Chapter 7: Re-Analysis of Clybucca 3 and Stuarts Point 1: Analytical Units and Indications of Late Holocene Change

7.1 Introduction

In the previous two chapters I assembled all of the field information from the Clybucca 3 and Stuarts Point I excavations, and presented the results of my re-examination and re-identification of the archaeological faunal material recovered from the two sites. In this chapter I group the 10cm arbitrary spits that were excavated, and the archaeological remains, into Stratigraphic Units in order to represent the depositional history of the two sites. The depositional sequence for the two sites needs to be understood in order to contextualise changes through time in the marine faunal assemblages at the sites. Without the time component it would not be possible to ascertain whether changing patterns within the marine faunal assemblages could be related to sea-level change. I discuss Clybucca 3 first, presenting diagrams of how I believe the depositional sequence proceeded, and then present the stratigraphy and depositional history of Stuarts Point 1. These Stratigraphic Units then become the Units through which I will analyse change over time as represented by the faunal remains. The compiled figures for the shellfish and vertebrate material from each site, grouping the archaeological remains in Analytical Units which represent time, are then presented. Here I also look at other information which can be gained from these sites, such as the size of the fish represented in the assemblages.

I then compare the two sites, and focus on comparing the trends evidenced in both sites over time. The hypotheses for the formation of the Macleay estuary and floodplain are then tested against the evidence gained from the analysis of the two sites. As I have previously stated, if sea-levels rose by two metres in the Macleay region, some of the changes to marine faunal habitats, and subsequently the fauna inhabiting the waters adjacent to the sites, should be expressed in the archaeological marine faunal remains.

By examining the marine faunal assemblages in Analytical Units, calculating measures of diversity and abundance, and any changing patterns in the size of fauna represented, I will be able to make judgements about the causes of a changing pattern of resource use over time.

If a change in abundance or richness of taxa occurs over time, this may be indicative of a changing environment (Ambrose 1967:174), as some species may die off or leave the environment. Any change in the size of the fauna represented may also indicate a changing environment, such as less food available, or a habitat that is not conducive to small or large species. The results of the analysis of richness and abundance of taxa, or changing size of specimens represented will allow me to explore the reasons for the patterns seen in the archaeological assemblages.

7.2 Re-analysis of Clybucca 3 and Stuarts Point 1

7.2.1 Grouping Spits into Stratigraphic Units - Clybucca 3, Cuttings I and II

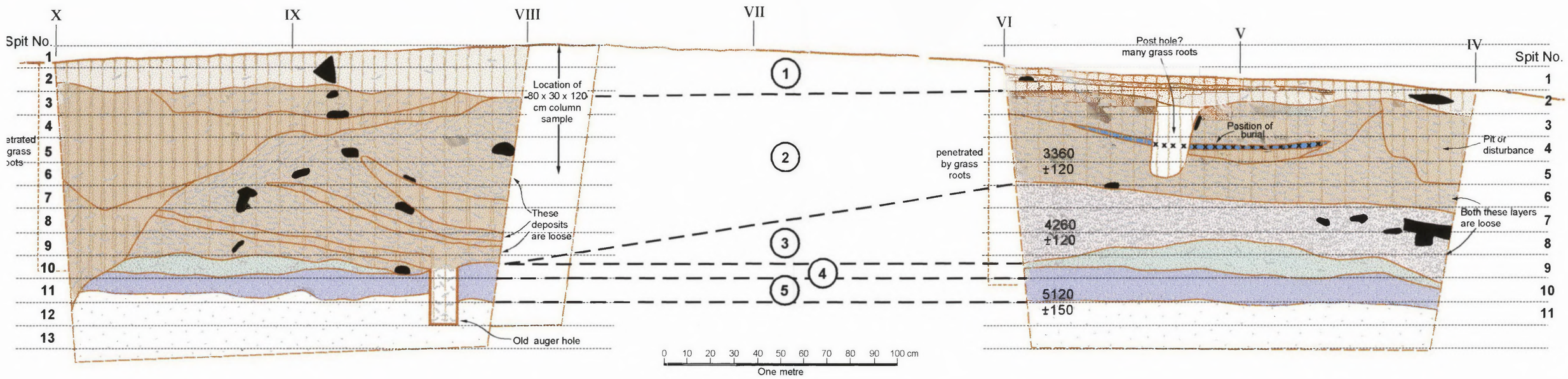
Cutting I of the Clybucca 3 excavation provides a reasonably straightforward picture of the stratigraphy of the site. The depositional layers are comparatively horizontal. However, Cutting II is another matter. Coleman (1978) and Callaghan (1980) agreed that Cutting II (VIII-X) of the Clybucca 3 excavation showed extensive disturbance of the deposits (Figure 4.1). They both elected to perform their analysis of the vertebrate fauna (Coleman 1978) and shellfish remains (Callahan 1980) by designating each 10cm arbitrary spit as an "autonomous unit" (Coleman 1978:59). Neither researcher chose to use the section drawings of the Clybucca 3 excavation in their research; and agree that Cutting II (VIII-X) poses numerous stratigraphic problems, with the stratigraphic layers dipping sharply towards the west. Nonetheless, obtaining temporal information from the archaeological deposits is not possible without defining a depositional sequence, and

without data on the shellfish remains from Cutting I it is not possible to give a full description of the site based on Cutting I alone. It was therefore necessary for me to attempt to 'stitch' the stratigraphy between the two cuttings in order to be able to use the shellfish data from Cutting II.

Figure 7.1 is my interpretation of the depositional history evidenced in the two excavation cuttings at the Clybucca 3 site. Knuckey (1999:2) recognised six stratigraphic units in the Clybucca 3 cuttings (Figure 3.16). Stratigraphic units 1, 2, 3, and 6 appeared in Cutting I; and stratigraphic units 1, 3, 4, 5, and 6 appeared in Cutting II (Figure 3.16). I have found five Stratigraphic Units (Figure 7.1), and my interpretation of the stratigraphy differs somewhat from Knuckey (1999:2), in that I believe that Stratigraphic Unit 3 (Figure 7.1) in Cutting I is lensing out into Cutting II, rather than these sections being sub-sections of stratigraphical unit 3 as in Knuckey's interpretation. In the following section of this chapter I describe each Stratigraphic Unit and give the reasons why I have interpreted the stratigraphy in the manner that I have.

As has been proposed in Chapter 4, allocating arbitrary spits into Stratigraphic Units based upon the perceived depositional history may enhance the interpretation of an archaeological shell midden site. In the following section I describe each of the Stratigraphic Units.

Clybucca 3: 1972: SE section



Cutting II

Cutting I

Figure 7.1 Clybucca 3 - Stratigraphic Units

The turf is removed prior to excavating Stratigraphic Unit 1.

Stratigraphic Unit 1

This Unit is composed of black humus and covers spits 1, and most of 2 in Cutting I, and spits 1 and 2 in Cutting II (Figure 7.1). This is the upper layer of the excavations. In Cutting I, the first spit was excavated as a 2m x 2m square, the excavation decreasing to 2m x 1m in spit 2. All of Stratigraphic Unit 1 in Cutting II was excavated as a 2m x 2m square.

Stratigraphic Unit 2

This Unit encompasses a small section of spit 2 and spits 3, 4, 5, and most of spit 6 in Cutting I, and is where the stratigraphy becomes much more complex in Cutting II (Figure 7.1). A part of Stratigraphic Unit 2 begins in spit 3 of Cutting II, but is then intruded by a heavily humic layer from the west. Humus from the upper layers (Stratigraphic Unit 1) and the intrusion from the west has infiltrated into Stratigraphic Unit 2. The inclination of shell in this unit in spits 4, 5, 6, and 7 shows the Unit dipping sharply to the west. This Unit is further intruded by what appears to be the lensing out of a lower Unit from Cutting I. Stratigraphic Unit 2 is characterised by the most dense concentration of shell in both cuttings, in a fairly loose matrix. The area excavated in Cutting I was 2m x 1m. In Cutting II, spit 3 represents the final spit excavated as a 2m x 2m square, the remainder of the spits incorporated into Stratigraphic Unit 2 were excavated in 2m x 1m spits. Spit 4 of Cutting I was radiocarbon dated to 3360±120 BP (Connah 1975:29). I have allocated spits 3 to 9 from Cutting II to Stratigraphic Unit 2 as there is no means of separating the slumped material as the Cutting was excavated in arbitrary spits.

Stratigraphic Unit 3

This Unit is described as black sand in the section drawing legend in Cutting I. It incorporates part of spit 6, all of spit 7, most of spit 8, and a small proportion of spit 9 in the eastern corner of Cutting I (Figure 7.1). This Unit is characterised by sparse shell

deposits and a black coloration. Spit 7 of Cutting I was radiocarbon dated to 4260±120 BP (Connah 1975:29).

Stratigraphic Unit 4

This is a small Unit with sparse shell deposits, located in spits 8 and 9 of Cutting I, and occupying a small area of spit 10 in Cutting II (Figure 7.1).

Stratigraphic Unit 5

This Unit is natural sand stained by the upper deposits. The auger hole from Campbell's 1968 research is visible in this unit in Cutting II (Figure 7.1).

Age/Depth Analysis of Clybucca 3

An age/depth analysis of Cutting I, Clybucca 3 shows the estimated rate of deposition of the stratigraphic units. The radiocarbon dates were plotted on a graph representing 100 year intervals, along with the depth from the surface from which the date was obtained. The length of time taken for the deposition of each stratigraphic unit was calculated by plotting the stratigraphic units on the graph. Stratigraphic Unit 5 represents an estimated 740 years of accumulation of the deposits; Stratigraphic Unit 4, 300 years; Stratigraphic Unit 3, 520 years; Stratigraphic Unit 2, 820 years; and Stratigraphic Unit 1, approximately 280 years of deposition (Figure 7.2).

The age/depth analysis shows a steady rate of deposition, as proposed by Knuckey (1999:4), with only a very slight rate in the increase of deposition in Stratigraphic Units 2 and 3. Though, without a radiocarbon date for the top of Stratigraphic Unit 1, it is impossible to be certain of the rate of deposition for the uppermost deposits. However, as turf was removed prior to excavation, I have assumed that the top of Stratigraphic Unit 1, represents the date when the midden was last occupied.

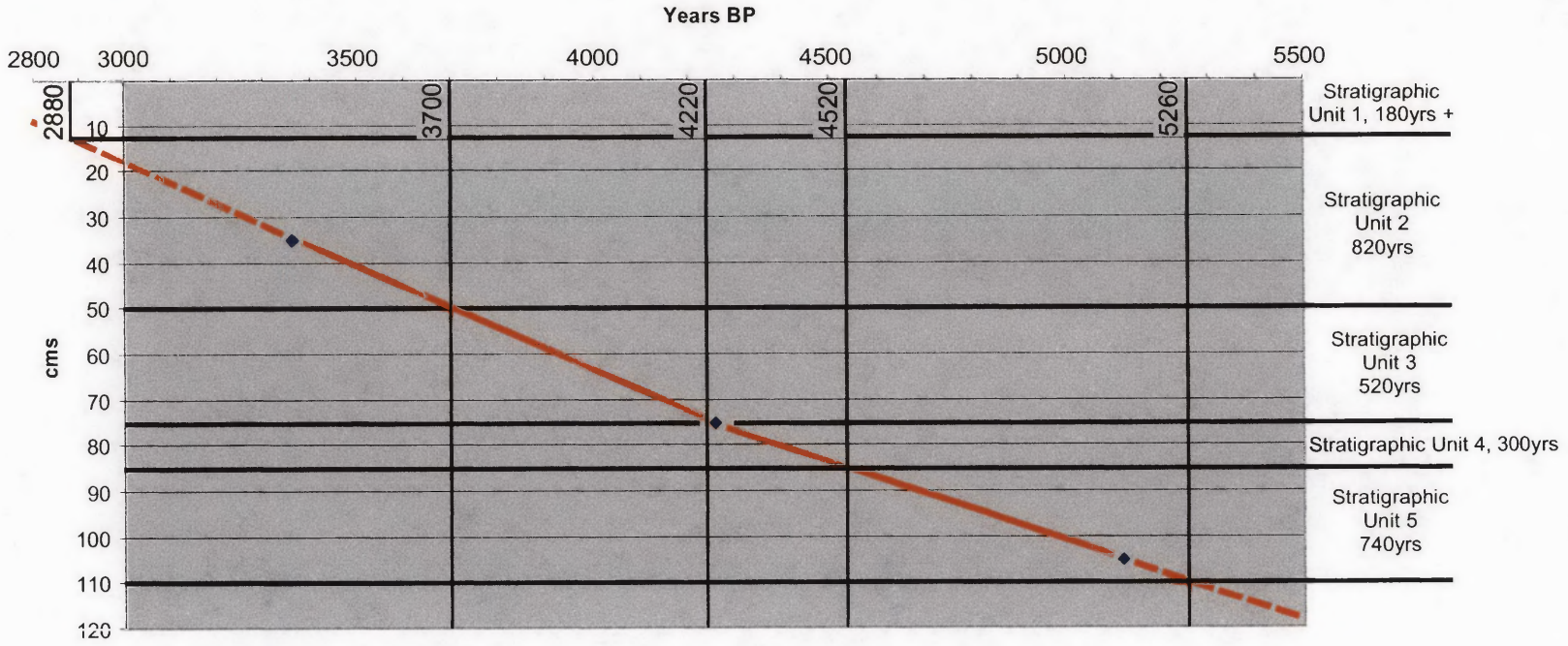


Figure 7.2 Age/Depth Curve, Cutting I, Clybucca 3

The above descriptions of the Stratigraphic Units refer to the depositional layers within the Clybucca 3 site (Table 7.1). The Stratigraphic Units will be referred to as Analytical Units in the further sections of the re-analysis of the site, so as to avoid confusion when analysing the faunal assemblages from the site (Table 7.1).

