# ARCHAEOLOGY IN NEW ZEALAND

# A FISH BONE SAMPLE FROM MANGAWHAI SANDSPIT AND INFERRED PREHISTORIC FISHING PRACTICES

Stuart Hawkins
Auckland

## Introduction

The excavation of coastal middens has an important place in New Zealand archaeology for two reasons. The first because of the obvious significance of coastal environments to Maori subsistence, and secondly because coastal middens provide direct evidence of human behaviour in past environments. More specifically coastal middens, which usually contain a majority of fish and shellfish remains, indicate the availability of various resources from different niches within a local coastal environment and most importantly in what abundance these resources were exploited over time. Midden R08/30-2, located on the Mangawhai spit dunefields approximately 4km south of Mangawhai Heads in the Northland region, was sampled by excavation during May 1978 and is discussed by Pearce (2001). Three 1.0m x 0.25m test pit sections were excavated. Sediments were screened through a 2 mm mesh and in some cases wet sieved. Fish and shellfish remains, as well as small amounts of rat (cf *Rattus exulans*) and one dog (*Canis familiaris*) mandible were recovered (Pearce 2001). However only fish remains from the central and south sections were available for analysis. The coastal environment surrounding the Mangawhai spit dunefield, where Pearce (1975, 2001) has recorded 16 middens, currently consists of an open sandy beach on the east side of the spit and an estuary on the west side. The site itself is a foredune in close proximity of the shore, exposed, with deflated surfaces surrounding it where the stratigraphy is clearly visible. While Pearce (2001) has analyzed the shellfish remains and interpreted geomorphic evidence, this paper focuses on the analysis of the recovered fish remains in an attempt to reconstruct Maori exploitation of fish resources during a Classic phase of prehistoric settlement, within the context of a changing coastal landscape. This is achieved by means of fish bone identification and quantification for the compilation of a taxonomic species list.

## Methods

The fish remains were analyzed using similar methods to those developed by Anderson (1973) and standardized by Leach (1986). Identifications were made using the New Zealand fish reference collection in the Auckland University Anthropology Department laboratory in conjunction with illustrations from Leach (1997). Taxonomy follows Paul (1997). Those elements identified were predominantly five paired jaw bones (dentary, premaxilla, maxilla, articular, and quadrate), scutes (Carangidae) and teeth (cf snapper *Pagrus auratus*). However only those five paired jaw bones mentioned above were quantified using NISP (Number of specimen present), MNE (Minimum number of elements), and MNI (Minimum number of individuals) so as to reduce inflation of snapper and Carangidae values.

Most paired jaw bones could be identified to species , a good indication that the bones were well preserved. However, in some cases specimen have only tentative identifications due to their fragmented nature. It should be noted here that difficulties did arise with respect to identification of jack mackerel (*Trachurus declivis)*. Paul (1997) has distinguished three species of jack mackerel, *T. declivis, T. novaezelandiae* and *T. murphyi*. It is apparent that these three species are very similar and it is often difficult to tell them apart (Paul 1997) The current lack of adequate representation of all three species in the University of Auckland Anthropology reference collection as well as the possibility of morphological similarity and confusion between the species during identification, has resulted in identification of jack mackerel to cf *T. declivis.*

## Results

Of the 151 paired jaw bones identified to element, 139 were identified to species level. A further five paired jaw bones have been given tentative identifications. At least six species were identified and these include, in order of most abundance, jack mackerel (*Trachurus declivis),* snapper (*Pagrus auratus),* blue mackerel (*Scomber australasicus),* barracouta (*Thyrsites atun),* kahawai (*Arripis trutta),* and a tentative identification to red gurnard (*Chelidonichthys kumu)* (see Table 1). However the majority of the assemblage consists of just three species with jack mackerel, snapper, and blue mackerel dominating 91.2% of the entire assemblage. This assemblage is consistent with a bulk sample that was most likely collected from the same midden during a later excavation, which yielded an unknown quantity of fish bones identified by Dr. Reg Nicholl as snapper, jack mackerel, and blue mackerel (Enright and Anderson 1988).

