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Prehistoric Māori Fishermen of Te Ika a Maru Bay, Cook Strait, New Zealand

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ABSTRACT

Analysis of fish remains from two adjacent middens at Te Ika a Maru Bay on the northern shores of Cook Strait revealed a number of differences in the fish catches at the two sites. These may be due to a difference in age between the two middens and a possible change in fishing conditions through time. A comparison of fish catches at a number of Cook Strait archaeological sites showed that pre-European fishermen in the region used several catching strategies, notably trolling with lures, angling with demersal baited hooks, and netting. Fishermen gave different emphasis to these methods at different sites.

Keywords: NEW ZEALAND, COOK STRAIT, TE IKA A MARU BAY, PREHISTORY, ARCHAEOZOOLOGY, FAUNA, FISHING.

INTRODUCTION

Te Ika a Maru Bay is located near the southwest tip of the North Island (Fig. 1). It is one of two adjacent north-facing bays which offered possibilities for canoe landing and settlement on the generally rugged and exposed coast north of Cape Terawhiti. There is a concentration of archaeological sites, including two fortified pā, in the bay, which was the site of a small Māori settlement in the 1840s. The presence of two pā suggests the strategic importance of the bay for canoe travel across the strait.

Survey and excavations were carried out by the Wellington Archaeological Society at Te Ika a Maru Bay in the summer of 1962-63. Some results were incorporated in an MA thesis (Davidson 1964) and an account of the fieldwork and results of analyses carried out up to that time were published in 1976 (Davidson 1976).

A notable feature of the two excavated middens was the amount of fish bone recovered. This was retained but could not be properly identified during the initial study because of the lack of comparative material. These fish remains were initially studied by Leach in 1977 and restudied by Leach and Boocock (1993) as part of a wider investigation of prehistoric fishing in New Zealand. The results of the latter study provide the basis for this paper.

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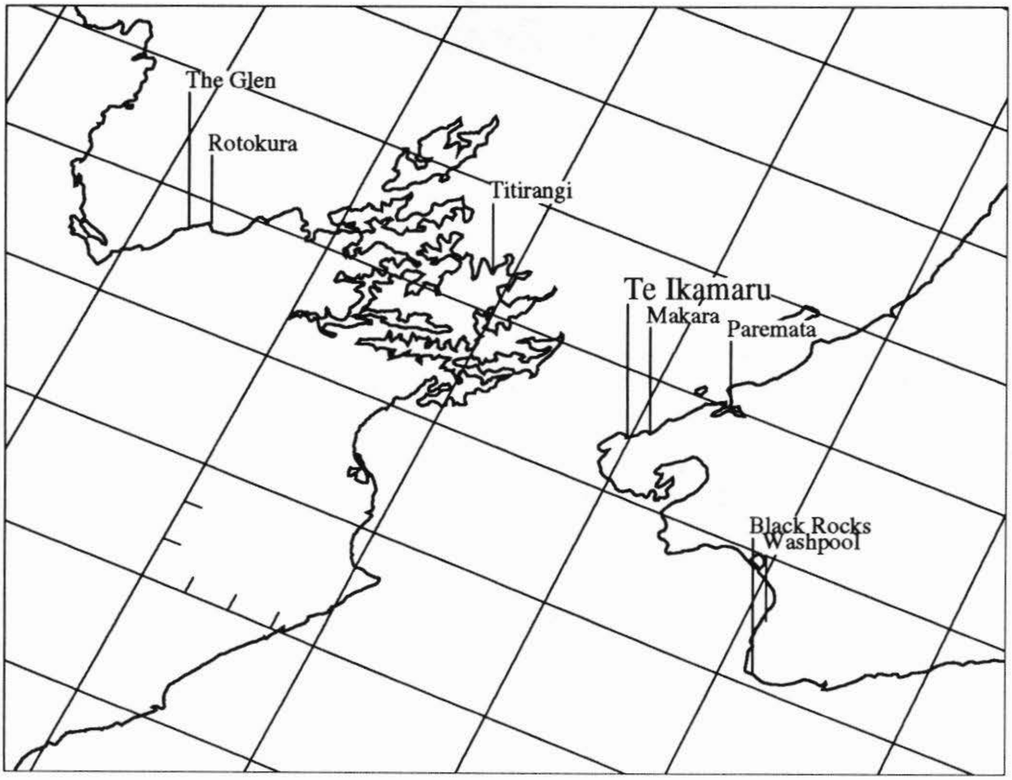

Figure 1: The location of the Te Ika a Maru Middens, and other archaeological sites in Cook Strait with significant fish remains which have been studied.

THE TE IKA A MARU EXCAVATIONS

The two main streams draining the hinterland of Te Ika a Maru Bay merge and enter the centre of the bay at the foot of one of the two pā. The middens were situated at the edges of these streams.

The Eastern Midden (site Q27/30, formerly N164/16) is located on the eastern bank of the eastern stream, at the edge of a sandy flat area from which artefacts and moa bones are said to have been collected in the past. Two eight-foot (2.4 m) squares, B-2 and B-4, were excavated here, in a line roughly paralleling the stream. Items of European manufacture were found in layers 1 and 2 in both squares. Only prehistoric material was found in layer 3 in B-2 and layers 3 to 5 in B-4. These deposits were not sieved, but shell and bone fragments were collected by hand during excavation. The bulk of the midden material was recovered from layer 5 in B-4, with lesser amounts from layers 3 and 4 in that square, and from layer 3 and the fill of features in the underlying natural in B-2.

The Western Midden (site Q27/36, formerly N164/22) was on the flat at the base of the pā. A thick deposit of midden containing large amounts of fish bone was exposed in the stream bank on the western side of this flat. Three separate excavation units of varying size, N, O and O2, were excavated in this midden. The heavy clay matrix of the deposit necessitated the use of wet sieving in the adjacent stream; faunal components were separated from unworked stone and gravel in the field. Most of the midden was recovered from layers 3 to 5 in excavation N, with much smaller amounts from equivalent but less concentrated deposits in O and O2. These deposits contained no European material and were sealed beneath a sterile overburden. No trace of this midden was seen on a recent visit and it is assumed to have eroded away completely.

