Final Report on the Excavations at the Pinnacle Point Shell Midden Complex (PPSMC), Western Cape Province, South Africa

Erf 15387 and a portion of Erf 2001, Farm Boplaas, Pinnacle Point, Mossel Bay, Western Cape Province

Heritage Western Cape

(HWC permit No. 2006-08-001 to 004)

(HWC ROD Ref. No C13/3/6/2/1/1/1/1/C17)

By

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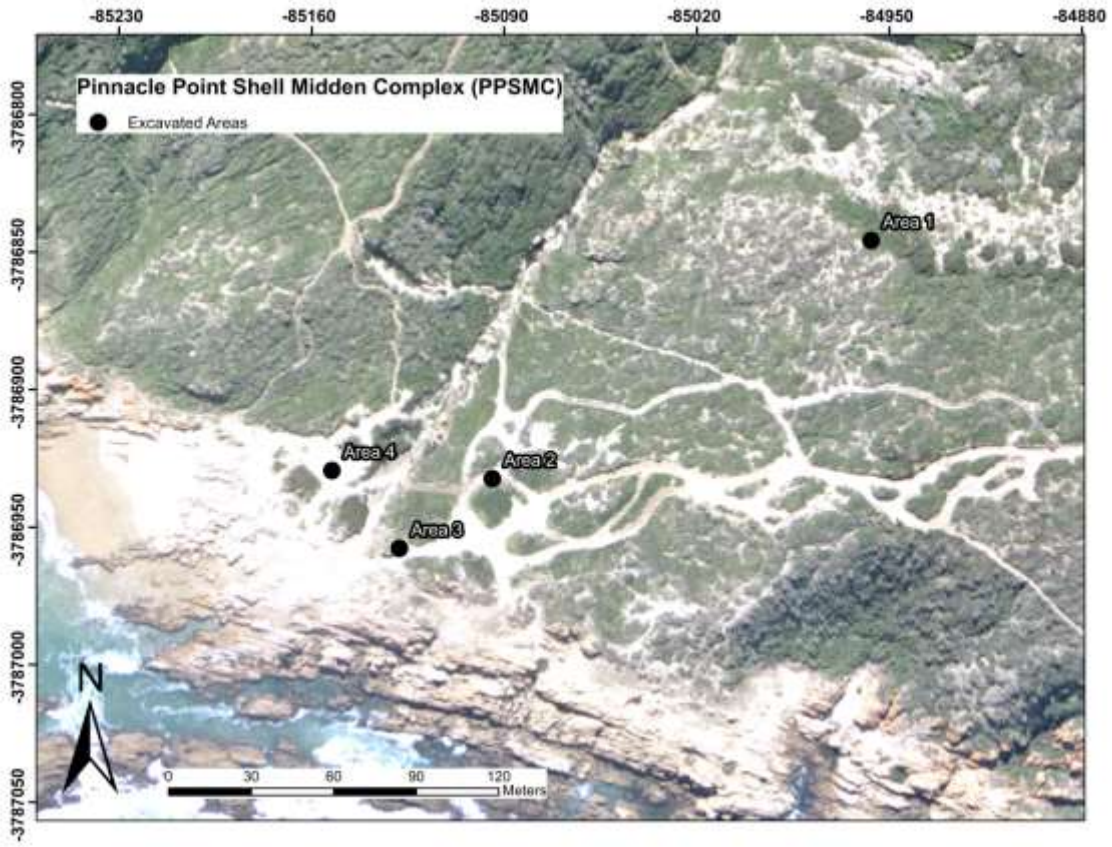
Executive Summary

1. Site Name – Pinnacle Point Shell Midden Complex Areas 1 through 4
2. Location - Erf 15387 and a portion of Erf 2001, Farm Boplaas, Pinnacle Point, at: at approximately 34°12.31S; 22°05.40E in: Mossel Bay, Eden, Western Cape Province.
3. Locality Plan – above is from WGS84 3422AA and square shows detail below.



4. Description of Proposed Development – Residential units with supporting services are planned for construction in the area.
5. Heritage Resources Identified – The PPSMC was discovered during a phase 1 survey (Kaplan, 1997). Plans for extensive residential building and associated road and utilities resulted in a plan to excavate portions of the discovered shell middens in what

is known as the Oyster Bay locality. CHARM was contracted to conduct these excavations, and excavations began in 2006. CHARM divided the PPSMC into 5 separate study areas, designated Areas 1 to 5. A total of six excavations were completed covering Areas 1 to 4. No excavations were undertaken in Area 5 as no development was planned. MAPCRM cc was contracted to write the final report of the CHARM excavations, and the reasoning behind this is explained in the main report.

