant utilized resource. The size of the South Bay midden was not estimated but here again quantities of Tahanga basalt were considerable (1,817 gms from 3 sq. metres).

CONCLUSIONS

The inhabitants of both Home Bay and South Bay were involved to some extent in fishing, sealing and shellfish gathering. These activities may have been seasonal though there is no good evidence for this. The inhabitants were also involved in a range of industrial activities evidenced by the considerable amounts of waste Tahanga basalt, Mayor Island obsidian and Kuaotunu sinter and the utilized bone and shell. The quantity of Tahanga basalt suggests regular visits must have been made to the mainland to collect this resource. This might imply that occupation on the island was more than just seasonal. If occupation was of some duration then it is likely, that agriculture provided the economic basis of settlement. Other resources are not abundant and would be seasonally reduced. Archaeological evidence for agricultural activities is present on the island but this cannot be directly related to the Home Bay and South Bay occupations. Nevertheless indirect evidence does suggest this as a possibility.

Firstly, as already noted if occupation was of any duration it is likely to have been dependent on agricultural products as other resources would not support a permanent population and secondly Willan's analysis of the landsnail sequence does indicate vegetation was cleared from initial settlement and clearance was maintained.

Some length of occupation must be indicated by the presence of considerable quantities of Tahanga basalt. It would be more economical to make adzes, or at least rough them out near the source rather than transport considerable amounts of what was to become waste back to the island. At least if the island was being visited seasonally one might expect to find only a few disused adzes. There was an active industry in both the production of adzes and fishhooks, though complete specimens of these were not present. It is possible that adzes and fishhooks were being produced during a lull in agricultural activities and as a prelude to hunting expeditions to the mainland. If agriculture were being practiced on a regular basis with occasional or even frequent visits to the mainland to gather moas, stone material, and other resources this might account for the considerable quantities of stone material brought back to the island and the absence of adzes and other tools which were used and perhaps largely discarded in hunting expeditions on the mainland. The presence of pipis and cockles which appear to have been used as scrapers may provide some suggestion of agriculture activities though

there are a range of other possibilities. Ethnographies suggest shells were used in haircutting, scarification, Flax preparation, scraping of potatoes (Shawcross & Terrell 1966: 425) and in fish scaling and kumara scraping (Best 1924: 102).

An unexpected feature of both middens was the presence of considerable numbers of both pipis and cockles. They have been interpreted in this and similiar contexts as imports from mainland areas. This explanation was found not to be entirely satisfactory mainly because it would suggest the inhabitants had a strong preference against tuatuas which are the species presently available immediately adjacent to the sites. It is thus presumed that pipis and cockles must have been available on the island at the period of occupation of South Bay and Home Bay. Elsewhere (Rowland: 1976) it has been suggested that the presence of large numbers of Cellana denticulata in early middens in the Coromandel area and their absence in later sites was indicative of ecological change and/or the effects of human predation. While remaining generally cautious of supporting either cause the emphasis was placed on a possible analogy with the extinction of the moa, thus supporting the more direct and local predatory effects of human exploitation. Taken together both situations might suggest some locally widespread environmental changes occuring at this period. But as with the evidence for Cellana, so with the evidence for pipis and cockles, both environmental (ie sea-level changes) and human induced changes (as a result of vegetation clearance) can be hypothesised to explain changes in the shellfish distributions and abundances. Caution is again favoured. Supporting evidence from zoological, geomorphological and climatic studies and further quantification of shellfish remains is necessary to test these hypothesis.

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The excavated material has been deposited with the Auckland Institute and Museum.

Editor's note: In the interest of space the following have been deleted from the paper: Table 1, Table 3, Table 5, Figs 3, 4 & 5. The entire Appendix containing details of the midden analysis had to be left out, but this, and the tables are available for further study at the Anthropology Department, Auckland.