The shell in the two middens consisted almost entirely of rocky shore species that would have been locally available (Davidson 1964: 118, 1976: 19). Some differences in the proportions were observed between the two deposits; in particular, paua (*Haliotis iris*) were most abundant in the Western Midden, and cat's eyes (*Turbo smaragdus*) in the Eastern Midden. Of the minor components the bivalve, *Protothaca crassicosta*, was quite well represented in the Eastern Midden but barely present in the Western Midden. This analysis, carried out in 1964, was based on weight rather than number of individuals, and did not take account of shell size (cf. Anderson 1979).

Dog bones were found in all the midden layers, and seal, rat and human bone were also present in both sites. At least fourteen species of bird, the majority seabirds, were represented, ten in the Western Midden and eight in the Eastern Midden, and there was one piece of worked moa bone from the Western Midden. Charred kernels of hinau berries were found in both middens.

The excavation report concluded as follows:

> The prehistoric layers sampled are undated, and could with equal justification be ascribed to most periods of a hypothetical Wellington prehistoric sequence. It can be said, however, that they represent occupation of the bay by people who certainly differentiated various activities in their settlements, who had contacts in various directions outside the district [reflected in the stone resources at their disposal], but whose principal preoccupation, as reflected by their middens, appears to have been the exploitation of the food resources of the immediate vicinity. This resulted in middens with an unmistakably Cook Strait flavour in which the rich Cook Strait sea coast resources were supplemented by more casual exploitation of the adjacent coastal forest. (Davidson 1976: 24)

Radiocarbon dates are now available for both middens and are discussed in Appendix 1. They indicate that both sites belong to the later part of Wellington prehistory (Fig. 5).

ANALYSIS OF FISH BONE

The analysis of fish bone followed the techniques used at the Archaeozoology Laboratory of the Museum of New Zealand Te Papa Tongarewa for the treatment of archaeological fish bone assemblages from the Pacific generally. The method, which has been described in detail elsewhere (Leach 1986), is outlined in Appendix 2.

It is important to note that all identifications were made to the lowest taxonomic level possible. Taxonomy and nomenclature follow Paulin and Stewart (1985) and Paulin *et al.* (1989). For a few species it is not possible to identify at a lower level than class (for example Elasmobranchii). For the three mackerel species (*Trachurus* spp.) present in New Zealand waters, identification is only possible to genus level because of similarity in anatomy among species.

Wherever possible, common names are used in this paper. The correspondences between common name, binomial and family name are given in Table 1.

TABLE 1

Common Fish Names and their Equivalent Systematic names

This Table lists common names of fish identified in the Te Ika a Maru assemblages.

Common Name	**Binomial**	**Family**
barracouta	*Thyrsites atun*	Gempylidae
blue cod	*Parapercis colias*	Mugiloididae
blue moki	*Latridopsis ciliaris*	Latrididae
common trumpeter	*Latris lineata*	Latrididae
common warehou	*Seriolella brama*	Centrolophidae
conger eel	*Conger verreauxi*	Congridae
gemfish	*Rexea solandri*	Gempylidae
greenbone	*Odax pullus*	Odacidae
groper	*Polyprion oxygeneios*	Percichthyidae
gurnard	*Chelidonichthys kumu*	Triglidae
John dory	*Zeus faber*	Zeidae
kahawai	*Arripis trutta*	Arripidae
kingfish	*Seriola lalandi*	Carangidae
labrid	*Pseudolabrus sp.*	Labridae
ling	*Genypterus blacodes*	Ophidiidae
mackerel	*Trachurus* spp.	Carangidae
marblefish	*Aplodactylus arctidens*	Aplodactylidae
red cod	*Pseudophycis bachus*	Moridae
scarlet wrasse	*Pseudolabrus miles*	Labridae
scorpionfish	*Scorpaena cardinalis*	Scorpaenidae
sharks, skates, rays	Elasmobranchii (Class)	Elasmobranchii (Class)
snapper	*Pagrus auratus*	Sparidae
spotty	*Pseudolabrus celidotus*	Labridae
tarakihi	*Nemadactylus macropterus*	Cheilodactylidae
trevally, mackerels	Carangidae	Carangidae

The calculation of minimum numbers followed the general technique of Chaplin (1971), and has been further discussed by Leach (1986). No attempt was made to increase MNI by taking into account observed size mis-matches.

The identifications used in this study were those of Leach and Boocock (1993). One assemblage included in their study has been omitted from consideration here. This was a surface collection from the vicinity of the Western Midden, which was very selective (consisting of large, easily identifiable mouth parts) and was not directly related to the excavated deposit.

A total of 732 fish bones were identified from the two middens. These yielded a minimum number of 255 fish. The distribution of identified bones by anatomy is given in Table 2.

The minimum numbers of fish by layer are given in Tables 3 and 4. (The data files relating to this study are available on the internet at

http://atlas.otago.ac.nz:800/~foss/Archaeozoology/archzoo.htm

TABLE 2
Number of identified bones from Te Ika a Maru according to anatomy and side

	Eastern Midden			Western Midden		
Anatomy	**Left**	**Right**	**Unsided**	**Left**	**Right**	**Unsided**
Dentary	20	23	-	49	46	-
Articular	11	17	-	25	18	-
Quadrate	9	17	-	30	30	-
Premaxilla	22	27	-	44	56	-
Maxilla	11	12	-	31	41	-
Left Superior Pharyngeal	1	2	-	18	18	-
Inferior Pharyngeal	-	-	13	-	-	94
Vertebra	-	-	16	-	-	31
Sub-Totals	**74**	**98**	**29**	**197**	**209**	**125**
Totals		**201**			**531**	

TABLE 3
Fish MNI from the Eastern Midden, Te Ika a Maru Bay

Columns
1 = B-4, fill of posthole, probably layer 5
2 = B-2 and B-4, layer 3
3 = B-4, layer 4
4 = B-4, layer 5

Taxon	**1**	**2**	**3**	**4**	**Totals**
barracouta	1	-	3	13	17
greenbone	-	1	1	6	8
mackerel	-	-	3	5	8
labrid	-	1	1	5	7
conger eel	-	-	1	2	3
sharks, skates, rays	-	1	1	1	3
tarakihi	-	1	1	1	3
blue cod	-	1	-	2	3
scorpionfish	-	1	1	1	3
blue moki	-	-	1	1	2
groper	-	-	-	2	2
snapper	-	-	-	1	1
red cod	-	-	-	1	1
gemfish	-	-	-	1	1
John dory	-	-	1	-	1
Totals	**1**	**6**	**14**	**42**	**63**