The PPSMC includes a series of Later Stone Age (LSA) occupations with varying levels of mollusk remains, most of which reach the density required to classify them as shell middens. Most are thin, possibly single-occupation, shell lenses separated by sterile sand. There are also several thicker shell lenses (Area 2 NW and Area 4) that occur stratigraphically above thinner lenses. Stone artefacts are present in the form of chipped stone, unmodified manuports, and various stones that show indications of having been used as hammerstones and anvils. The regular appearance of fire modified rock (FMR), charcoal, and at least one intact hearth clearly signal the presence of regular burning activities at the sites. Faunal remains include mammals, birds, reptiles, and fish.

A small stone tool assemblage was found in excavation, and 1492 stone tools were coded from the 4 areas using an extensive database of attributes. Early stages of flake-based lithic reduction on quartzite dominate all the assemblages, though there is also a very low frequency of flakes and cores on fine-grained raw materials such as silcrete, chalcedony, and quartz. Diagnostic retouched tools, such as backed pieces and thumbnail scrapers, are absent at PPSMC. Bipolar cores, consistent with an LSA designation are rare, but present. There are no major differences between the areas in stone tool characteristics. Pottery is rare and oonly found in Area 3. It resembles that found at Kasteelberg. Ostrich eggshell beads are rare but present in all 4 areas. Area 3 has larger beads than the other areas.

Shellfish remains are abundant and are the dominant item found. Several mollusk species of abalone, limpet, mussel, turban shell, whelk and winkle were present including unidentifiable chiton fragments belonging to the class Polyplacophora and crustacean fragments of barnacle, belonging to the subclass Thecostraca. Most of the species identified can still be found in the area today. The faunal remains in all the areas are dominated by marine animals, mostly fish and Cape fur seal. No clear domestic animal remains were found, though one fragmented astragalus may be sheep.

Bird remains are abundant. Ciconiiformes (marine birds) dominate the bird remains. The only exception was one bone belonging to the order Strigiformes (owls). The most prominent families present in the record were that of the family Sulidae (Gannets) and the family Phalacrocoracidae (Cormorants). Under the family Phalacrocoracidae the following species were found; *Phalacrocorax capensis* (Cape cormorant), *Phalacrocorax lucidus* (White-breasted cormorant) and the *Phalacrocorax neglectus* (Bank cormorant). Under the family Procellariidae family the *Morus capensis* (Cape Gannet) was the most dominant bird species present in the bone assemblage. The *Morus capensis* made up 43% of the plotted find assemblage

and 17% of the 10mm assemblage. The Phalacrocorax species (Cormorants) was the second most prominent species making up 6.5% of the plotted find assemblage and 4% of the 10mm assemblage. Other species that also appeared in the plotted find and 10mm assemblage were the *Spheniscus demersus* (Jackass penguin), the *Procellaria aequinoctialis* (White-chinned Petrel) and *Bubo africanus* (Spotted Eagle-Owl). Comparing these beached bird results with the archaeological record of PPSMC might indicate in which seasons these Areas were exploited. Area1 and Area 4 may have been exploited during the winter between July and September. Area 2 seems to have been occupied through the whole year as there is a large amount of Cormorants (dominant in July to September) and Cape Gannets (dominant in January to May). Lastly Area 3 seems to have been occupied between July and September as the site is dominated by Cape Gannet bones

Area 1 has 2 stratigraphically separate thin shell lenses, separated by a layer of sterile dune sand. The radiocarbon ages are 2180 +/- 30 BP (Cal BC 350 to 300 and Cal BP 2300 to 2250) for SMCA1A and 2920 +/- 30 BP (Cal BC 1125 to 975 and Cal BP 3075 to 2925). Shellfish remains were abundant and include 7915 individual fragments weighing 40.20 kg. *P. perna* is by far the best represented species making up 70.42% of this assemblage. *D. serra*, inhabiting sandy beaches in the mid intertidal zone, constitutes the second most abundant species accounting for 8.85% of the assemblage. This is followed by the rocky shore gastropod *T. sarmaticus* constituting 6.34% of the identified shell.

Area 2 has three separate excavated zones, all showing similar results. This is a large dense shell midden that has been severely damaged by recreational activities at the top and a thin shell lens at the base. Two radiocarbon dates from the upper and lower layers yielded ages of 1680 +/- 30 BP (Cal AD 360 to 475 and Cal BP 1590 to 1475) and 2470 +/- 30 BP (Cal BC 745 to 685 and Cal BP 2695 to 2635), respectively.

The shellfish remains include 10005 fragments weighing 68.90 kg. *P. perna* constitutes the best represented species at the site, accounting for 28.19% of the total assemblage. *T. sarmaticus* is the next most abundant species, making up 25.38% of the assemblage as a whole. *D. serra* constitutes 13.15% of the total assemblage followed by the large abalone *H. spadicea* (6.95%).