Table 7.1 Allocation of Stratigraphic Units to Analytical Units, Clybucca 3

Analytical Unit	Stratigraphic Unit	Cutting	Spit	Calibrated Date	Estimated Date Range		Estimate of time span
1	1	I	1 and upper portion of 2	No date available	2600	2880	180+ years
		II	1 and 2				
2	2	I	Lower portion of 2; 3,4 and 5 and eastern section of 6	3360±120	2880	3700	820 years
		II	3 to 9 and small portion of 10 and 11				
3	3	I	Western section of 6, 7 and portions of 8	4260±120	3700	4220	520 years
		II	Not present				
4	4	I	Upper portion of 9		4220	4520	300 years
		II	Portion of 10				
5	5	I	10 and 11	5120±150	4520	5260	740 years
		II	Small portion of 10 and 11 to 13				

7.2.2 Grouping spits into Stratigraphic Units – Stuarts Point 1, Cutting II,

The Stuarts Point 1 excavation was also carried out using arbitrary spits of 10 cm. Cutting II, which is being used for the re-analysis of the site, contained 16 arbitrary 10 cm spits. The definition of Stratigraphic Units is achieved using the photocopies of Connah's original section drawing for Cutting II with the 1975 excavation notes. In this manner I have arranged the arbitrary spits into four Stratigraphic Units - three depositional layers, with a transitional layer between Stratigraphic Units 2 and 4 (Figure 7.3).

The turf was removed prior to excavation of the site.

Stratigraphic Unit 1

This Unit consists of spits 1 to 3 in Layer 1, and was recognised by Connah during the excavation. The use of arbitrary spits was briefly abandoned in spit 3 of the excavation to allow a stratigraphic boundary to be outlined (Figure 7.3). The shellfish recovered in this layer is predominantly oyster *(Saccostrea glomerata*), along with mud whelks (*Pyrazus ebinenus*) and some cockle (*Anadara trapezia*).

Stratigraphic Unit 2

I have allocated spits 1 to 3 of Connah's Layer 2 to this Stratigraphic Unit (Figure 7.3). The stratigraphy in this layer is described as being tightly packed shell and shell fragments with grey ash and humus. The predominant shell species is still oyster (*Saccostrea glomerata*), along with mud whelk and cockle (*Anadara trapezia*).

Stratigraphic Unit 3 – a transitional layer

I have allocated spits 4 and 5 of the previous Layer 2 to a transitional boundary between Stratigraphic Units 2 and 3 (Figure 7.3). What I believe to be the boundary between Stratigraphic Units 2 and 3 cuts through spits 4 and 5 of Connah's Layer 2. In this transitional layer oyster (*Saccostrea* glomerata) is still the predominant species, however mud whelks (*Pyrazus ebinenis*) appear in spit 4, where they are absent in spit 5. Cockle shells (*Anadara trapezia*) are becoming more evident on the western edge of spit 5. Spit 4 is where the area of the excavation was reduced from 2m x 2m to 1m x 2m.

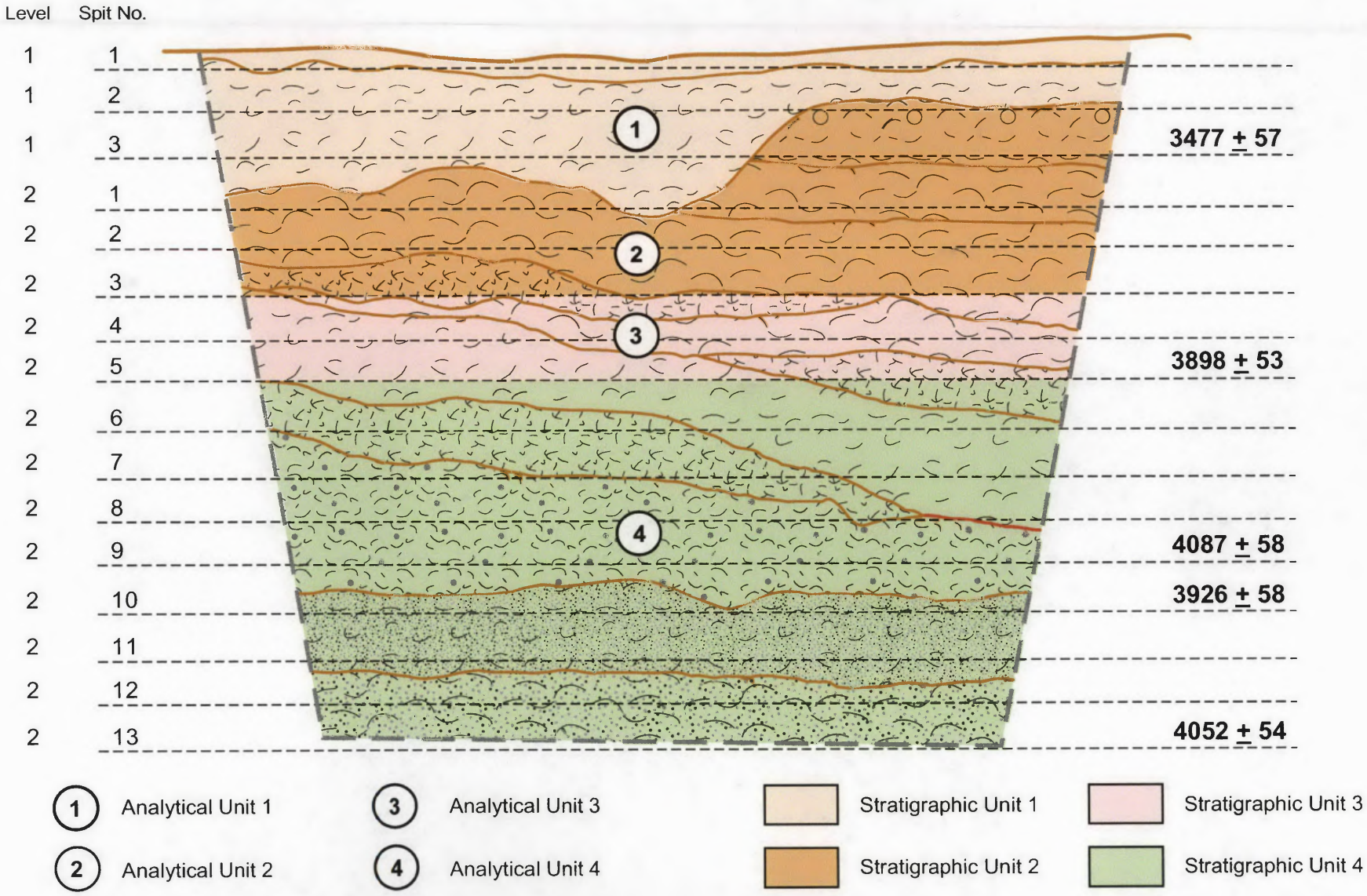


Figure 7.3 Cutting II, Stuarts Point 1 - Stratigraphic Units

Stratigraphic Unit 4

This Unit consists of spits 6 to 13 of Connah's Layer 2 (Figure 7.3). The stratigraphy is described in the section drawing as 'closely packed cockle shells and charcoal with little matrix'. The predominant shell species in these spits is overwhelmingly cockle (*Anadara trapezia trapezia*), with little oyster (*Saccostrea glomerata*) and no mud whelk.

Age/Depth Analysis Stuarts Point 1

The Stuarts Point 1 age/depth analysis was carried out in the same manner as the Clybucca 3 age/depth analysis. Stratigraphic Unit 4 represented an estimated deposition time span of 160 years; Stratigraphic Unit 3, 140 years; Stratigraphic Unit 2, 250 years; and Stratigraphic Unit 1, approximately 220 years (Figure 7.4).

Unlike Clybucca 3, the Stuarts Point site shows an accelerated rate of deposition in Stratigraphic Unit 4, the lowest unit in the excavation. Eighty centimetres of the total 160 cm of deposition accumulated in an estimated 160 years. In Stratigraphic Unit 3, the rate of accumulation slows, with a minimum of 510 years being represented in the upper 80 cm of the deposits (Figure 7.4). The turf was removed prior to excavation, so I have assumed that the top of Stratigraphic Unit 1 represents the date when the midden was last occupied.

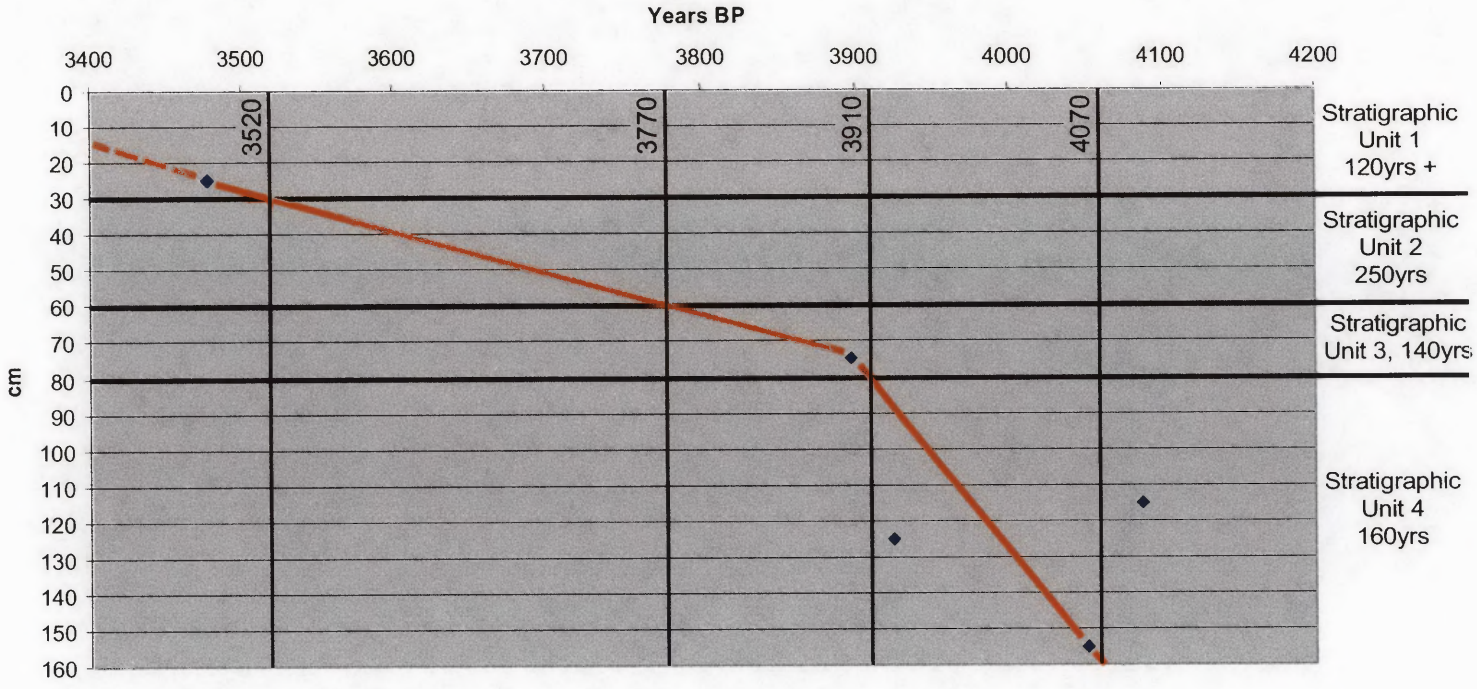


Figure 7.4 Age/Depth Curve, Cutting II, Stuarts Point 1

Again, the Stratigraphic Unites are termed Analytical Units for the purpose of analysing the faunal assemblages from Stuarts Point 1, Cutting II (Table 7.2).