TABLE 4
Fish MNI from the Western Midden, Te Ika a Maru Bay

Columns
1 = N layer 4
2 = N layer 4 + 5
3 = N layer 5
4 = N layer 5 + 6
5 = N layer 6
6 = O layer 1
7 = O layer 3
8 = O2 upper and lower

Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**total**
labrid	24	10	38	2	1	3	-	1	79
greenbone	2	3	8	-	1	3	-	-	17
blue moki	3	4	6	-	1	-	-	-	14
barracouta	2	1	1	-	1	7	-	-	12
kahawai	2	1	5	-	-	1	-	-	9
snapper	-	2	4	-	1	1	1	-	9
conger eel	2	1	2	1	-	1	-	-	7
mackerel	3	-	4	-	-	-	-	-	7
kingfish	-	1	4	-	-	1	-	-	6
tarakihi	3	-	2	-	-	-	-	-	5
common warehou	-	1	3	-	-	1	-	-	5
sharks, skates, rays	-	1	1	-	-	1	-	1	4
blue cod	1	1	2	-	-	-	-	-	4
ling	-	1	1	-	-	1	-	-	3
groper	-	-	3	-	-	-	-	-	3
trevally, mackerel	-	-	1	-	-	1	-	-	2
common trumpeter	-	-	1	-	-	-	-	-	1
gurnard	-	-	-	-	-	1	-	-	1
red cod	-	-	1	-	-	-	-	-	1
scorpionfish	-	-	1	-	-	-	-	-	1
marblefish	-	-	1	-	-	-	-	-	1
John dory	-	1	-	-	-	-	-	-	1
Totals	**42**	**28**	**89**	**3**	**5**	**22**	**1**	**2**	**192**

A minimum number of 63 fish were identified from the Eastern Midden, comprising 16 different species from 15 families. A minimum number of 192 fish were identified from the Western Midden, representing 22 taxa from 19 families. These are fairly large numbers of species for North Island middens, but the results are comparable to those from other sites in Cook Strait, such as those in Palliser Bay, as is discussed below.

DIFFERENCES IN THE FISH CATCH BETWEEN THE TWO SITES

There are a number of differences in the fish catches between the two sites. These are illustrated in Fig. 2.

The dominant fish in the Eastern Midden are members of the Gempylidae family, predominantly barracouta, but also gemfish, representing 28.6% of the catch. These fish

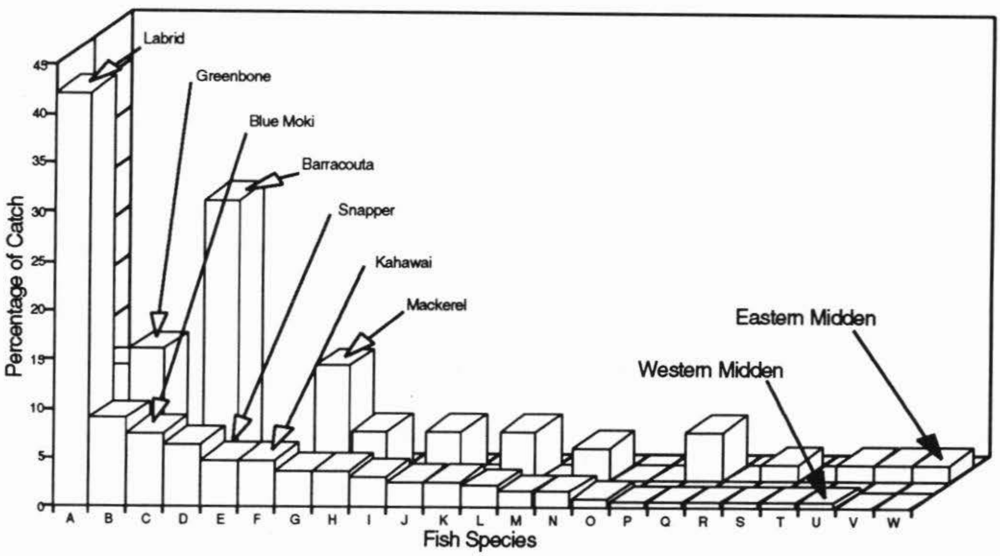

Figure 2: Percentage histogram of fish species (excluding elasmobranchs) caught by the fishermen at Te Ika a Maru, comparing the catch represented in the Eastern and Western Middens. Significant differences are: very high proportion of labrids in the Western Midden, and higher proportions of barracouta and mackerel in the Eastern Midden.

swim in schools and are voracious surface-feeding carnivores. They are therefore easily caught on a trolling lure.

The next most abundant fish are greenbone or butterfish (12.7%), members of the Odacidae family, which are shallow water, weed dwelling herbivores. These fish are most easily taken using nets.

Wrasses (family Labridae), such as the spotty and scarlet wrasse, representing 11.1% of the fish catch, are the next in relative importance. This family of small fish occupy shallow, rocky, coastal waters, feeding on bottom-living invertebrates. They are easily caught in shallow water all year round and readily take a baited hook.

Of similar abundance to the labrids are mackerels (Carangidae) which are essentially pelagic species feeding on crustaceans and small fish. They are generally caught using a trolling lure when they shoal on the surface.

In the Western Midden labrids represent 41.2% of the catch. Greenbone are the next most abundant, representing 8.9%. Next in importance are the Carangidae and Latrididae (both 7.8%). Latrididae, comprising predominantly blue moki but also trumpeter, take a baited light hook in both shallow and medium depth waters, but blue moki are more usually netted since they school on the surface, particularly in September to November during spawning (Leach 1979: 116 after Parrott 1957: 120).

It is clear from Figure 2 and Tables 3 and 4 that the fishermen at these sites had different fishing strategies, although they caught a similar range of fish. At the Eastern Midden, barracouta was the most frequently caught species. This indicates that these people were more successful at taking pelagic species using surface trolling lures. By contrast, the people from the Western Midden appeared to be more successful at catching labrids and other species that inhabit shallow coastal waters; such fish would be plentiful around the rocky outcrops along this coast.

FISHING PRACTICES AT TE IKA A MARU BAY

The fish species caught by the Te Ika a Maru fishermen are grouped according to different catching methods in Table 6. Catching methods are determined through an understanding of modern fishing methods and the habits and ecology of the various species. This table clearly indicates that trolling lure and demersal baited hook (41% and 43% respectively) were equally favoured and successful fishing methods for the Eastern Midden people, whereas at the Western Midden the catch was dominated by species caught by baited hook (64%).