Area 3 is the most extensively excavated. The top layer is disturbed sand and modern soil, and below this is a thin but extensive and rich shell midden and human occupation layer. In the northern extent of this lens is a very well preserved rather novel stone lined hearth. This is the only excavated area to yield pottery. Two radiocarbon ages on charcoal from the hearth are 971 ± 43 BP and 962 ± 43 BP, and these were attained and provided to us by Dr. Andy Herries. A third radiocarbon age on an opercula fragment provided an age of 890 ± 30 BP, which must be corrected for the sea water effect. We attained a radiocarbon date of 1160 +/- 30 BP (Cal AD 775 to 970 and Cal BP 1175 to 980) from the southern portion of the area, and together these suggest an age range of about 200 years during the time of pastoral occupation of the south coast.

The shell includes a total NISP of 3594 and sample weight of 15.88 kg with little species variability. The identified sample is dominated by *P. perna* accounting for

77.82% of the total assemblage. The next most numerous contributors are *T. sarmaticus* (4.72%) and *S. longicosta* (4.10%).

Area 4 is a very large shell midden that is transected by the "Old Road". This shell midden was previously named PP19 and is protected in perpetuity. There appears to be many separate shell middens in this area. The area was excavated with an L shaped trench is 2.5m N-S and at its widest is 3m E-W, and there are multiple test holes that intercepted shell midden. Our GIS analysis suggested there are 3 distinct anthropogenic units. Two radiocarbon dates from this 'L' shape provides ages of 2430 +/- 30 BP (Cal BC 540 to 395 and Cal BP 2490 to 2345) and 2410 +/- 30 BP (Cal BC 735 to 690 and Cal BP 2685 to 2640).

The shell assemblage had 2571 specimens. The brown mussel *P. perna* is by far the best represented species, making up 79.16% of the assemblage as a whole. It is the most abundant species in each of the individual strata from which the shell remains were recovered. *T. sarmaticus* is the next best represented species accounting for 4.84% of the total remains identified and is followed by the bivalve *D. serra* (4.36%).

6. Anticipated Impacts on Heritage Resources – Construction in this area will damage these archaeological sites. For this reason, excavation permits were awarded to CHARM (under the directorship of Dr. Peter Nilssen).
7. Recommendations – MAPCRM was contracted to describe the excavations and resulting archaeological materials from those excavations. We have not provided any recommendations in this report. However, we do note that a decision by HWC has been made to allow destruction in the area of this report for the purpose of construction and services. Also, in a preliminary report (#2) CHARM provided the following recommendations: "Recommendations for protection and conservation measures have been made for sites in Areas 1 and 4 which are to be conserved in perpetuity. Recommendations for the large, sub-surface shell midden in Area 1, close to the boundary of the property, include the erection of a protective wooden fence complemented by an information plaque. The recommendations for PP 19 shell midden in Area 4, which is in a very vulnerable position, are that the site be completely covered with biddum / geotextile to prevent penetration of roots and then by a bank of sand and topsoil for protection and revegetation and finally enclosed and protected by a wooden palisade. Again, an information plaque – in relevant languages - should be erected qualifying the protected status of the site and including some information on the archaeology of the area."
8. Author/s and Date – 7 August 2014

Dr. Curtis Marean (Arizona State University)

Dr. Naomi Cleghorn (University of Texas at Arlington)

Betinna Gennari (MAPCRM)

Struan Henderson (MAPCRM)

James McGrath (Arizona State University)

Cindy Nelson (MAPCRM and now University of Edinburgh)

Leesha Richardson (UNISA)

Christopher Shelton (University of Texas at Arlington)

Dr. Jayne Wilkins (Arizona State University)

Full Permit Details Covered by this Report

HWC APPLICATION No. 2009/11/APM 003 HWC REF No. HM/EDEN/MOSSEL BAY/OYSTER BAY/BOPLAAS/ERF 15387, A PORTION OF ERF 2001 PERMIT No. 2009/11/003 Issued under Section 48(2) of the National Heritage Resources Act, Act No. 25 of 1999 and the Western Cape Provincial Gazette 6061, Notice 298 of 2003. Permission is hereby given: to: Dr. Peter Nilssen of: Centre for Heritage and Archaeological Resource Management, Great Brak for: excavation, disturbance, removal from its original position, collection, use of excavation equipment and damage for the purpose of analysis and remedial mitigation on: Area 1 on Erf 15387 and a portion of Erf 2001, Farm Boplaas, Pinnacle Point, at: at approximately 34°12.31S; 22°05.40E in: Mossel Bay, Eden, Western Cape Province.