It is important to note that based on MNI, 76.5% of the assemblage (jack mackerel, blue mackerel, barracouta, kahawai) is represented by fish that are most likely caught off shore in the pelagic zone using lures (Leach and Boocock 1993). Ayling and Cox(1982: 217) describe jack mackerel (*Trahurus declivis*) as a bottom to mid water dwelling pelagic schooling carnivore, common throughout New Zealand from near shore to depths of 300 metres on the upper continental shelf. As already mentioned above, Paul (1997) has described three species of jack mackerel as being pelagic and usually inhabiting the inner to central shelf. There is, however, an important difference regarding one of the species. While *Trachurus declivis* mainly inhabits the central shelf, *Trachurus novaezelandiae* has a relatively greater inner shelf presence and smaller specimen usually inhabit harbours and bays (Paul 1997). Blue mackerel is also a pelagic schooling carnivore, however, it differs to species of jack mackerel and barracouta in that it is strictly an offshore species that inhabits the outer continental shelf throughout the year (Ayling and cox 1982: 290).

Fish most likely to be caught inshore (snapper, red gurnard) comprise 23.5% of the assemblage. Snapper in particular is one of the most abundant continental shelf carnivores in Northern New Zealand waters. They spawn in schools during the summer further off shore with adults moving inshore during late summer, and many appear to permanently occupy a territory of inshore rocky reef (Ayling and Cox 1982).

## Discussion

The data is indicative of a primary fishing strategy focussed on fast moving pelagic schooling fish offshore most likely using trolling lures from a canoe. The relatively smaller quantity of snapper suggests a secondary emphasis on an inshore rocky zone using baited hook and line during late summer. The limited evidence of kahawai tends to support a summer occupation when seas are less rough. Kahawai is an inshore pelagic fish during summer, and often found in estuaries (Paul 1997), but moves to deeper waters during winter (Ayling and Cox 1982: 222). This suggests that fishing was concentrated during the summer in deep offshore waters.

This is a most interesting fish assemblage when put in the regional context of prehistoric Maori fishing practices from any period. In all but one fish assemblage from the entire North Island to date, near shore species have dominated the prehistoric fish catches, particularly snapper (Anderson 1997, Leach and Boocock 1993). The exception being Kohika, a coastal site located in the Bay of Plenty (Nicholl 1988), where jack mackerel also dominate the fish assemblage.

A temporal analysis of the central excavation unit (see Tables 2 and 3) reveals a decrease in the relative abundance of snapper through time until its absence by layer 2a, as well as the consistent domination of offshore species particularly jack mackerel in the assemblage. This suggests two things. The first implies that jack mackerel were plentiful to the coastal region throughout all occupations of the site. Secondly it suggests a change in fishing behaviour. Initially in layer 4, a more balanced primary offshore and secondary inshore focus described above gave way to a decline in inshore species by layer 3, followed by almost total domination of offshore species by layer 2. Another fact that is clear is the reduction in fishing behaviour in layer 2 compared to layers 3 and 4 and its near absence in layer 1.

The shellfish data (Pearce 2001) suggests similar differences between the top two layers and the bottom two layers, to the fish data. Pearce argues for an early focus on shellfish from the estuary based on a predominance of cockle (*Austrovenus stutchburyi)* in the bottom two layers, followed by a change in focus to the open ocean beach based on a predominance of tuatua (*Paphies subtriangulata)*. It is quite possible, as Pearce also points out, that this correlates with fishing patterns and suggests that snapper could have been caught from the estuary while cockles were collected, although this is not the only possible zone for snapper procurement. Pearce has further argued for a casual link between subsistence change and environmental changes that occurred at a close proximity in time. Since the site is situated on a mobile sand spit with a fluctuating estuary and harbour entrance, this may have affected past fishing practices although it is not exactly clear how. A possible link between subsistence and changing site location in relation to the estuary and open beach has been implied by both Pearce (2001) and Enright and Anderson (1988). Enright and Anderson (1988) in particular have observed that of the four middens in close proximity to R08/30-2, three are parallel to but further inland and these have no fish remains whatsoever.

Radio carbon dates suggest that midden deposition began in the sandspit area at about c. 400 B.P. (Anderson 1984, Enright and Anderson 1988, Pearce 2001). The Radio carbon dates for midden R08/30-2 (Pearce 2001) however, suggest a fairly rapid rate of deposition of approximately 50-100 years for approximately 1.15 metres of midden. The central section stratigraphy appears intact and clearly represents more than one occupation of the site. This could possibly be reduced into at least four general phases of occupation. Phase one (Layer 4) involved an early relatively intense emphasis on offshore fishing with a secondary emphasis on inshore fishing and a focus on estuary resources (cockle, and possibly snapper). Phase two (Layer 3) also involved an emphasis on off shore fishing, but inshore fishing declined as did exploitation of estuary resources. By phase 3 (Layer 2) fishing intensity was significantly reduced and almost all fish caught were offshore species, while focus had shifted completely from estuary resources to open sandy beach resources (tuatua). In phase four (Layer 1) there is scant evidence of fishing and only large amounts of tuatua (Pearce 2001) were recovered.