Netting was of less importance than other fishing methods at both sites, although it was similar in significance to lure fishing for the Western Midden. There is no evidence that baited traps were used and it is difficult to confirm whether diving or spearing were activities undertaken by these people.

It therefore appears that the fishermen of the Eastern Midden favoured fishing over rocky ground or surface trolling in deeper offshore waters, whereas the Western Midden people favoured fishing in more coastal waters, from rock outcrops, for example, that are common along this coastline.

Previous surface finds from Te Ika a Maru Bay have been reported to include a stone minnow shank and a stone sinker (Davidson 1976: 20). Few artefacts were recovered during the 1962–63 excavations. Despite the predominance of fish bone amongst the faunal remains, no fishing gear was excavated, apart from a possible unfinished bone lure shank.

TE IKA A MARU BAY IN THE COOK STRAIT CONTEXT

Table 5 presents the results of the fish bone analysis by family for other Cook Strait sites (Fig. 1) from which fish bone has been analysed (Leach and Boocock 1993).

Paremata (site R26/122, formerly N160/50) is a stratified midden on the northern side of the entrance to the Porirua Harbour. Salvage excavations revealed three cultural deposits representing occupations during the early and late prehistoric periods as well as the early historic period. There is a single radiocarbon date (Davidson 1978: 214). The Conventional Radiocarbon Age has been recalculated by Leach from original count data as 582 ± 48 BP (NZ510, unidentified wood, assumed $\delta^{13}C$ value of -25.00). This calibrates to a fourteenth or early fifteen century age.

The fish bone recovered from Paremata was originally analysed by Leach and Davidson (1977). It was re-analysed by Leach and Boocock (1993: 229), producing an MNI of 147 fish comprising 16 species belonging to 16 families. The results indicate that three species contributed 50% of the catch — snapper (21%), labrids (17%), and kahawai (12%). Table 6 shows that fishing activity was concentrated on baited hook and line fishing for demersal species, although significant catches of pelagic fish were also made with surface trolling lures.

TABLE 5

Cook Strait MNI grouped into fish families

Columns: 1 = Te Ika a Maru Eastern Midden Q27/30, 2 = Te Ika a Maru Western Midden Q27/36, 3 = Paremata R26/122, 4 = Makara Beach R26/54, 5 = Makara Terrace R26/53, 6 = Washpool Settlement S28/49, 7 = Black Midden, Black Rocks S28/104, 8 = Crescent Midden, Black Rocks S28/104, 9 = Pond Midden, Black Rocks S28/104, 10 = Rotokura O27/1, 11 = The Glen O27/13, 12 = Titirangi Sandhills P26/208

Fish Family	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Anguillidae	-	-	-	-	-	27	-	-	-	1	-	0
Aplodactylidae	-	1	2	-	-	1	-	4	1	-	-	0
Arripidae	-	9	17	1	-	31	4	10	1	2	-	0
Balistidae	-	-	-	-	-	1	-	-	-	56	-	2
Carangidae	8	15	8	-	-	3	-	-	-	2	-	2
Centrolophidae	-	5	-	-	-	3	-	-	-	-	-	0
Congridae	3	7	7	4	-	3	2	5	2	7	-	3
Callorhynchidae	-	-	-	-	-	6	-	-	-	-	-	0
Cheilodactylidae	3	5	4	3	1	71	5	30	-	20	-	0
Elasmobranchii	3	4	7	6	5	14	-	6	1	7	-	2
Gempylidae	18	12	12	8	6	21	1	37	1	103	2	22
Labridae	7	79	25	12	5	74	108	258	21	60	7	3
Latrididae	2	15	10	2	1	9	4	15	1	17	-	0
Moridae	1	1	6	1	2	45	3	19	1	40	4	11
Mugiloididae	3	4	3	2	1	11	5	17	6	11	-	2
Odacidae	8	17	5	5	3	5	7	62	20	1	-	0
Ophidiidae	-	3	-	-	-	1	2	-	-	11	3	0
Percichthyidae	2	3	-	1	-	6	3	6	1	-	-	0
Pleuronectidae	-	-	1	-	-	-	-	-	-	-	-	0
Scombridae	-	-	-	-	-	11	-	-	-	-	-	0
Scorpaenidae	3	1	-	-	-	1	-	25	1	3	-	0
Sparidae	1	9	31	5	-	10	2	6	-	235	163	0
Triglidae	-	1	2	-	-	9	-	-	-	4	-	0
Zeidae	1	1	7	-	-	-	-	-	-	-	-	0
Teleostomi	-	-	-	-	-	-	-	-	-	5	-	0
Totals	63	192	147	50	24	363	146	500	57	583	179	47
No families	**15**	**19**	**16**	**12**	**8**	**22**	**12**	**14**	**12**	**17?**	**5**	**8**

Makara Beach Midden (site R27/54, formerly N160/105), north of Te Ika a Maru on Wellington's west coast, was excavated by the Wellington Archaeological Society in the 1960s and is undated. Twelve species from 12 families were identified, with a MNI of 50 fish. Labrids (24%) dominated the catch, followed by barracouta (16%), then sharks and rays (12%). Table 6 indicates that the use of a demersal baited hook was the most important fishing method at this site, as it was at Paremata.

Excavations at Makara Terrace Midden (site R27/53, formerly N160/106) has a published radiocarbon date of 493 ± 58 BP (McFadgen 1980: 5). Leach's recalculation of the Conventional Radiocarbon Age gave the same result of 493 ± 58 BP (NZ1877, marine shell, $\delta^{13}C$ +1.32) which gives a calibrated age range in the eighteenth to twentieth centuries. The fish bone analysis identified a MNI of 24, comprising 8 species from 8 families. Barracouta were the most common (25%), with labrids and elasmobranchs representing 21% of the catch each. Fishing with demersal baited hooks appears to have contributed a major proportion of the catch, with trolling lures also of some importance.