Table 7.2 Allocation of Stratigraphic Units to Analytical Units, Cutting II, Stuarts Point 1 (Marine Reservoir Corrected (Stuiver et al. 1998); Delta_R 10±7)

Analytical Unit	Stratigraphic Unit	Cutting II Layer/Spit	Calibrated Date	Estimated Date Range		Estimate of time span
1	1	L1/Spit 1 and portions of L1/Spits 2 and 3	3477±57	3300	3520	220 years
2	2	Portions of L1/Spits 2 and 3 and L2/Spit 1, and L2/Spits 2 and 3	No Date	3520	3770	250 years
3	3	L2/Spits 4 and 5	3898±53	3770	3910	140 years
4	4	L2/Spits 6 to 13	4087±58 3926±58 4052±54	3910	4070	160 years

7.3 Allocation of Excavated Fauna to Analytical Units

7.3.1 Shellfish

Cutting II, Clybucca 3.

As already discussed, the weight of shellfish remains from Cutting I, Clybucca 3, was not recorded. As a result of this I examine the shellfish remains retrieved from Cutting II (Table 5.2). Campbell (1968 and Chapter 4) had recorded a change in shellfish remains at the Clybucca 3 site from a predominance of *Anadara trapezia* in the lower layers to a high proportion of oyster (*Saccostrea glomerata*) in the upper layers. The remains of Campbell's auger hole can be seen in Cutting II, Clybucca 3 (Figure 7.1), but the shellfish remains excavated from Cutting II do not support her findings.

The shellfish remains were allocated to Analytical Units as described in section 7.2 of this chapter. The allocation tables appear in Appendix IV. When allocating the assemblages to Analytical Units, adjustment was made for the change in the area excavated during the excavation. In the case of Clybucca 3, Cuttings I and II, the area excavated was reduced from 2 x 2 metres in Spit 1 to 2 x 1 metre in Spit 2; and in Cutting II, the reduction in area excavated, from 2 x 2 metres to 2 x 1 metres occurred in Spit 4. The grouping of the shellfish remains into Analytical Units does not change the fact that oyster (*Saccostrea glomerata*) is the dominant species by weight retrieved from throughout the Cutting (Table 7.3).

Table 7.3 Shellfish Remains Represented in the Analytical Units Cutting II, Clybucca 3 – After Adjustment for the Change in Excavation Areas

Taxa	AU1 kg	AU2 * kg	AU4 and 5 kg
Anadara trapezia	1.25	16.5	1.5
Saccostrea glomerata	21.5	223.25	12.5
Other	0.25	3.5	0.5
Fragments (unidentifiable)	24.25	276.25	15

* Analytical Unit 3 is not present in Cutting II

Figure 7.5 shows each of the shellfish categories represented in the Analytical Units from Cutting II, Clybucca 3. The amount of *Anadara trapezia* recovered is greater in Analytical Unit 2 from the amounts recovered in Analytical Units 1, and 4 and 5 (Table 7.3). However this unit accounts for a large part of the deposit, comprising 1340 estimated years of accumulation (Figure 7.2), as Analytical Unit 2 in Cutting II probably can be equated to Analytical Units 2 and 3 in Cutting I. I have also shown the shellfish remains recovered from Cutting II as a percentage of the total retrieved from each Analytical Unit in Figure 7.5. This figure shows that *Saccostrea glomerata* overwhelm the total *Anadara trapezia* in all of the Analytical Units (Figure 7.5), to a greater degree than when viewed on a spit by spit basis (Figure 5.5). A large percentage of the fragmented shell is also most likely to consist of *Saccostrea glomerata* remains, showing that *Saccostrea glomerata* use predominated over *Anadara trapezia* in this site, with no evidence of a change in shellfish use from *Anadara trapezia* to *Saccostrea glomerata* over time.

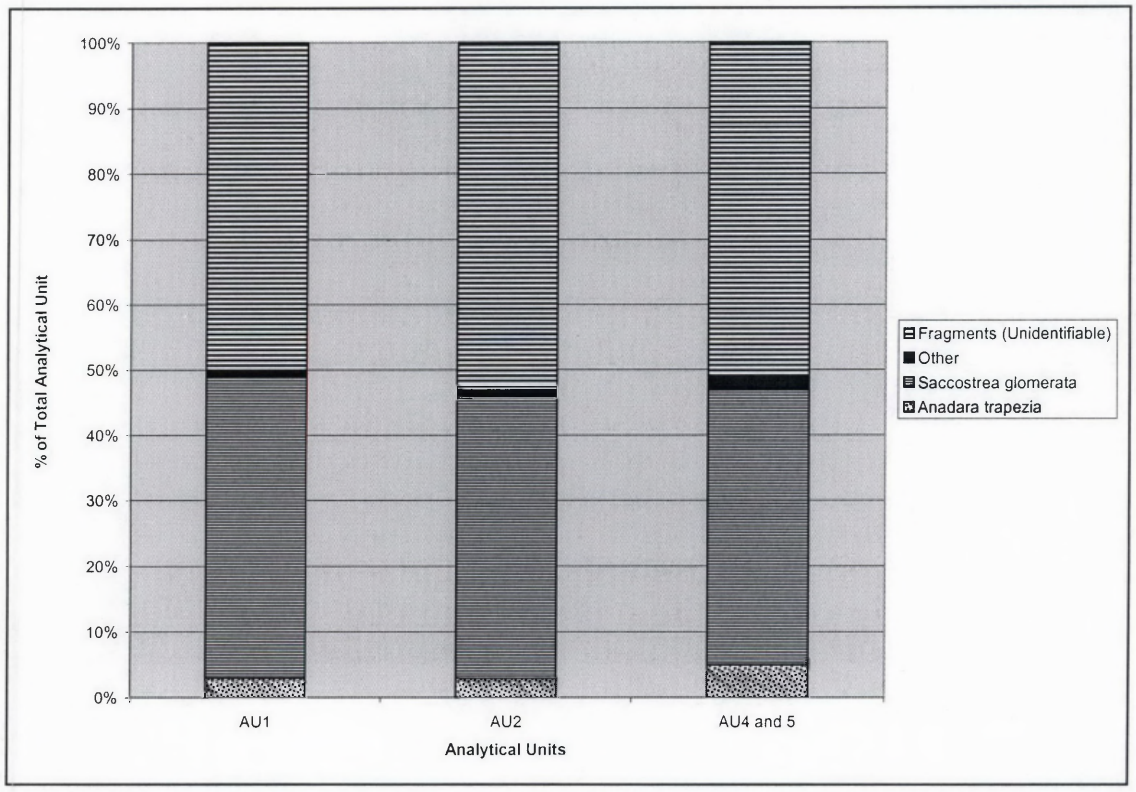


Figure 7.5 Shellfish Remains Cutting II, Clybucca 3 – Represented as a Percentage of the Total Retrieved from Analytical Units

I now analyse the shellfish remains retrieved from Cutting II of Stuarts Point 1, to identify the trends in shellfish use at that site.

Stuarts Point I, Cutting II

The weight of each category of shellfish remains from each spit excavated at Stuarts Point 1, Cutting II was presented in Chapter 6 (Table 6.3). The shellfish remains are now allocated to the Analytical Units, after the adjustment has been made for the different

areas of excavation, as was done for Clybucca 3 (Table 7.4). The area excavated was reduced from 2 x 2 metres to 2 x 1 metres in Layer 2/Spit 4. The tables showing the allocation of the shellfish remains from spits to Analytical Units appears in Appendix IV.

Table 7.4 Shellfish Remains Represented in Cutting II, Stuarts Point 1 – After Adjustment for the Change in Excavation Area

Taxa	Analytical Unit 1 kg	Analytical Unit 2 kg	Analytical Unit 3 kg	Analytical Unit 4 kg	Total kg
Anadara trapezia	16.14	47.39	42.5	545.3	651.33
Saccostrea commercialis	83.26	158.88	112.25	51	405.39
Pyrazus ebeninus	4.76	8.88	0.5	0	14.14
Other	10.13	14.63	6.75	8.5	40.01
Fragments	77.38	82.88	29.75	68.75	258.76

The allocation of the shellfish shows a predominance of *Anadara trapezia* in the lowest unit, Analytical Unit 4 (Table 7.4). If the weight of the *Saccostrea glomerata* and the fragments are combined, assuming that most of the fragments would be *Saccostrea glomerata*, the combined weight of 119.75 kg is still far short of the weight of the *Anadara trapezia* in this Unit. In the next Analytical Unit this result changes to a predominance of *Saccostrea glomerata* over *Anadara trapezia*, with the first mud whelks (*Pyrazus ebinenus*) being introduced to the site in small numbers (0.5 kg) (Table 7.4). The predominance of *Saccostrea glomerata* over *Anadara trapezia* continues in Analytical Units 2 and 1, with the amount of mud whelk recovered increasing in Analytical Unit 2, but dropping in Analytical Unit 1, as does the weight of all the other species represented. Figure 7.6 illustrates the shellfish species represented in Cutting II of the Stuarts Point 1 site, and demonstrates the dramatic difference in the amount of cockle (*Anadara trapezia*) represented in the lower spits of Cutting II, Stuarts Point 1. Even though the arbitrary spits have now been grouped into Analytical Units, based on the section drawings and the radiocarbon dates returned on the shellfish remains, it is evident that the *Anadara trapezia* species is considerably underrepresented in the upper layers of the site in comparison to the lower layers.

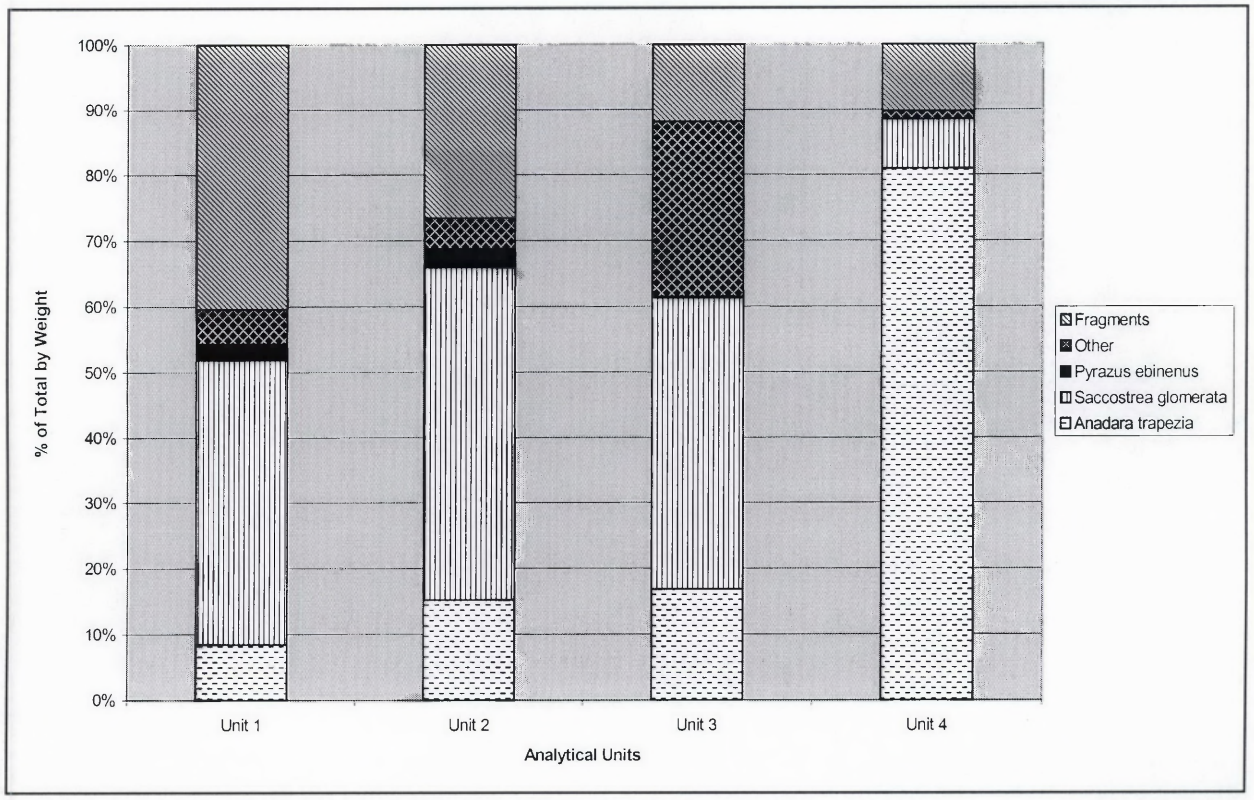


Figure 7.6 Shellfish Remains Cutting II, Stuarts Point 1 – Represented as a Percentage of Total Retrieved from Analytical Units

7.3.2 Fish Remains

Cuttings I and II, Clybucca 3

In order to gain a full understanding of fish use over time by the people inhabiting the site, I now combine the fish remains recovered from both Cuttings I and II of the Clybucca 3 excavation. This is despite the fact that I am only able to use the shellfish remains from Cutting II. However, since I am not comparing the amount of shellfish to fish or other taxa, I believe that combining both the cuttings for the fish remains will give me an accurate picture of the fishing activity at the site during the various time phases represented by the Analytical Units.