## Conclusion

This is an important assemblage when one is attempting to explain prehistoric Maori fishing activities because it provides evidence for a predominant offshore fishery where few have been found (Leach and Boocock 1993). The central section of midden R08/30-2 in particular has yielded well preserved fish remains from secure stratigraphic contexts that allows one to look for changes in fishing behaviour over time. However, the evidence for changes in subsistence behaviour and the reasons why are not clear. Although four possible phases of fishing occupation have been identified, an alternative scenario that is the complete opposite is also plausible, and demands that any conclusions must be cautious. Confusion over the identifications to jack mackerel must be clarified in future.

The scenario which the author considers the most plausible implies that changes in fish abundances are accompanied by a corresponding change in shellfish abundance. As offshore fishing remained a dominant behaviour, inshore fishing gradually declined while at the same time there was a shift in focus from the estuary to the open ocean beach for shellfish exploitation. The intensity of fishing also declined over time until evidence of fish remains practically disappeared by the last level of occupation. While such interpretations feel overly simplistic and reductionalist in value, it would be of further interest to develop a more detailed argument for change. Future excavations on middens in the study area, therefore, are a necessary measure for further developing this reconstructed model for subsistence change that could possibly be tied more closely to changes in the environment.

## Acknowledgements

I appreciated the opportunity Peter Pearce gave me to work on this assemblage recovered in 1978. The final conclusions were in part a collaboration with Peter and I thank him for helping me formulate some of the ideas. Thanks also to Dr. Melinda Allen for her extremely valuable input and Dr. Rod Wallace for allowing me access to the New Zealand fish reference collection in the Auckland University laboratory, Karen Baker for her efficient proof reading, and Jonathon Carpenter for some useful comments, Joan Lawrence for being an understanding editor. Lastly I would like to thank my fiancé and the Jacobi family for supporting me during the research process, I could not have done it without them.

## References

Anderson, A. 1973. *Archaeology and behavior: Prehistoric subsistence behaviour at Black Rocks peninsula, Palliser Bay*. M.A. thesis, University of Otago, New Zealand.

Anderson, A. 1997. Uniformity and regional variation in marine fish catches from prehistoric New Zealand. *Asian Perspectives*, Vol 36, No 1: 1-26.

Anderson, M.J. 1984. *Evolution, morphology and dynamics of the Mangawhai high dune system*. M.A. Thesis. University of Auckland, New Zealand.

Ayling, T. and G.J. Cox. 1982. *Collins guide to the sea fishes of New Zealand.* Auckland: Collins.

Enright, N.J. and M.J. Anderson. 1988. Recent evolution of the Mangawhai spit dunefield. *Journal of the Royal Society of New Zealand.* Vol 18, No 4: 359-367.

Leach, B.F. 1986. A method for the analysis of Pacific Island fishbone assemblages and an associated database management system. *Journal of Archaeological Science* 13: 147-159.

Leach, B.F. 1997. A guide to the identification of fish remains from New Zealand archaeological sites. *New Zealand Journal of Archaeology* Special Publication.

Leach, B.F. and Boocock, A.S. 1993. Prehistoric fish catches in New Zealand. *British Archaeological Reports*, International series 584.

Nicholl, R. 1988. *Tipping the feather against the scale: Archaeozoology from the tail of the fish*. Unpublished Ph.D diss, University of Auckland, New Zealand.

Paul, L. 1997. *Marine Fishes of New Zealand.* Mobil New Zealand Nature Series No. 1 and 2. Reed, Auckland.

Pearce, P. 1975. Archaeological site survey report: Te Arai Point to Poutawa

stream. N.Z. Historic Places Trust, Wellington.
Pearce, P. 2001. Mangawhai Sandspit Excavation 1978. *Archaeology in New Zealand*, this issue.