The Washpool Village (site S28/49, formerly N168/22) is a stratified site at the mouth of the Makotukutuku River in Palliser Bay. Six radiocarbon dates were obtained ranging from the 12th to 16th centuries. Level I includes cooking features, burials and rubbish pits and is believed to represent an occupation of some duration (Leach 1979: 81). The Level II occupation includes a number of structural features. The numerous scoop hearths and ovens indicate that this occupation phase was also of some duration (ibid.: 80). The nature of the latest deposit suggests that the midden was on the periphery of the occupied area at this period (ibid.).

A MNI of 363 was determined from the fish bone analysed from the Washpool Midden. This comprised 24 species from 22 families dominated by labrids (20%) and tarakihi (20%). Red cod was the next most abundant at 12% of the catch. As indicated in Table 6, demersal baited hook and line fishing once again produced the major proportion of the fish catch at this site. The results also indicate that there was a general decline in offshore fishing in favour of inshore foraging about broken rocky ground. This has been interpreted as a part of a more general decline in marine conditions towards the end of the fourteenth century AD (Leach 1976: 179).

Black Rocks (site S28/104, formerly N168-9/77) is an area of numerous middens on an exposed coastal flat in eastern Palliser Bay. Four middens were excavated (Anderson 1979); the three which contained fish bone are discussed here. Radiocarbon samples have been interpreted to suggest that the Black Midden was deposited about AD 1150, the Crescent Midden about AD 1270, and the Pond Midden about AD 1750 (Anderson 1979: 56).

Analysis of the Black Midden produced a MNI of 146, comprising 12 species from 12 families. This midden was dominated by labrids (74%) which are usually taken with a baited hook, as was almost 90% of the remaining catch from this site.

The Crescent Midden produced a MNI of 500 with 14 species identified from 14 families. Labrids represented 52% of the catch, with greenbone the next most abundant (12%). This indicates that netting had some significance but by far the most important fishing method, represented by about 75% of the catch, was the use of demersal baited hook.

Twelve species representing 12 families and a MNI of 57 were identified from the Pond Midden. The majority of this catch (72%) comprised two species — labrids (37%) and greenbone (35%). Of all the Cook Strait sites considered here, the Pond Midden appears to reflect the most significant use of netting. Fish caught by demersal baited hook and line, however, were still the most common in this assemblage.

Rotokura (site O27/1, formerly S14/1) is a stratified midden at Cable Bay near Nelson on the north coast of the South Island. Four occupation layers were exposed. There is a single radiocarbon date on unidentified charcoal with a Conventional Radiocarbon Age of 586 ± 57 BP (NZ1105, assumed $\delta^{13}C$ value of -25.00), which gives a calibrated age range very similar to that for Paremata (Challis 1991: 130). It is clear that snapper (40%) is the most abundant species caught by these fishermen, with barracouta (18%) the next most common, followed by labrids (10%). Demersal baited hook was therefore the most important fishing method, with trolling lure also contributing significantly to the catch.

A salvage excavation at The Glen (site O27/13, formerly S14/20) in Tasman Bay on the north coast of the South Island revealed a fishing camp which was probably occupied in the fourteenth or fifteenth century (Walls 1979). A long period of seasonal occupation has been suggested, on the basis of the depth and nature of the deposits. The principal activity at the site appeared to be the manufacture of fishing gear. The fish bone from this site was dominated by snapper (91%), although four other species were present. In total, five families were represented at the site with a MNI of 179.

The Titirangi Sandhills site (site P26/208, formerly S16/83), located in the Marlborough Sounds on the northeast coast of the South Island, was occupied on at least three occasions (Trotter 1977). Six radiocarbon dates span virtually the whole prehistoric period (Challis 1991: 130-131). The site was finally used after European contact (Trotter 1977: 9). Fish bone from this site produced a MNI of 47, representing nine taxa from eight families. Barracouta was by far the most abundant species (47%), with red cod the next most important (23%). Although barracouta dominated the catch, surface trolling for pelagic species was only slightly more important than fishing with demersal baited hook.

TABLE 6

Comparison of Cook Strait fish catch methods

Abundance values are percentages

Columns

1 = Demersal baited hooks: Centrolophidae, Cheilodactylidae, Elasmobranchii, Congridae, Labridae, Moridae, Mugiloididae, Ophidiidae, Percichthyidae, Scorpaenidae, Sparidae, Triglidae, Zeidae, Teleostomi

2 = Netting: Odacidae, Latrididae, Aplodactylidae, Balistidae, Callorhynchidae, Pleuronectidae

3 = Pelagic lures: Gempylidae, Carangidae, Scombridae, Arripidae

4 = Basket traps: Anguillidae

Site	**1**	**2**	**3**	**4**	**Total**
1 = Te Ika a Maru Eastern Midden Q27/30	42.9	15.9	41.3	-	100.1
2 = Te Ika a Maru Western Midden Q27/36	64.1	17.2	18.8	-	100.1
3 = Paremata R26/122	62.6	11.3	25.2	-	99.1
4 = Makara Beach R27/54	68.0	14.0	18.0	-	100.0
5 = Makara Terrace R27/53	58.3	16.7	25.0	-	100.0
6 = Washpool Settlement S28/49	68.5	6.2	18.1	7.4	100.2
7 = Black Midden, Black Rocks S28/104	89.2	7.5	3.4	-	100.1
8 = Crescent Midden, Black Rocks S28/104	74.4	16.2	9.6	-	100.0
9 = Pond Midden, Black Rocks S28/104	58.0	38.7	3.6	-	100.3
10 = Rotokura O27/1	69.0	12.7	18.3	0.2	100.2
11 = The Glen O27/13	98.9	-	1.1	-	100.0
12 = Titirangi Sandhills P26/208	44.8	4.3	51.1	-	100.2