Table 7.5 shows the total for both cuttings after allocation to Analytical Units, after adjustment has been made for the different areas excavated from the cuttings. The allocation of excavated fish remains to Analytical Units and the adjustment for the different areas excavated appears in Appendix IV.

Table 7.5 Fish Remains Retrieved from Clybucca 3, Cuttings I and II, Adjusted for Change in Excavation Area – Analytical units

Taxon	Analytical Unit 1			Analytical Unit 2			Analytical Unit 3			Analytical Units
	MNI	NISP	Weight (g)	MNI	NISP	Weight (g)	MNI	NISP	Weight (g)	4 and 5
Platycephalidae	4	14	2.68	28	112	24.37	1	1	0.08	0
Sparidae	9	12	4.85	50	104	25.14	3	3	0.56	0
Mugilidae	1	1	0.08	7	48	4.23	0	0	0	0
Sillaginidae	0	0	0	2	14	0.68	0	0	0	0
Sciaenidae	3	4	5.88	2	5	7.03	0	0	0	0

As explained in Chapter 4, I present three methods of quantification for the fishbone assemblages (MNI, NISP and weight), and use each at different points in the analysis. For example, in quantifying relative abundance of taxa in the Macleay sites I use MNI. This is because of the presence of a large amount of Platycephalidae remains in the sites. Platycephalidae have a relatively larger number of easily identifiable skeletal elements than any of the other taxa identified in these sites. This would bias the quantification of relative abundance if only NISP was used. As can be seen in Table 7.5, in Analytical

Units 1 and 2, the NISP for Platycephalidae is greater than the NISP for Sparidae; whereas when MNI is considered, Sparidae are twice as plentiful as Platycephalidae. Figure 7.7 presents the relative abundance of taxa identified in Cuttings I and II (after adjustment has been made for the different areas excavated in the spits), based upon the calculated MNI for each taxon identified.

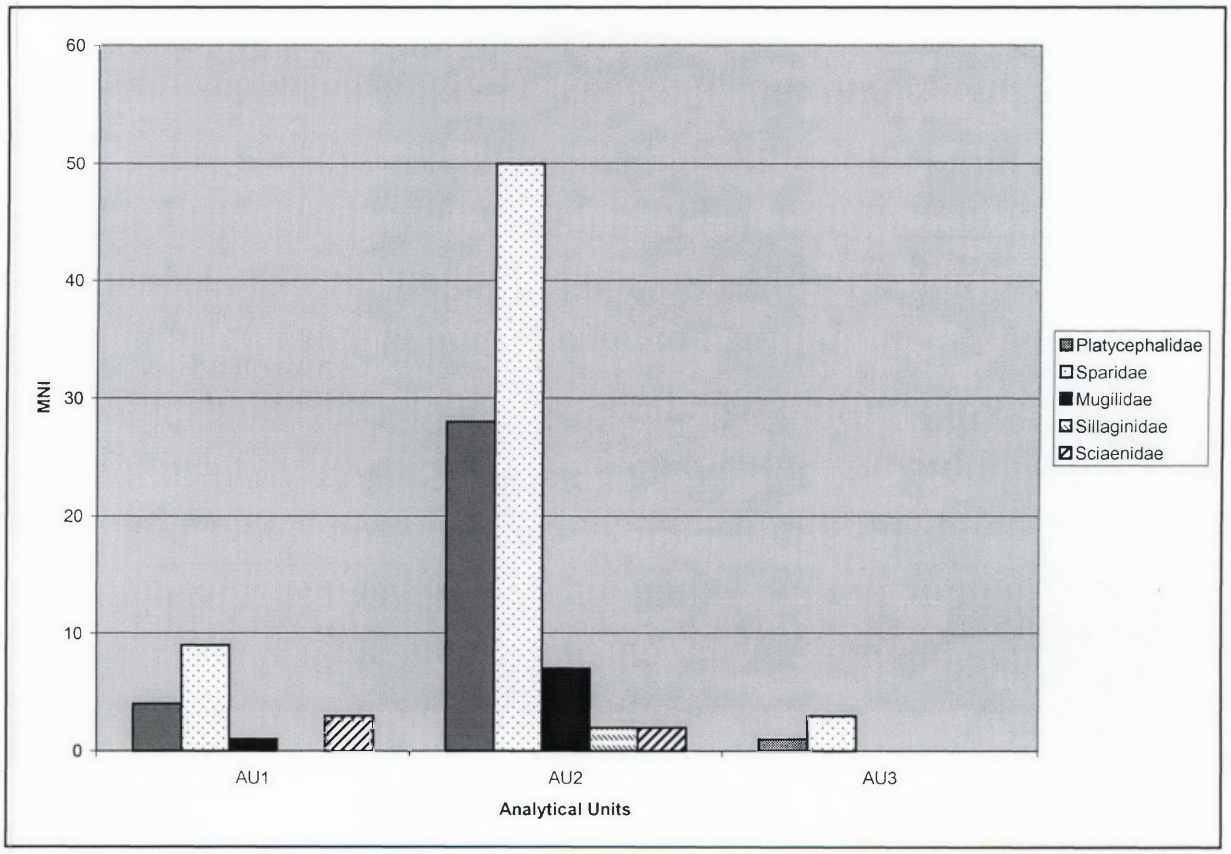


Figure 7.7 Clybucca 3, Cuttings I and II – Fish Species Represented in the Analytical units

Sparidae dominates each of the Analytical Units when represented by MNI. Analytical Unit 1 contains four families, Analytical Unit 2 has five families represented, and Analytical Unit 3 has only Sparidae and Platycephalidae. The proportion of Mugilidae

increases substantially in Analytical Unit 2, and this species is also represented in Analytical Unit 1 by one specimen. Sillaginidae appears only in Analytical Unit 2, and Sciaenidae appears in Analytical Units 1 and 2.

The analysis of the fish remains graphed by Analytical Unit shows an increase in the use of fish resources in Analytical Unit 2 dated to between 3700 and 2880 BP, compared with the time periods prior to and after these dates. This also coincides with the increase in the use of shellfish during the same time frame (Table 7.3). Consequently, it appears that the use of marine resources increased in the period from approximately 3700 years ago.

Cutting II, Stuarts Point 1

The fish remains from Cutting II, Stuarts Point 1, are also grouped into the Analytical Units described in section 7.1 of this chapter, after adjustment for the different areas excavated in the upper six spits of the cutting. The grouping of the fish remains into Analytical Units, and the adjustment for different excavation areas, appears in tables in Appendix IV. The identifications are presented in MNI, NISP, and weight (grams) (Table 7.6) to allow for comparisons to be made between the different time frames represented by the Analytical Units.

Table 7.6 Fish Remains Retrieved from Stuarts Point I, Cutting II – Adjusted for Different Excavation Areas – Analytical Units

Taxon	Analytical Unit 1			Analytical Unit 2			Analytical Unit 3			Analytical Unit 4		
	MNI	NISP	Weight (g)	MNI	NISP	Weight (g)	MNI	NISP	Weight (g)	MNI	NISP	Weight (g)
Platycephalidae	27	129	48.26	32	184	71.53	20	165	40.22	36	202	45.62
Sparidae	25	46	16.08	49	152	45.34	15	85	20.01	23	106	30.52
Mugilidae	1	2	0.2	4	42	6	10	63	8.6	8	32	4.21
Sillaginidae	1	4	0.54	1	14	1.47	1	2	0.19	1	7	0.49
Sciaenidae	1	1	0.28	1	2	1.45	1	3	2.23	1	3	1.28
Girellidae	0	0	0	1	1	0.05	1	3	0.25	1	6	0.41
Scorpididae	0	0	0	0	0	0	1	3	0.33	0	0	0
Pomotomidae	0	0	0	1	1	0.15	0	0	0	0	0	0

There are six families of fish represented in Analytical Unit 4, seven in Analytical Units 3 and 2, and five families represented in Analytical Unit 1. Platycephalidae and Sparidae dominate the fish remains recovered. The analysis of the Analytical Units shows a greater diversity of fish species represented in the estimated time frame between 3,900 and 3,500 years before present.

Figure 7.8 shows the range of fish species recovered from Cutting II, Stuarts Point, grouped in the Analytical Units and represented as MNI. Platycephalidae is the dominant species identified in the lowest Analytical Unit corresponding to the time frame when *Anadara trapezia* was the dominant shellfish species recovered from the cutting. In Analytical Unit 2 more Sparidae are represented than any other taxon. Sparidae feed on oysters (such as *Saccostrea glomerata*) and this may account for the dominant fish species represented here, as oysters (*Saccostrea glomerata*) dominate the shellfish assemblage in this Analytical Unit. In the upper Analytical Unit, dated to 3300 - 3500 BP, Sparidae and Platycephalidae are represented by similar numbers of specimens.

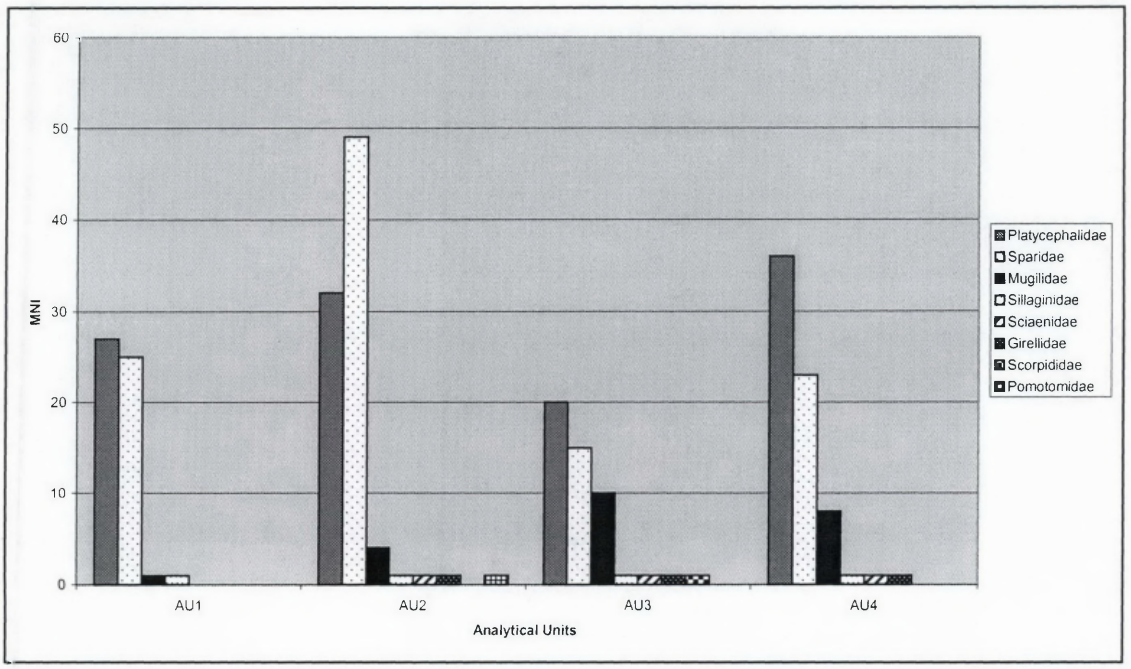


Figure 7.8 Stuarts Point I, Cutting II – Fish Species Represented in the Analytical Units

7.3.3 Change In Fish Size Over Time

Using the most numerous skeletal elements identified in the Platycephalid and Sparid families, I present the ranges in the size of the fish found at the two sites. These two species dominate the fishbone assemblages recovered from both of the sites. The calculations of the life size represented by the archaeological bone appear in Appendix V.