*Table 1: Total NISP, MNE, and MNI: Note that MNI and MNE values here are calculated and aggregated based on the entire excavated sample regardless of provenance unit.*

| Taxon | NISP | MNE | MNI |
|---|---|---|---|
| Jack mackerel cf *Trachurus declivis* | 68 | 67 | 16 |
| Snapper *Pagrus auratus* | 47 | 42 | 7 |
| Blue mackerel *Scomber australasicus* | 15 | 14 | 8 |
| Barracouta *Thyrsites atun* | 6 | 5 | 1 |
| Kahawai *Arripis trutta* | 3 | 2 | 1 |
| Cf jack mackerel *Trachurus Spp.* | 3 | 3 | |
| Cf red gurnard *Chelidonichthys kumu* | 1 | 1 | 1 |
| Cf snapper *Pagrus auratus* | 1 | 1 | |
| Sp? | 7 | 5 | |
| Total | 151 | 140 | 34 |

*Table 3: Central section MNI % for each temporal unit*

| Fish MNI (%) | | | | | |
|---|---|---|---|---|---|
| Layer | Jack mackerel | Snapper | Blue mackerel | Barracouta | Other |
| 1a | 0 | 0 | 0 | 0 | 0 |
| 1b | 0 | 0 | 0 | 0 | 0 |
| 1c | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | 0 | 0 |
| | | | | | |
| 2a | 75 | 0 | 0 | 0 | 25 |
| 2b | 0 | 0 | 0 | 0 | 0 |
| 2c | 50 | 25 | 25 | 0 | 0 |
| 2d | 0 | 0 | 0 | 0 | 0 |
| Total | 62.5 | 12.5 | 12.5 | 0 | 12.5 |
| | | | | | |
| 3b | 50 | 16.7 | 25 | 8.3 | 0 |
| Total | 50 | 16.7 | 25 | 8.3 | 0 |
| | | | | | |
| 4a | 33.3 | 33.3 | 22.2 | 11.1 | 0 |
| 4b | 44.4 | 33.3 | 11.1 | 0 | 11.1 |
| Total | 38.9 | 33.3 | 16.7 | 5.6 | 5.6 |

*Table 2: MNE and MNI aggregated by layer and section. Sp? Refers to elements that could not be identifies to taxon.*

| Unit and Layer | Taxon | NISP | MNE | MNI |
|---|---|---|---|---|
| Middle 1b | Sp? | 1 | 1 | |
| | Total | 1 | 1 | |
| Middle 2 | Jack mackerel | 2 | 2 | |
| | Total | 2 | 2 | |
| Middle 2a | Jack mackerel | 14 | 14 | 3 |
| | Kahawai | 2 | 1 | 1 |
| | Total | 16 | 15 | 4 |
| Middle 2c | Jack mackerel | 2 | 2 | 2 |
| | Blue mackerel | 1 | 1 | 1 |
| | Snapper | 1 | 1 | 1 |
| | Total | 4 | 4 | 4 |
| Middle 2d | Sp? | 3 | 3 | |
| | Total | 3 | 3 | |
| Middle 3b | Sp? | 2 | 2 | |
| | Jack mackerel | 20 | 20 | 6 |
| | Snapper | 11 | 10 | 2 |
| | Blue mackerel | 4 | 4 | 3 |
| | Barracouta | 4 | 3 | 1 |
| | Total | 41 | 39 | 12 |
| Middle 4a | Jack mackerel | 9 | 9 | 3 |
| | Snapper | 8 | 7 | 3 |
| | Blue mackerel | 4 | 4 | 2 |
| | Barracouta | 2 | 2 | 1 |
| | Cf Mackerel | 1 | 1 | |
| | Total | 24 | 23 | 9 |
| Middle 4b | Sp? | 1 | 1 | |
| | Jack mackerel | 18 | 18 | 4 |
| | Snapper | 15 | 13 | 3 |
| | Blue mackerel | 3 | 3 | 1 |
| | Kahawai | 1 | 1 | 1 |
| | Cf Jack mackerel | 2 | 2 | |
| | Total | 40 | 38 | 9 |
| South 3-5 | Snapper | 3 | 2 | 1 |
| | Total | 3 | 2 | 1 |
| South 3-6 | Jack mackerel | 2 | 1 | 1 |
| | Snapper | 1 | 1 | 1 |
| | Cf Snapper | 1 | 1 | |
| | Blue mackerel | 2 | 1 | 1 |
| | Total | 6 | 4 | 3 |
| South 4-7 | Snapper | 8 | 8 | 2 |
| | Jack mackerel | 1 | 1 | 1 |
| | Blue mackerel | 1 | 1 | 1 |
| | Cf Red gurnard | 1 | 1 | 1 |
| | Total | 11 | 11 | 5 |
| Total | | 151 | 142 | 47 |