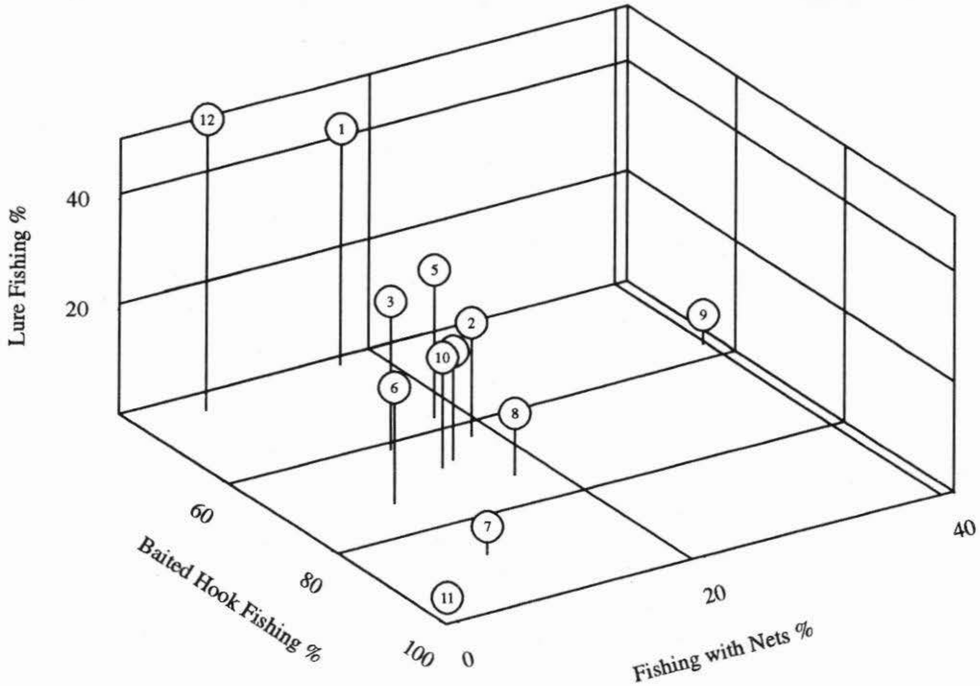

Figure 3: Comparison of fish catches for various archaeological sites in Cook Strait, organised into three main categories. The site numbers are listed in Table 5. The Eastern Midden (1) plots close to the Titirangi Sandhills site (12), both having a high proportion of pelagic fishes caught by lure. The Western Midden (2) forms part of a cluster of sites such as Paremata (3), Rotokura (10), the Washpool (6), and the Crescent Midden at Black Rocks (8), where, although baited hook fishing dominates, there is also a significant amount of netted species. The Glen (11) stands out as almost entirely focused on baited line fishing, while the Pond Midden (9) at Black Rocks shows an unusually high proportion of netting.

When these fish catches are organised into likely catch methods, the differences between these sites become rather clearer (Table 6). The sites form several groupings according to the relative importance which fishermen gave to baited hook fishing, netting, and lure fishing (Fig. 3).

The main group forms a reasonably tight cluster in the central part of the distribution with about 50-70% baited hook, 10-20% netting, and about 20% lure fishing. The Western Midden is in this group, along with the two Makara sites, Paremata, Rotokura, the Washpool, and the Crescent Midden.

A second cluster is based on a much higher emphasis on lure fishing and low emphasis on baited hook. There are only two sites in this category — the Eastern Midden and Titirangi Sandhills.

A third cluster also has two sites in it (Black Midden and The Glen), with very high emphasis on baited hooks, and practically no net fishing or use of lures.

The fourth and final cluster is formed on the Pond Midden at Black Rocks with a high emphasis given to netting.

It must be emphasised that the MNI values are very low for some of these sites, and therefore too much could be read into these clusters. However, this study does show that fishing in Cook Strait was anything but uniform.

Some of the effects noted here are bound to be due to seasonal changes in emphasis. Assessing the importance of changes in seasonal abundance is a complex subject. In Figure 4 commercial landings throughout the year are shown for several of the important species in these sites. These show pronounced seasonal effects, partly due to changes in emphasis of the fishermen, and partly due to seasonal availability. One very pronounced peak is observed for moki in October. This coincides with known migratory behaviour of this species:

> The results suggest the existence of a single stock of moki on the east coast of New Zealand. The fish make an annual spawning migration, swimming north from Kaikoura in May-June, reaching Gisborne to spawn in August-September, and then swimming south, passing Kaikoura again in October (Francis 1981: 267).

A similar pattern of abundance in early summer can be seen for kingfish, although these records were not collected for the Wellington area. It is interesting that the barracouta and snapper figures show a lower catch rate in the height of summer.

It will be observed in Figure 3 that the two middens at Te Ika a Maru show quite different balances between these three main types of fishing. As noted above, the main difference between these two sites is due to an abundance of labrids in the Western Midden, and an abundance of barracouta in the Eastern Midden. Such a difference may indicate that general sea conditions were different when these two sites were occupied. Barracouta are more likely to have been taken from canoes away from the shore, though not necessarily very far out to sea. It is very unlikely that canoes would be taken out in rough weather. On the other hand, labrids may be taken in very shallow water, and most could have been taken off rocks. These fish certainly could be taken at times when launching a canoe might be difficult. It has been observed before that in Cook Strait, a high proportion of labrids in a site may indicate localised difficulties in fishing over deeper water for more desirable species (Leach and Anderson 1979). Although the calibrated radiocarbon dates for these two sites overlap at the 95% confidence level they do not overlap at the 68% confidence level and it is possible that they were actually occupied at different times. It is noticeable in Figure 5 that the most likely period of occupation of the Western Midden is right in the middle of the Little Ice Age, while the Eastern Midden is likely to have been occupied immediately before it (Leach and Leach 1979: 231).

Eastern Midden	**Western Midden**
CAL 1564-1685 AD (68%)	CAL 1689-1864 AD (68%)
Before Little Ice Age	During Little Ice Age
Calmer seas	Rougher seas
Canoe fishing easier	Rock fishing more common
Labrids 11.1%	Labrids 41.2%

This could account for the observed differences between these two sites. During the Little Ice Age sea conditions would have been much rougher in Cook Strait, making canoe transport hazardous and less frequent.