The Sparidae and Platycephalidae recovered from Clybucca 3 show a greater range of sizes in Analytical Unit 2 (Figures 7.9 and 7.10). The range of Sparidae supraoccipital widths ranges from 3.1 mm to 11.6 mm in Analytical Unit 2, and from 5.7 mm to 11.2 mm in Analytical Unit 1. This represents an approximate live size range of between 16

cm and 40 cm in Analytical Unit 2, and between 23 cm and 42 cm in Analytical Unit 1 (Appendix V). Only three specimens were represented in Analytical Unit 3, ranging in estimated size between 23 cm and 29 cm. Sparidae may grow to a length of 66 cm, but reach sexual maturity at between 15 cm and 24 cm (Edgar 1997:452). The Sparidae found at the Clybucca site therefore represent a size capable of being a breeding population, but are not large individuals. Platycephalidae were identified from all of the Analytical Units at Clybucca. The estimated size of the Platycephalidae recovered from Analytical Unit 2, which had the greater range of sizes, was between 34 cm and 78 cm with the mean size being 47 cm (Appendix V). The range of sizes estimated from the Platycephalidae remains recovered from Analytical Unit 1 was 36 cm to 57 cm, with the mean size being 46 cm. Platycephalidae may reach a maximum length of 1.2 metres, so the largest represented at Clybucca is still somewhat smaller than the potential size of this species.

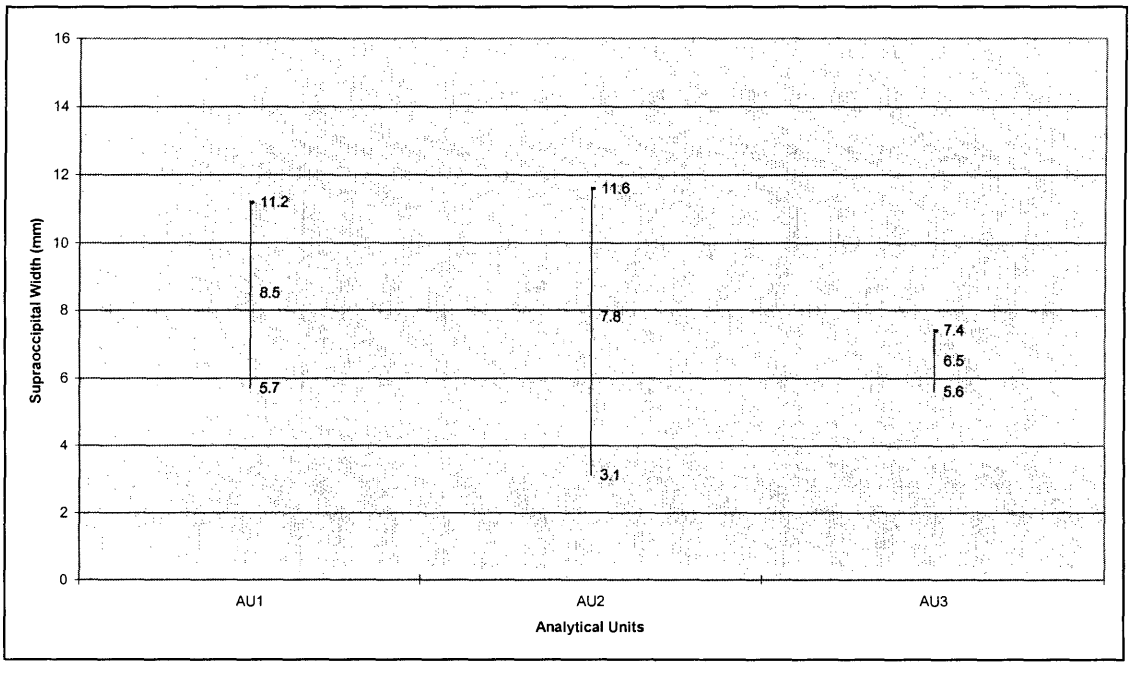


Figure 7.9 Sparidae Supraoccipital Size Represented in Analytical Units, Clybucca 3, Cuttings I and II

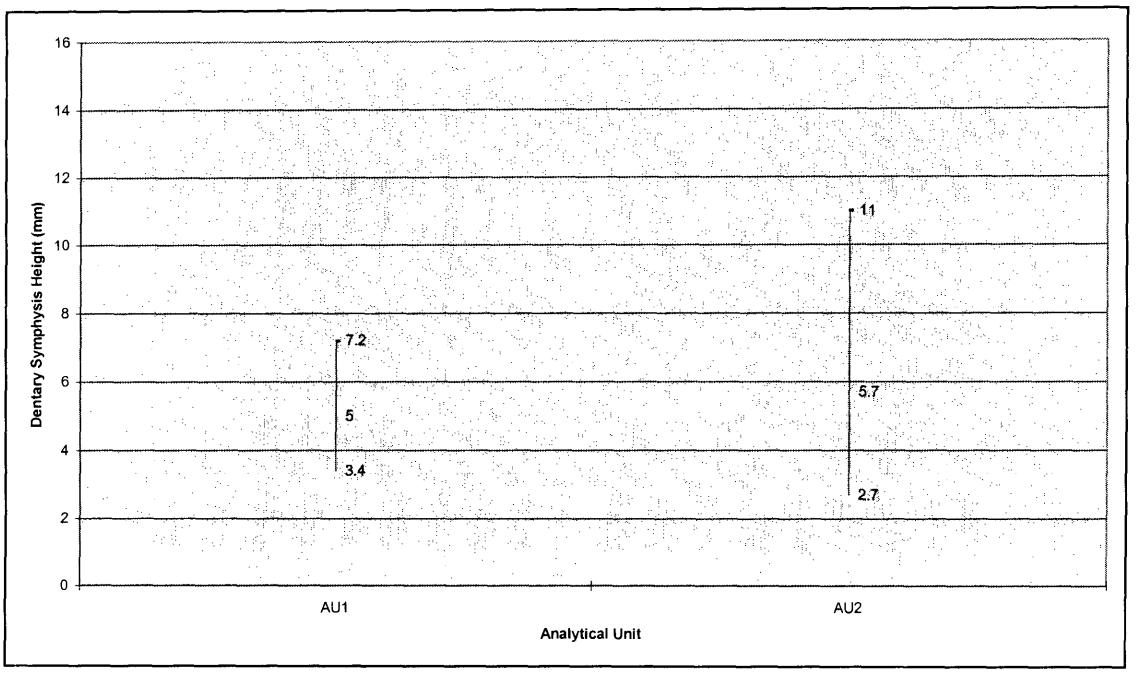


Figure 7.10 Platycephalidae Dentary Symphysis Size Represented in Analytical Units, Clybucca 3, Cuttings I and II

Change in size of the fish represented at the Stuarts Point 1 site was also calculated using the measurements made on the supraoccipital of the Sparidae and the dentary symphysis of the Platycephalidae (Figures 7.11 and 7.12). The greatest range of sizes found in the Sparidae was in Analytical Unit 2, with a range of skeletal measurements from 4.8 mm to 13.9 mm. This represented an estimated live size of 20 cm to 51 cm, with a mean of 35 cm. This analysis shows a greater range in sizes recovered from Stuarts Point than Clybucca, with Stuarts Point having smaller and larger individuals represented.

Unlike the Platycephalidae recovered from Clybucca, the Stuarts Point specimens show an increase in size over time. The Platycephalidae dentaries recovered from Analytical Unit 4 measured 2.9 mm to 7.6 mm at the symphysis, increasing to a range of 3.1 mm to

12.3 mm in Analytical Unit 1 (Figure 7.12). This represented estimated size ranges of 33 cm to 57 cm in Analytical Unit 4, and 34 cm to 85 cm in Analytical Unit 1 (Appendix V).

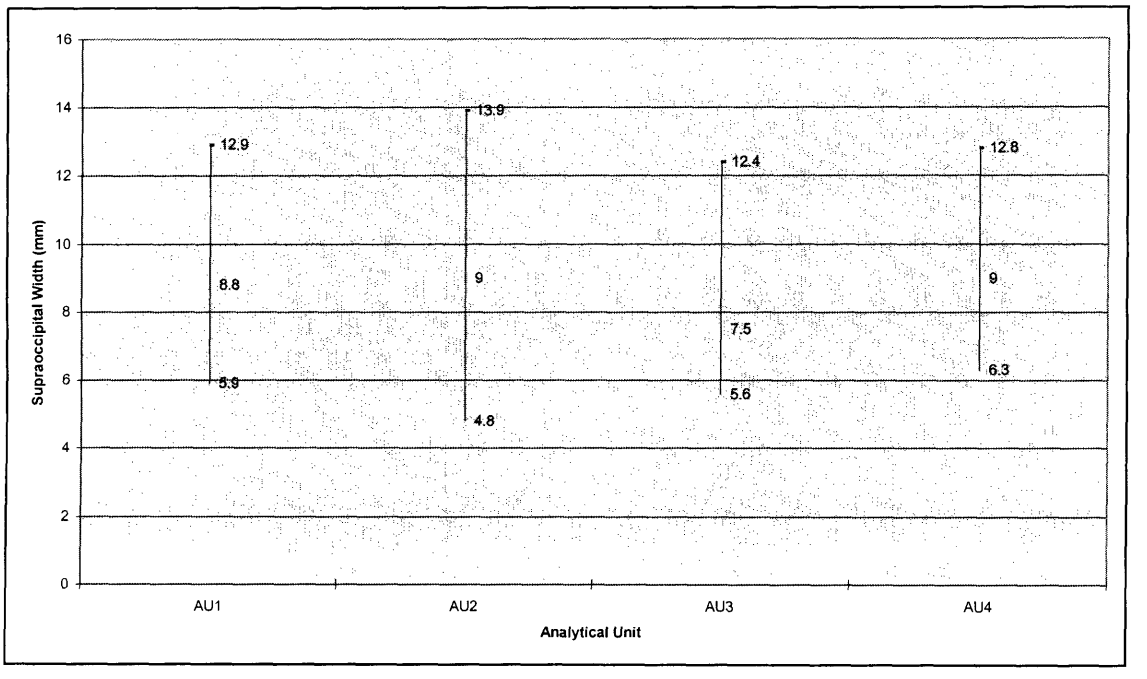


Figure 7.11 Sparidae Supraoccipital Size Represented in Analytical Units, Stuarts Point 1, Cutting II

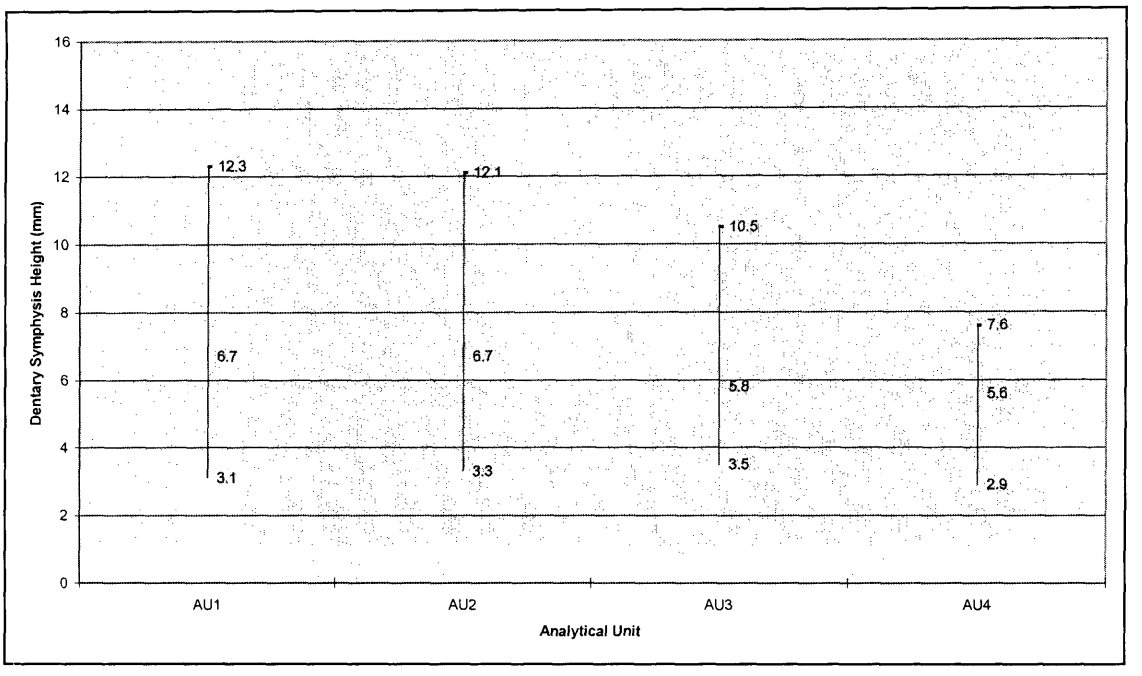


Figure 7.12 Platycephalidae Dentary Symphysis Size Represented in Analytical Units, Stuarts Point 1, Cutting II

This analysis of size ranges estimated for the fish from both sites shows that the waters adjoining the Stuarts Point 1 site were capable of sustaining larger fish in both of the taxa for which the size estimates were made.