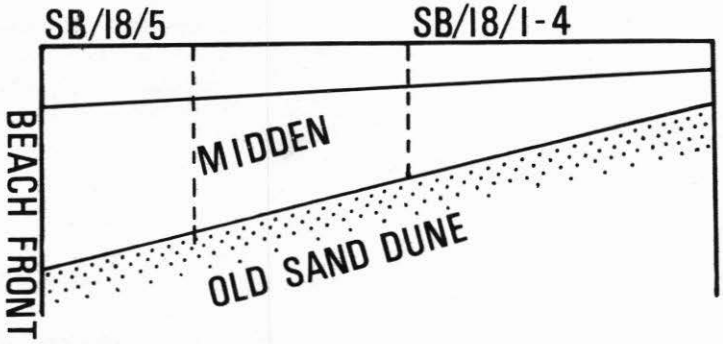

Figure 4. Schematic Section of South Bay Midden

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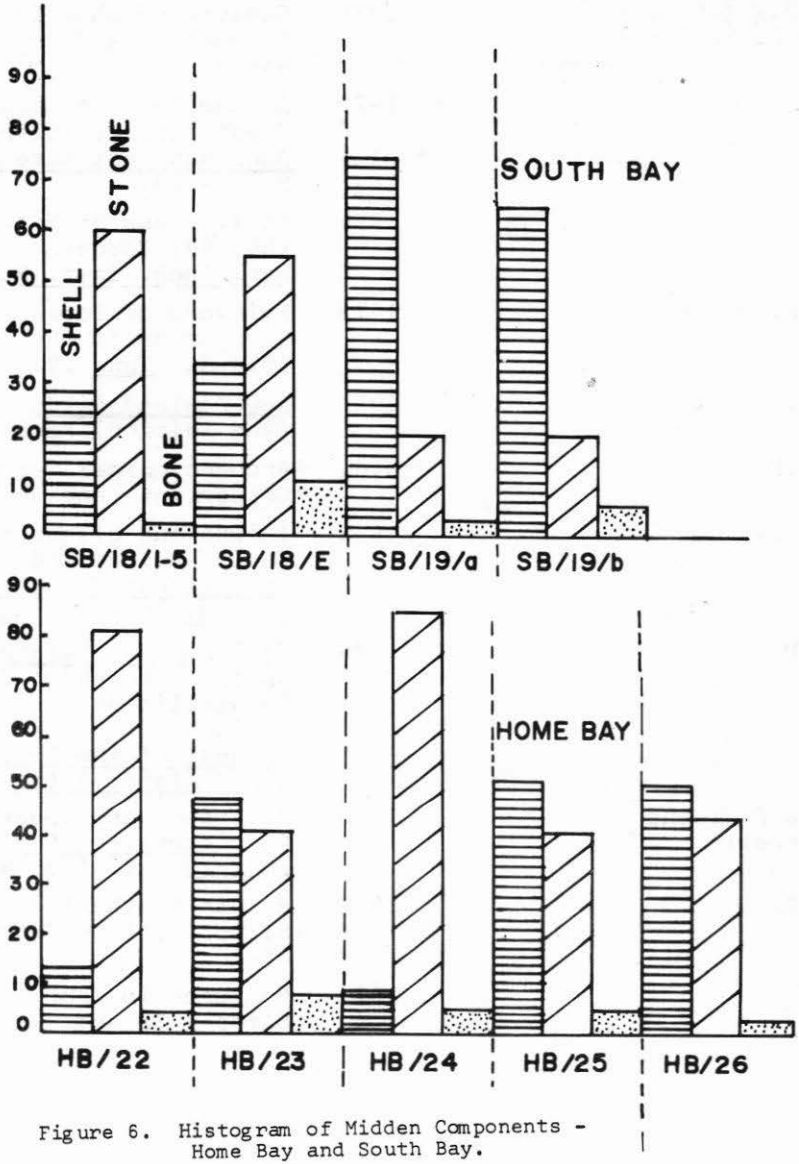

Figure 6. Histogram of Midden Components - Home Bay and South Bay.