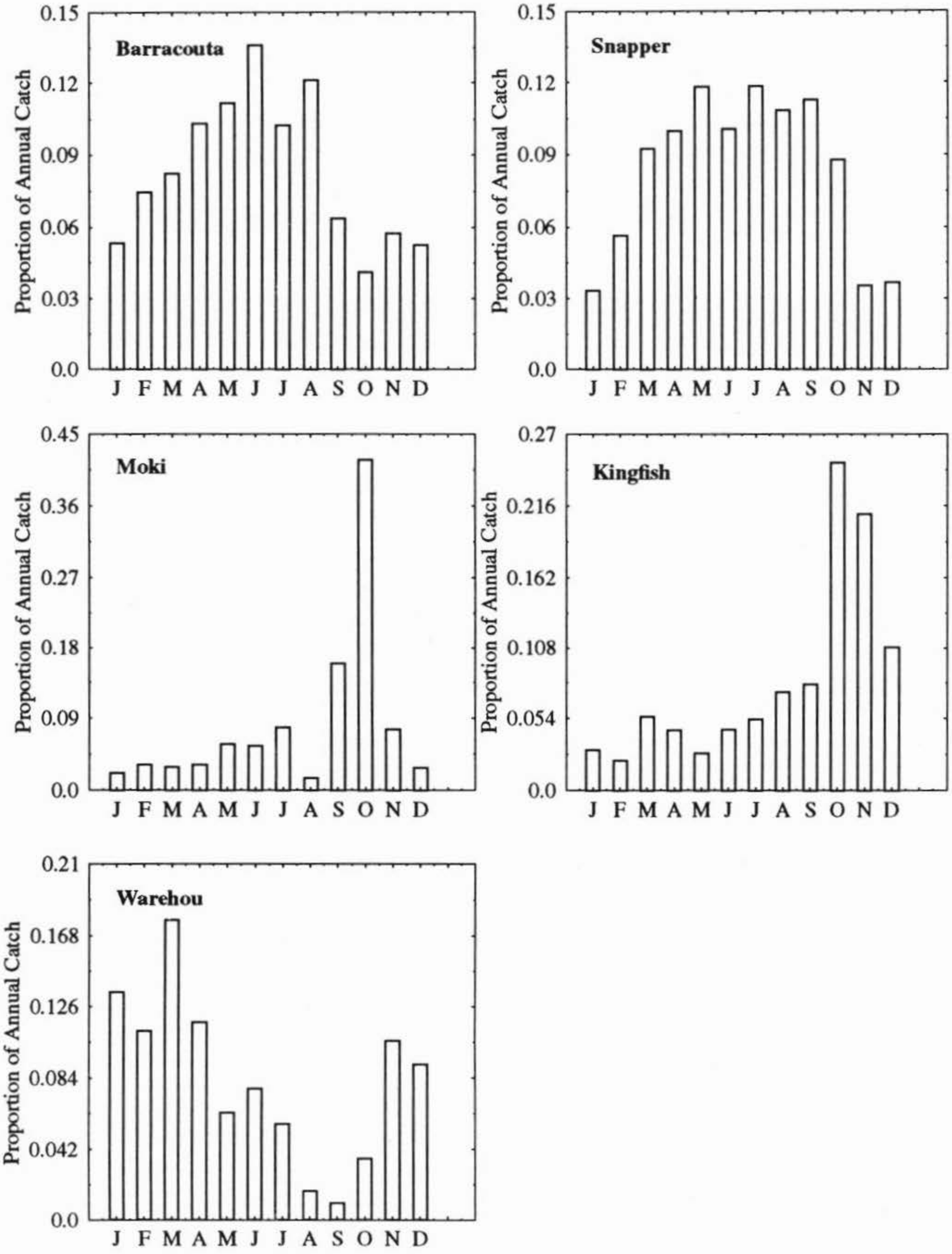

Figure 4: Commercial landings of various fish species throughout the year. All are landings in Wellington except for kingfish, which are for Napier and Tauranga. Landings are combined figures for several years: barracouta (1949-1961), snapper (1953-1966), moki (1945-1971), kingfish (1969-1971, warehou (1957-1966).

CONCLUSIONS

Fish catches at two closely adjacent middens at Te Ika a Maru Bay showed some marked differences, which appear to reflect different catching methods. Although no definite items of fishing gear were recovered in the excavations, the nature of the fish catches suggests a significant use of fishhooks. At the Eastern Midden, trolling lures are likely to have been important, whereas the Western Midden appears to reflect a greater reliance on baited hooks. Some netting was probably practised by the inhabitants of both sites.

If our inferences about fishing behaviour at Te Ika a Maru are correct, the presence of large numbers of fishhooks in some archaeological sites in New Zealand and their virtual absence in others cannot be taken as a reliable indication of fishing practices, nor of the species which were caught.

Radiocarbon dates for the two sites overlap, but it is nonetheless likely that the Eastern Midden is somewhat older than the Western Midden. Both sites belong to the latter part of Wellington prehistory. The Eastern Midden may have been occupied before the onset of the Little Ice Age, whereas the Western Midden seems to fall in the middle of that period, when sea conditions were probably less favourable for canoe use and for fishing generally. This may explain the greater emphasis on trolling in the earlier site, and the reliance at the later site on fish which could be caught inshore.

Comparison of fish catches at Te Ika a Maru and ten other Cook Strait sites shows that fishermen in this region regularly caught quite a wide range of species, although catching strategies varied. The Western Midden at Te Ika a Maru groups with a number of other sites in which baited hook fishing predominated, with a lesser use of nets and lures. The Eastern Midden, however, groups with only one other site in a cluster with a much higher emphasis on trolling. Two other small clusters reflect high emphases on baited hook and net fishing respectively.

The variety in fish catches in these Cook strait sites shows how important it is to have sufficient data in order to understand fishing behaviour in a particular region. Information from one site at Te Ika a Maru, rather than two, would have given a more restricted insight into the fishing activities of the inhabitants of this small bay. Each new site analysed adds to our understanding of the complexity of fishing history in Cook Strait. Chronological aspects are not well controlled; there is much more still to be learned.

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APPENDIX 1: RADIOCARBON DATES FROM TE IKA A MARU BAY

Samples of *Protothaca crassicosta* from layer 5, square B-4, in the Eastern Midden and layer 5, excavation N, in the Western Midden were dated by the then Institute of Nuclear Sciences, DSIR, Lower Hutt.

The sample from the Eastern Midden, dated by the gas counting method, gave the following result.

NZ 7754 $\delta^{13}C = 0.4 \pm 0.1\%$ CRA = 680 ± 50 BP

This was calibrated by the laboratory (following Stuiver *et al.* 1986) with ΔR set at 0 radiocarbon years, producing a calendrical age of AD 1508 to 1792 (95%) and AD 1564 to 1685 (68%)

In an attempt to ensure comparability, the same species was used for both dates. However, insufficient shell was recovered from the Western Midden for the gas counting method and this sample was dated by accelerator mass spectroscopy. The initial determination on this sample was as follows.

NZA 881 $\delta^{13}C = 1.97$ CRA = 680 ± 180 BP

The large standard deviation on this result rendered it virtually useless as an indication of the age of the deposit. Discussion with the laboratory revealed other problems and the sample was reanalysed with the following result.