When the range of sizes represented in both sites is arranged in chronological order in graphs for Sparidae and Platycephalidae, it can be seen that the trend is for the largest fish of both species to be represented in the time frame after 4000 BP until 3360 BP (Figures 7.13 and 7.14). The largest representatives of Sparidae and Platycephalidae occur in this time period, and the greater range of sizes represented also occurs in this time period. Sparidae show a considerable range of sizes represented in the time dated to

3360 BP at Clybucca, but do not reach the size attained by this species at Stuarts Point in the earlier time frame (Figure 7.13).

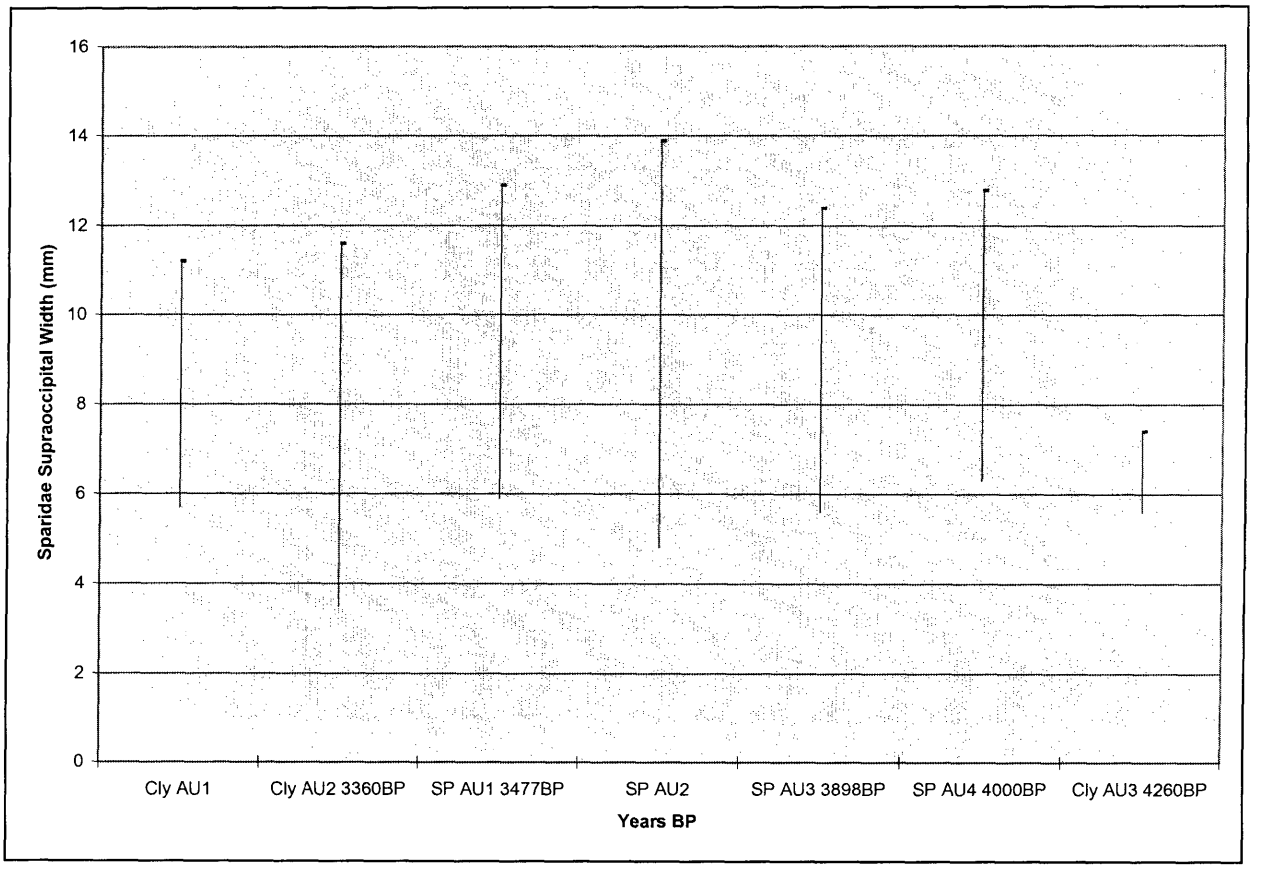


Figure 7.13 Sparidae Size Represented in the Clybucca 3 and Stuarts Point 1 Middens, Arranged in Chronological Order

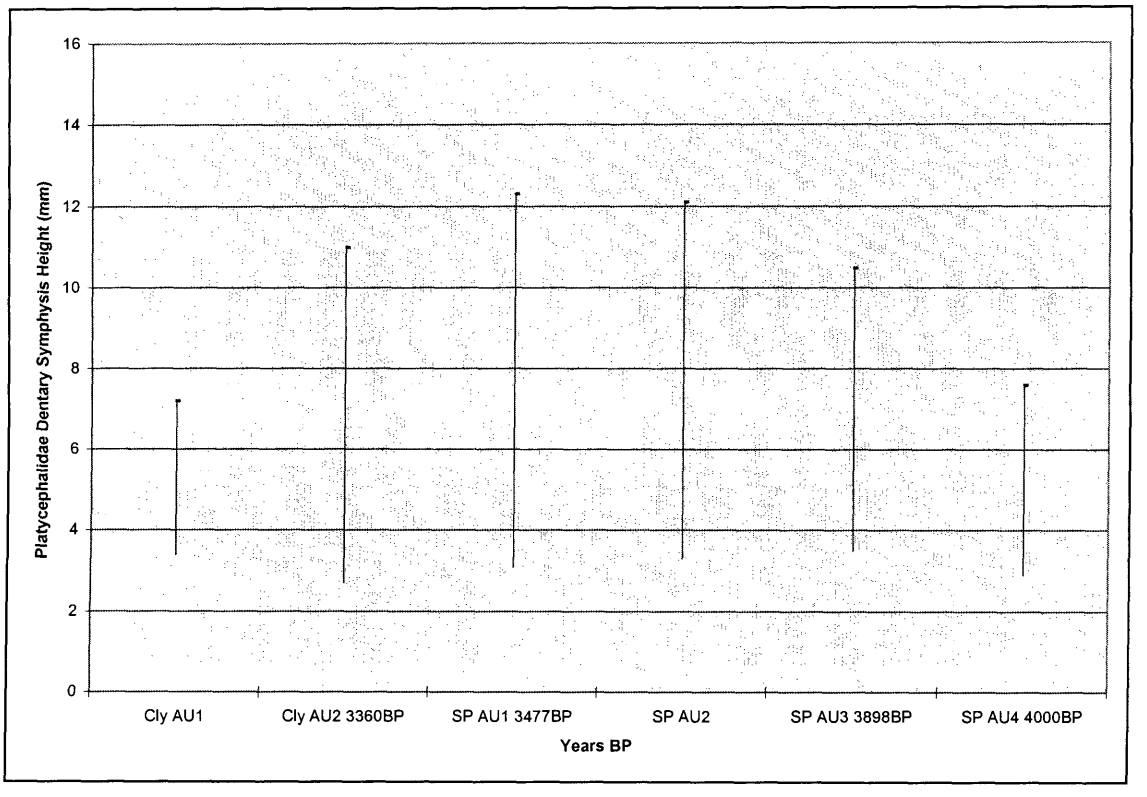


Figure 7.14 Platycephalidae Size Represented in the Clybucca 3 and Stuarts Point 1 Middens, Arranged in Chronological Order

The information gained from this analysis of the fishbone assemblages will be used in Section 7.4 of this chapter when I compare the results of the re-analysis by analytical unit with the models proposed for the formation of the Macleay floodplain and estuary (see Chapter 4).

7.3.4 'Other' Fauna

Clybucca 3, Cuttings I and II

The 'other' faunal bone comprising mammal, reptile, bird, crab, and turtle remains from Cuttings I and II, Clybucca 3 are also allocated to the analytical units described in section 7.2, and then adjusted for the different areas excavated in the spits (Table 7.7). The tables presenting these calculations appear in Appendix IV.

Table 7.7 Other Fauna Represented in Analytical Units, Clybucca 3, Cuttings I and II – After Adjustment for Different Excavation Areas

Taxa	Analytical Unit 1 g	Analytical Unit 2 g	Analytical Unit 3 g	Analytical Units 4 and 5 g
Mammal	41.7	362.85	12.83	5.7
Reptile	0	0.77	0	0
Bird	1.33	5.57	0	0
Crab	0	1.58	0	0
Turtle	0	0.88	0	0

Analytical Unit 2, representing the time period between 2880 and 3700 BP contains the largest amount of 'other' faunal remains by weight. This is a similar finding to that which was obtained in the analysis of the fish and shellfish remains by Analytical Unit. All categories of 'other' faunal remains are represented in this unit. Combined with information from the fish and shellfish remains, this suggests greater cultural deposition at the Clybucca site in this time period, than at any other time for which there is archaeological evidence of occupation.

Stuarts Point 1, Cutting II

Similarly, the 'other' faunal remains from Stuarts Point – mammal, reptile, bird and crab -- are allocated to the Analytical Units, with adjustment being made for the change in excavation area in the upper six spits of the excavation (Table 7.8). The tables presenting these calculations appear in Appendix IV.

Table 7.8 Other Fauna Represented in Analytical Units, Stuarts Point 1, Cutting II – After Adjustment for Different Excavation Areas

Taxa	Analytical Unit 1 g	Analytical Unit 2 g	Analytical Unit 3 g	Analytical Unit 4 g
Mammal	174.48	48.43	17.53	33.94
Reptile	0.45	0.11	0	0
Bird	0.56	0	0	1.06
Crab	0	0.51	0	0

The amount of 'other' faunal remains increases dramatically in Analytical Unit 1, dated to 3300 - 3500 BP. In the Analytical Units dated prior to this time, the fish remains predominate over the 'other' fauna by weight.

7.3.5 Trends In Faunal Use at the Case Study Sites

In order to compare trends in the use of each class of resources at Clybucca and Stuarts Point, the weight of the fish remains and the 'other' faunal remains are graphed for each site (Figures 7.15 and 7.16). At the Clybucca 3 site, the amounts of both the fish and 'other' faunal remains increases in Analytical Unit 2 (3700 – 2900 BP); however, 'other' faunal remains were predominant in each of the other time periods represented by the Analytical Units.

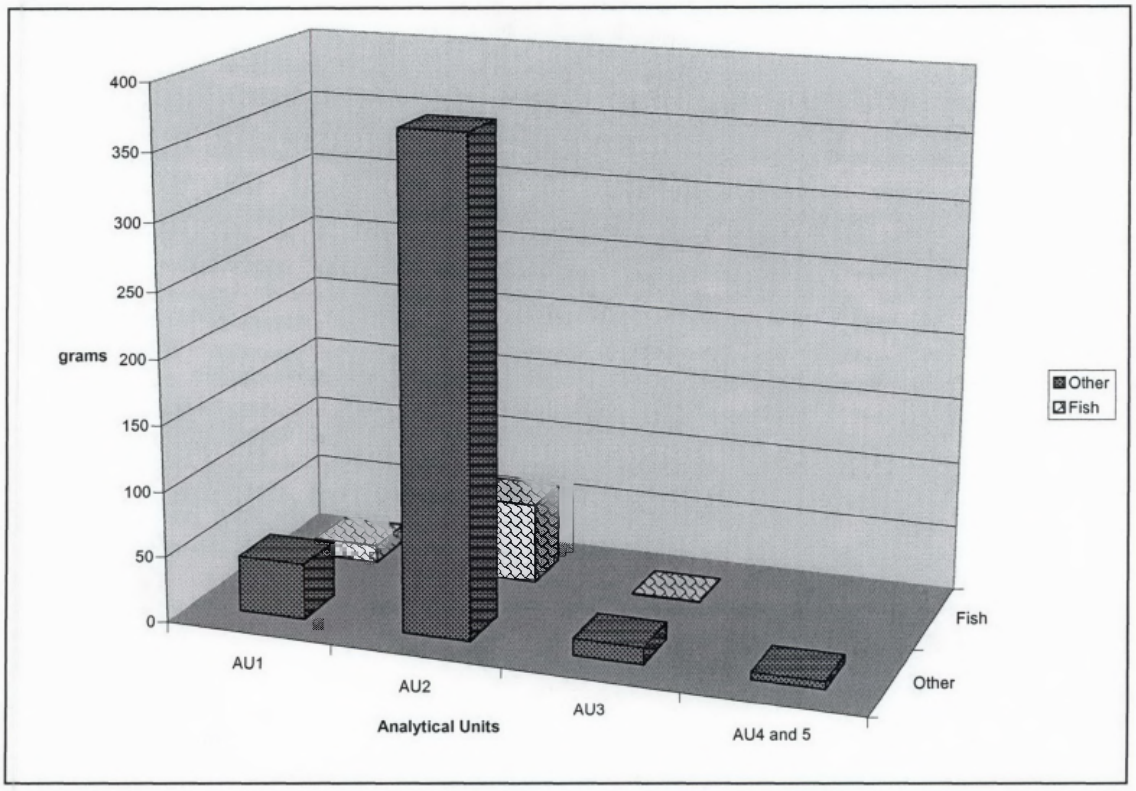


Figure 7.15 Cuttings I and II, Clybucca 3 – Comparison of Fish and Other Bone Recovered from Analytical Units