NZA 1736 $\delta^{13}C = 0.12$ CRA 525 ± 66 BP

This was calibrated by the laboratory (after Stuiver *et al.* 1986) with ΔR set at 0 radiocarbon years producing a calendrical age of AD 1668 to 1950 (95%) and AD 1689 to 1864 (68%) with a median of AD 1788.

The laboratory advised that the latter determination should be regarded as the best available result for the sample, and the earlier determination should be disregarded (Rodger Sparks, pers. comm.). This result raises the possibility that the Western Midden was deposited by the nineteenth century occupants of the Bay, who were recent immigrants from Taranaki and Whanganui. However, although items of nineteenth century European manufacture were found on the surface of the pā and elsewhere on the flat below, none were found in the midden excavation. Moreover, the Western Midden was well sealed by a thick sterile overburden. It is more likely, therefore, that the Western Midden is pre-European.

The results for the two sites overlap at the 95% confidence level, and there may be little difference in their ages. Since they do not overlap at the 68% confidence level, however, it is tempting to think that the Eastern Midden is actually somewhat older. Whatever the case, it is clear that both sites belong to the latter part of Wellington prehistory. The combined probability curve is illustrated in Figure 5.

APPENDIX 2: METHOD OF FISH BONE ANALYSIS

The fish remains were sorted into identifiable and not identifiable, and all material was rebagged and kept. The identifiable fragments were then sorted according to anatomical elements in the cranium. Many years of experience has shown that five parts of the cranial anatomy are most useful for identification of a wide range of fish taxa in New Zealand and the Pacific. These are therefore the most suitable from which to calculate minimum numbers on a consistent basis. They are the dentary, articular and quadrate in the lower jaw, and the premaxilla and maxilla in the upper jaw. We have made various attempts to extend this list of cranial elements by adding, for example, the opercular and cleithrum; however, for New Zealand and Pacific Island species, only a few taxa can be reliably identified using these bones, unlike those listed above. In addition to these five paired cranial elements, certain 'special' bones are also identified. These are items which are especially characteristic of some species, such as the caudal peduncle of tuna species, pharyngeal elements of labrids, erectile spines of triggerfish, and so on.

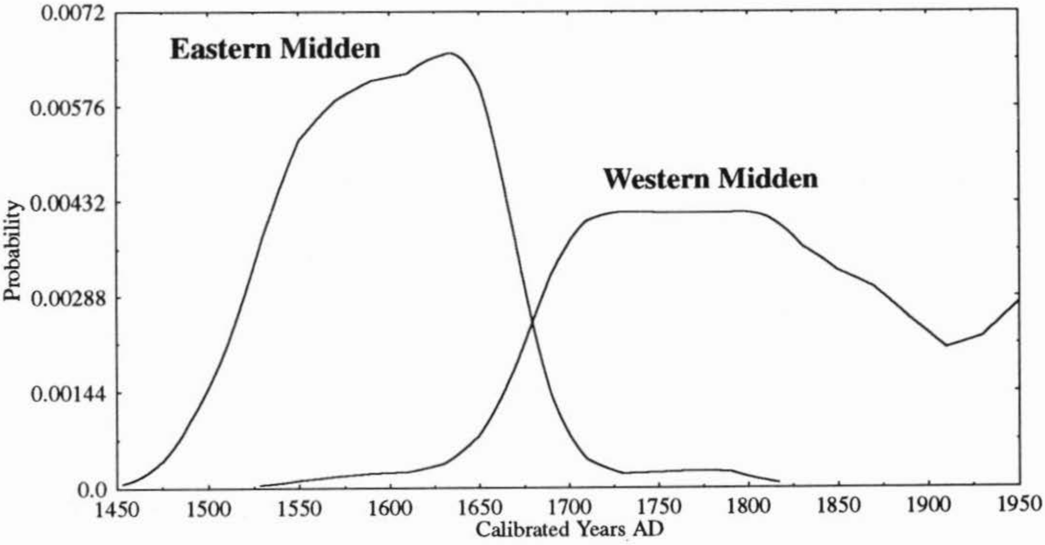

Figure 5: Probability curve for radiocarbon dates from the Eastern Midden (NZ774 680 ± 50 BP), and the Western Midden (NZA1736 525 ± 66 BP), after calibration using ΔR = -30 years. Both sites belong to the later period of Wellington prehistory. The Eastern Midden may be slightly earlier than the Western Midden.

The reference collection used for identifications is housed in the Archaeozoology Laboratory at the Museum of New Zealand Te Papa Tongarewa, and contains most of the common inshore species from New Zealand and about 300 Pacific Island species.

Bones are identified to the lowest taxonomic level possible. The taxon, anatomy and side, and number of bones are written on the bag containing the bones. Only a few bones may be identified to species across all anatomical elements, more to genera, and all to family level. Sometimes a few bones are found which can not be matched in the comparative collection, even to family level. These are described as Species A, Species B, etc., and are later listed as 'Teleostomi'. Identifications are entered into a computer database.

For the purpose of examining numeric abundance of fish by time and space, an archaeological unit must be chosen. This is referred to as an assemblage. An assemblage is defined as a single space/time unit in the excavation. Wherever possible, each assemblage refers to the contents of one excavation square and one excavation level (stratigraphic layer or unit level spit). Different excavators record and bag material by quite different methods, with varying degrees of attention to space/time units.

In calculating the relative abundance of different fish types in each assemblage, a unit of Minimum Number of Individuals (MNI) is used. This is defined as the smallest number of individuals which is necessary to account for all of the skeletal elements of a species in a faunal assemblage (Smith 1985: 107, see also Leach 1989: 115 ff.). It is possible to increase the MNI for a taxon by examining anatomical elements for mis-matches by size. We do not attempt this. It is important to realise that the MNI is a means of establishing the relative abundance, that is, the proportions of each taxon in an assemblage. The numeric value of the MNI is secondary to this objective. Various methods may be followed in arriving at MNI, using smaller or larger assemblages; however, what is of paramount importance is achieving stable proportions which truly represent the original relative abundances of different taxa.

Various computer programs are used when examining the database, to work out the distribution of different anatomical parts by time and space; and to calculate MNI by different assemblage sizes, proportions, diversity statistics, spatial variation and so on.

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