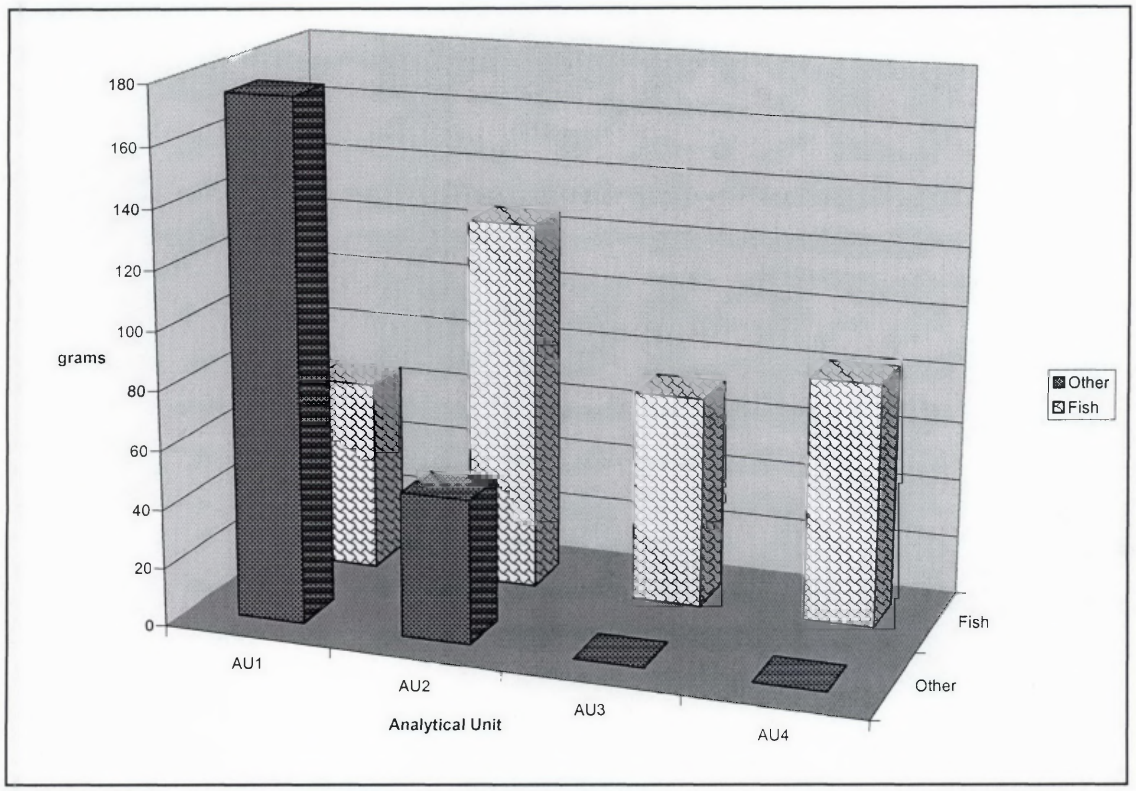


Figure 7.16 Cutting II, Stuarts Point 1 – Comparison of Fish and Other Bone Recovered from Analytical Units

The Stuarts Point 1 site shows a somewhat similar trend to the Clybucca 3 site. In the uppermost unit (3500 – 3200 BP) 'other' faunal remains outweigh the fish remains. The analysis of the fish and 'other' faunal remains from Stuart Point appears to show a constant reliance on fish resources, in the greatest quantities, during the time period c. 4,000 BP to c. 3,500 BP, after which the people inhabiting the site seem to change their resource use and other faunal species, particularly mammals, become most frequent. Consequently, there is a significant change in resource use evidenced at Stuarts Point, from fish to terrestrial animals; whereas, at Clybucca there is a consistent reliance on terrestrial animals, with a large increase in the overall amount of faunal remains being deposited at the site in the time period dated to between 4220 and 2880 BP.

7.4 Is Change Over Time Related to Sea-Level Change?

In Chapter 4 I presented two hypotheses for the Late Holocene history of the Macleay estuary and floodplain. The first hypothesis was that a sea-level rise had occurred approximately 5,000 years ago (Mundell 2000; Baker et al. 2001); and I proposed a model for how the marine fauna would have been affected by the rise and the subsequent fall in the sea-level which would have occurred after 3700 BP (Table 7.9). The second hypothesis was that formation of the estuary and floodplain was the result of continued sedimentation over time, rather than any change in the mean level of the sea, and I similarly modelled the expected effects on the marine fauna if this had occurred (Table 4.1). By comparing these models with the results of the analysis of the archaeological assemblages presented above, I should be able to determine which of the two hypotheses is best supported.

Table 7.9 Temporal Relationship between Analytical Units at Clybucca 3 and Stuarts Point 1 (See Tables 7.1 and 7.2)

Approx. Date Range Cal Years BP	Analytical Units Clybucca 3	Analytical Units Stuarts Point 1	Sea-Level (Height rel to present)
5100 - 4300	4 and 5	Absent	+ 1 - 2 metres
4300 - 3700	3	3 and 4	+ 2 metres
3700 - 2900	2	1 and 2	+ 1 metre
2900 - 2700	1	Absent	+ 1.25 metres

7.4.1 Prior to 5,000 Years Before the Present

People began occupying the Clybucca site just prior to 5,000 BP, as shown by the dating of the site (Tables 7.1 and 7.9). A small amount of faunal remains, mammal and shellfish – but no fishbone, was recovered from the lowest layer (Analytical Unit 5) of the Clybucca 3 midden. This suggests that the site was not intensively used during this time period (Table 7.10). The Stuarts Point 1 midden was not occupied at this time (according to the re-dating which was done as part of this research).

Table 7.10 Relative proportions of land/sea vertebrate fauna in the time span 5100 – 4300 BP

Time Span	Site/Analytical Unit	Land g	Land %	Fish g	Fish %	Total
5100 - 4300	Clybucca/4 and 5	5.7	100	0	0	5.7

If, as stated in Hypothesis Two, the Macleay was a large, marine environment which was subsequently in-filled by sediment carried down the river (Voisey 1934; Hails 1967), the archaeological remains do not reflect the picture at this time, because there are no fish remains evident in the archaeological assemblages. The archaeological remains retrieved from Clybucca prior to 5,000 years ago suggest an environment which had little availability of marine resources, therefore supporting Hypothesis One.

Of course, the Taphonomy of the Clybucca 3 site has to be considered to determine if the faunal remains recovered can be representative of what was actually occurring at the site in this time frame. All animal bones, both vertebrate and invertebrate, are subject to taphonomic processes, and will degrade over time under various influences (Wheeler and Jones 1989:61; Lyman 1994; Claassen 19998:53; Reitz and Wing 1999:110). While only a total of 29 kg of shell was recovered from Analytical Units 4 and 5 at Clybucca 3, these

were quite robust shell species, half of which were able to be identified to species. A small amount of vertebrate bone other than fish was also recovered. As vertebrate bone and shell was recovered it would be unusual for no evidence of fishbone to be present if it had been deposited in the midden. Sparidae, the species identified in Analytical Unit 3 (Table 7.5) has some very robust bones in its cranial morphology. With no evidence of fish having being deposited in the lowest layers, and the presence of large robust shell species which tend to protect fishbone in middens, it is difficult to explain why fish remains would not be present in some form if they had been deposited in the site at this time period. So, Hypothesis One is best supported by this evidence.

7.4.2 4,300 – 3,700 Years Before the Present

Hypothesis One proposed that between 5,000 and 4,000 years ago the sea-level was two metres higher than at the present time (Table 7.9). The reconstructions of sea-level are shown in Figures 7.17 and 7.18. The model for this scenario characterised the Macleay floodplain as a marine embayment, bordered in the west by a low-relief chain of hills (the foothills of the Great Dividing Range), and in the east by the Inner Barrier sand dune system which had formed during the last interglacial of the Pleistocene (Figure 3.4). In this model I proposed that the marine dominated habitat would have contained seagrass beds inhabited by shellfish and small fish. The deeper waters of the embayment would have provided a habitat for a range of fish species. Oysters would have been abundant in rocky areas bordering the embayment as the rocks would have provided an attachment point for this species. However, they may have been less prolific in the areas bordered by sand prior to the formation of mangrove swamps and the root systems which provide a habitat for oysters.

This time period between 4,300 and 3,700 BP is represented at Clybucca 3 by Analytical Unit 3, and at Stuarts Point 1 by Analytical Units 4 and 3. The time frame 4,300 – 3,700 BP represents the period in Hypothesis One when the sea-level would have been some

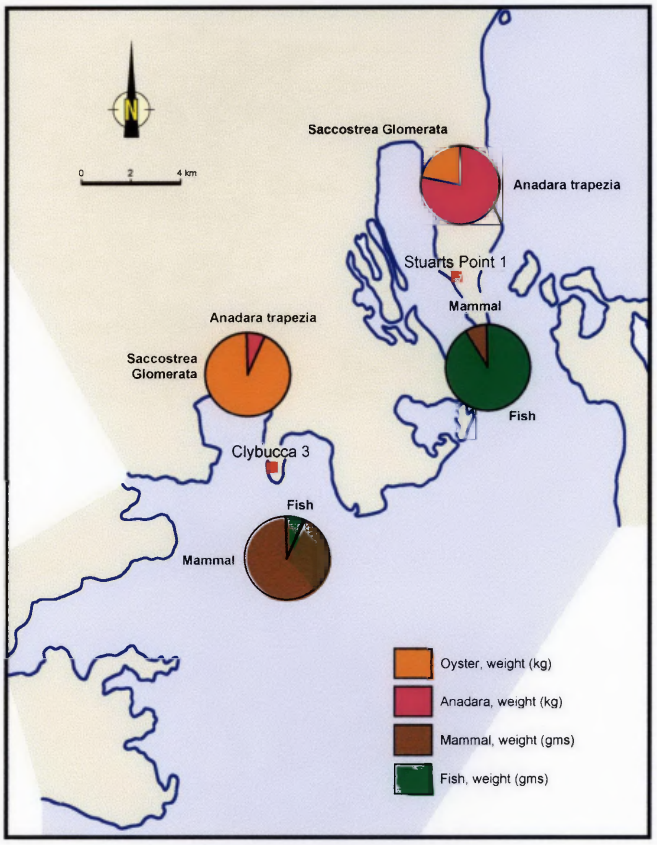


Figure 7.17 **The Northern Macleay Floodplain c. 4,000 BP, As Proposed in Hypothesis One-Resource Use (After Mundell 2000; Baker et al. 2001)**

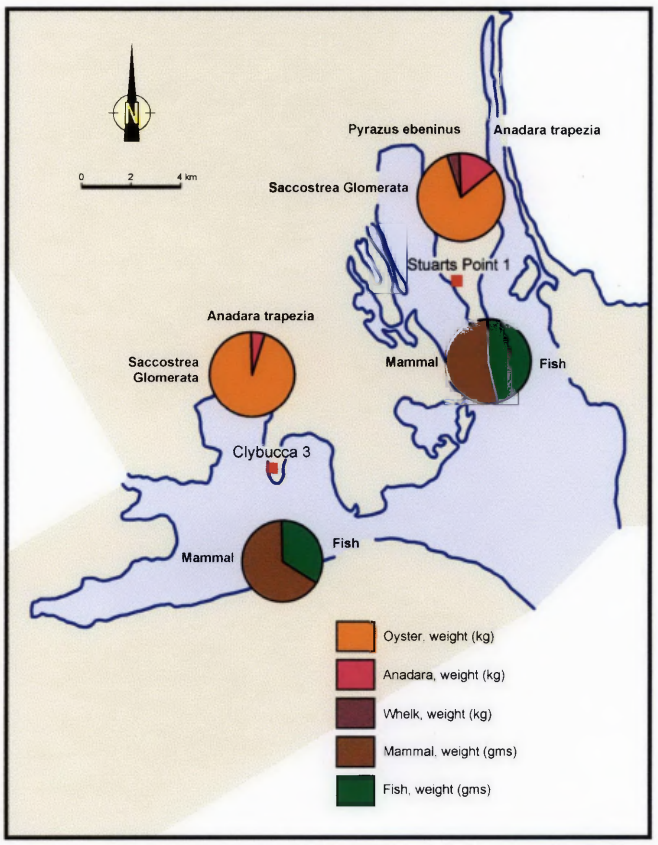


Figure 7.18 **The Northern Macleay Floodplain c. 3,000 BP, As Proposed in Hypothesis One-Resource Use (After Mundell 2000; Baker et al. 2001)**

two metres higher than the present, graduating into the time frame when the sea-level began dropping.

In this time frame at Clybucca the trend is one of increased use of the site and the commencement of the use of marine resources. In Analytical Unit 3, fish remains appear but account for only 5% of the total weight of vertebrate faunal remains (Table 7.11). At Stuarts Point, the fish remains account for close to 90% of the total weight of vertebrate faunal material (Table 7.11). When the total weight of fishbone (not just that able to be identified to taxon) recovered from Stuarts Point 1 is graphed, fish remains are much greater by weight than the terrestrial animal bone at Stuarts Point (Figure 7.16). The presence of *Platycephalus indicus* in Analytical Unit 3 at Stuarts Point also indicates a warmer climate than is presently experienced in the Macleay region, as this species is now only found to the north of the study area.

Table 7.11 Relative proportions of land/sea vertebrate fauna in the time span 4300 – 3700 BP

Time Span	Site/Analytical Unit	Land g	Land %	Fish g	Fish %	Total
4300 - 3700	Clybucca/3	12.83	95	0.64	5	76.83
	Stuarts Point/3 and 4	17.53	10.2	154.36	89.8	171.89

Figure 7.17 portrays how the Macleay floodplain would have appeared during this time period (Mundell 2000), along with charts comparing the use of fish and terrestrial animals at each of the case study sites. The comparative figures are based upon the data obtained from Analytical Unit 3 at Clybucca 3 and Analytical Units 3 and 4 at Stuarts Point (Table 7.11). The comparison of shellfish proportions in the sites is also shown (Figures 7.17).

Seven families of fish are represented at Stuarts Point, and Platycephalidae are more numerous than Sparidae (Figure 7.8). However, the Platycephalidae have not reached the size which they attain in later units (Figure 7.8). Relatively small fish such as Sillaginidae (whiting), Girellidae (luderick), and Scorpididae (sweep) are also represented in the fishbone assemblage. In this time period Mugilidae (mullet) are more numerous than any other time in the site. These smaller fish species are common inhabitants of estuaries, which are rich in nutrients, waste from the seagrass beds and terrestrial run-off. Mugilidae are bottom-feeders, feeding on algae and diatoms, and their presence in larger numbers than at any other time in the Aboriginal occupation of the site suggests that there was a plentiful food supply for the species.

Other vertebrate fauna are poorly represented at Stuarts Point in the time frame between 4,300 and 3,700 years before the present (Figure 7.16). All of the 'other' bone recovered from Analytical Units 3 and 4 was small and fragmented and could only be identified to either mammal or bird. It nevertheless suggests that only small animals were being used at the site during this time, whilst the marine fauna comprised a major part of the diet.

It is in this time frame that the shellfish remains recovered from Stuarts Point 1 are dominated by *Anadara trapezia*, along with a small percentage of *Saccostrea glomerata*, by weight (Figure 7.17). The large mud whelks are absent from the archaeological remains in Analytical Unit 4, suggesting that a suitable environment for this species had not yet formed. The dominance of *Anadara trapezia* suggests an environment where mangrove swamps are absent, and therefore *Saccostrea glomerata* do not have either a rocky substrate or mangrove roots on which to grow. It also may suggest that access to

this species is not impeded by excessive growth of vegetation along the shoreline of the embayment. In the latter part of this time frame, in Analytical Unit 3, a change occurs in the shellfish species, from a predominance of cockle (*Anadara trapezia*) in Analytical Unit 4, to a larger proportion of oyster (*Saccostrea glomerata*), along with the introduction of mud whelks (*Pyrazus ebinenus*) in the upper spit of Analytical Unit 3 (Figure 7.6). This could be suggestive of a changing environment for shellfish at Stuarts Point 1 around the time period just before 3,700 BP.

The shellfish data from Cutting II, Clybucca 3, is difficult to interpret for this time period as Analytical Unit 3 does not appear in Cutting II. Needless to say the trend in shellfish represented in the Clybucca assemblage is one of predominance of oyster (*Cassostrea glomerata*) over cockle (*Anadara trapezia*) throughout the site. Table 7.3 showed that all shellfish species are represented by only small amounts in the lowest units of the site, with a dramatic increase in the use of shellfish in Analytical Unit 2, which probably incorporates Analytical Unit 3 in Cutting II (Figure 7.1), but the two units cannot be differentiated stratigraphically because of the dip in the deposits, and an excavation carried out in arbitrary spits.

The trends from Clybucca in the time period during the 4,300 to 3,700 years before present show an increasing quantity of marine remains, fish and probably shellfish, deposited, though terrestrial remains are still predominant. Whereas, at Stuarts Point, this time frame is characterised by a reliance on marine fauna, with very little input to the diet by way of terrestrial fauna. If the embayment at this time was a large marine environment which was gradually being infilled by sediments (as proposed in Hypothesis Two) it could be expected that marine resources would have made a more prominent contribution to the people's diet at Clybucca. Instead, we see a greater quantity of terrestrial resources, with only limited contribution from marine fauna, albeit one which increases during this time frame. The trend from Stuarts Point from approximately 4,300 BP is dominated by marine fauna. This supports Hypothesis One because in this scenario sea-levels would still have been between one and two metres higher than the present, creating a large marine embayment over the Macleay floodplain.

7.4.3 3,700 – 2,900 Years Before the Present

This time period is represented by Analytical Unit 2 at Clybucca, and Analytical Units 2 and 1 at Stuarts Point (Table 7.9). Hypothesis One proposed that at this time the sea-level would have lowered to one metre above its present height in the Macleay region (Table 7.19). Figure 7.18 portrays how the floodplain would have appeared at approximately 3,000 BP (Mundell 2000; Baker et al. 2001).

Shellfish use appears to be at its height at Clybucca 3 in the time period represented by Analytical Unit 2, suggesting that the environment was conducive to oyster growth. Oysters would have been able to grow on the rocky shoreline at Clybucca, and therefore would not have needed a mangrove habitat. Shell attached to stone was noted throughout both of the Cuttings in Connah's 'trench book' (1972). However, it must also be noted that Analytical Unit 2 probably also incorporated Analytical Unit 3 in Cutting II, there fore it is difficult to know whether the shellfish was deposited predominantly in the time period 4,300 – 3,700 BP or 3,700 – 2,900 BP. There may have been a continual deposition over both of these time frames (Figure 5.5).

Table 7.12 Relative proportions of land/sea vertebrate fauna in the time span 3700 – 2900 BP

Time Span	Site/Analytical Unit	Land g	Land %	Fish g	Fish %	Total
3700 - 2900	Clybucca/2	371.65	69.7	161.5	30.3	533.15
	Stuarts Point/1 and 2	224.54	54.3	189.35	45.7	413.89

In this time frame, terrestrial animals are predominant by weight in both of the sites (Table 7.12). However, this change does not take place at Stuarts Point until Analytical Unit 1, therefore, towards the later part of this time frame.

The fish remains from Analytical Unit 2 show both Sparidae and Platycephalidae are represented by a larger range of sizes (Figures 7.9 and 7.10) than in Analytical Units 1 and 3 at Clybucca.

The picture portrayed by the faunal remains recovered from Stuarts Point in this time frame also shows a change in the nature of resource use, though it is changing in a different manner to that seen at Clybucca. The use of shellfish has declined, with oyster (*Saccostrea glomerata*) remaining the dominant species identified in Analytical Unit 1. The large mud whelk (*Pyrazus ebinenus*) was introduced into the assemblage in very small numbers in the transitional unit, Analytical Unit 3. It increased in weight in Analytical Unit 2, and remained a part of the shellfish assemblage in Analytical Unit 1. The introduction of the large mud whelk coincided with the decrease in *Anadara trapezia* recovered from the site. *Pyrazus ebenius* move about in the mud of mangrove swamps, so the introduction of this species over time shows an environment changing to one that can accommodate this species. The increase in the use of oysters over time also indicates an environment where the substrate is becoming muddier and encouraging the growth of mangroves.

Sparidae dominated the fish remains recovered in Analytical Unit 2 at Stuarts Point, and Platycephalidae (MNI 27) and Sparidae (MNI 25) were found in similar quantities in Analytical Unit 1 (Table 7.8). The increase in Sparidae coincides with the increase in oyster, and may also indicate that the waters of the embayment were becoming shallower. Platycephalidae tolerate water to a dept of approximately 30 metres, but are also able to inhabit shallow waters. Sparidae prefer to inhabit shallow waters. The richness of the fish taxa identified decreases somewhat in Analytical Unit 1 at Stuarts Point, with only five families being identified.

The most significant trend in this time period at Stuarts Point is the increase in the amount of vertebrate fauna other than fish that came to form part of the midden. The fauna identified from Analytical Unit 1, not only increased by weight, but mammal, bird and reptile were identified in the assemblage. The mammal remains included a mandible from the species *Macropus giganteus*, a much larger animal than had been identified in the lower units of the site. Analytical Unit 1 is the only unit at Stuarts Point where the terrestrial faunal remains outweigh the fish remains.

These findings suggest a change in the focus of resource procurement from fish to land animals at Stuarts Point in the time after 3,700 BP – the time at which Hypothesis One suggests that the sea-level would have been falling. It is assumed the site was abandoned around 3,200 BP (Figure 7.4).

7.4.4 2,900 – 2,700 Years Before the Present

This time frame is represented at Clybucca 3 by Analytical Unit 1, and is absent at Stuarts Point 1 (Table 7.13).

At the Clybucca site faunal remains decrease substantially in Analytical Unit 1 after reaching a maximum in Analytical Unit 2. The reduced amount of terrestrial remains were identified as coming from the brush-tailed rat kangaroo and a brush tailed possum, along with fragmented pieces of other mammal remains and a reptilian vertebra. Crab remains were also identified. Sparidae dominated the fishbone assemblage, although the amount of fish remains is quite small, and the size of the fish represented has also decreased (Figure 7.7). The amount of oyster (*Saccostrea glomerata*) recovered from the deposits also decreases in Analytical Unit 1. These findings suggest a decreased use of the site after c. 3,500 years ago, with the amount of all faunal remains decreasing substantially. It is assumed that the site was abandoned around 2,700 BP (Figure 7.2).

Table 7.13 Relative proportions of land/sea vertebrate fauna in the time span 2900 – 2700 BP

Time Span	Site/Analytical Unit	Land g	Land %	Fish g	Fish %	Total
2900 - 2700	Clybucca/1	43.03	76.1	13.5	23.9	56.53

In this time frame the estuary and floodplain would have begun taking on its present day appearance. The area would have included a low flat floodplain on which sediments carried down the river would build up, especially during times of flooding; and the river itself would have started to assume the meandering nature, that it has today.

7.5 Conclusion

This chapter presented my interpretation of the depositional history of Clybucca 3 and Stuarts Point 1 and explained how I assigned the faunal remains recovered from these sites to Analytical Units based on strata. I then presented my analysis of the faunal remains from each strata and compared and contrasted trends observed in the data from the two sites. Clear differences were seen in faunal resource use between the sites and over time (Figures 7.17 and 7.18). In the final section of the chapter I discussed the implications of these differences for the two alternative hypotheses proposed in Chapter 4 in regard to the formation of the Lower Macleay region. By comparing the findings of my re-analysis of the Clybucca 3 and Stuarts Point 1 faunal assemblages with the alternative models formulated to represent what would be expected if each hypothesis were true, I was able to show that my results do, indeed, provide greater support for Hypothesis One – that sea-levels fluctuated in the Lower Macleay during the Late Holocene. In the following chapter I present these findings and its implications for both archaeological midden research and sea-level research in Australia.