HWC APPLICATION No. 2009/11/APM 004 HWC REF No. HM/EDEN/MOSSEL BAY/OYSTER BAY/BOPLAAS/ERF 15387, A PORTION OF ERF 2001 PERMIT No. 2009/11/004 Issued under Section 48(2) of the National Heritage Resources Act, Act No. 25 of 1999 and the Western Cape Provincial Gazette 6061, Notice 298 of 2003. Permission is hereby given: to: Dr. Peter Nilssen of: Centre for Heritage and Archaeological Resource Management, Great Brak for: excavation, disturbance, removal from its original position, collection, use of excavation equipment and damage for the purpose of analysis and remedial mitigation on: Area 2 on Erf 15387 and a portion of Erf 2001, Farm Boplaas, Pinnacle Point, at: at approximately 34°12.31S; 22°05.40E in: Mossel Bay, Eden, Western Cape Province.

HWC APPLICATION No. 2009/11/APM 005 HWC REF No. HM/EDEN/MOSSEL BAY/OYSTER BAY/BOPLAAS/ERF 15387, A PORTION OF ERF 2001 PERMIT No. 2009/11/005 Issued under Section 48(2) of the National Heritage Resources Act, Act No. 25 of 1999 and the Western Cape Provincial Gazette 6061, Notice 298 of 2003. Permission is hereby given: to: Dr. Peter Nilssen of: Centre for Heritage and Archaeological Resource Management, Great Brak for: excavation, disturbance, removal from its original position, collection, use of excavation equipment and damage for the purpose of analysis and remedial mitigation on: Area 3 on Erf 15387 and a portion of Erf 2001, Farm Boplaas, Pinnacle Point at: at approximately 34°12.31S; 22°05.40E in: Mossel Bay, Eden, Western Cape Province.

HWC APPLICATION No. 2009/11/APM 006 HWC REF No. HM/EDEN/MOSSEL BAY/OYSTER BAY/BOPLAAS/ERF 15387, A PORTION OF ERF 2001 PERMIT No. 2009/11/006 Issued under Section 48(2) of the National Heritage Resources Act, Act No. 25 of 1999 and the Western Cape Provincial Gazette 6061, Notice 298 of 2003. Permission is hereby given: to: Dr. Peter Nilssen of: Centre for Heritage and Archaeological Resource Management, Great Brak for: excavation, disturbance, removal from its original position, collection, use of excavation equipment and damage for the purpose of analysis and remedial mitigation on: Area 4 on Erf 15387 and a portion of Erf 2001, Farm Boplaas, Pinnacle Point at: at approximately 34°12.31S; 22°05.40E in: Mossel Bay, Eden, Western Cape Province.

Preamble

The Pinnacle Point Shell Midden Complex (PPSMC) was excavated by the Centre for Heritage and Archaeological Resource Management (CHARM) under the directorship of Dr. Peter Nilssen in 2006 and 2007. As part of an agreement between the Pinnacle Point Homeowners Association (PPHOA), CHARM, and MAPCRM, in May of 2013 MAPCRM (under the directorship of Dr. Curtis W. Marean) agreed to take on the work of curating and analyzing the collections and field excavation paper and digital notes, and developing a report on the excavations and finds from the sites for submission to Heritage Western Cape (HWC) so as to fulfill the permit requirements. In May of 2013 Nilssen provided MAPCRM with the materials from his excavations at the PPSMC. MAPCRM developed a budget based on the size of the collection they were given (the inventory is provided below). MAPCRM was assured that these were all the materials from CHARM's excavations at the PPSMC. Since the purpose of MAPCRM is research and it is not a for-profit enterprise, the budget was developed on a "cost" basis, and not a "for profit" basis. MAPCRM estimated the work would take about one year, with breaks due to research to be conducted by MAPCRM staff. PPHOA accepted the estimate provided by MAPCRM, and beginning in June of 2013 MAPCRM staff and project scientists of the South African Coast Paleoclimate, Paleoenvironment, Paleoecology, Paleoanthropology Project (SACP4) undertook the analysis. This report is the product of that work by MAPCRM and SACP4, and is submitted to HWC to fulfill the requirements of the excavation permits given to Nilssen.

Inventory of Material Given to MAPCRM by Nilssen

On the 15th of May 2013 Nilssen handed over to MAPCRM the paperwork, digital data and artefacts described below from excavations done on the PPSMC on the Pinnacle Point estate from 2006 to 2008 at four shell midden sites (PPSMC1, PPSMC2, PPSMC3 and PPSCM4) and various shovel tests scattered throughout the research area. In addition to the sites mentioned above MAPCRM also received three boxes labelled PTNR that contained a mixture of fauna, shell, stones/lithics and pottery. We do not know what that material is. MAP also received the following labelled as PPMC; two boxes of lithics and one box each of organics, charcoal, breccia, pottery, ochre and fauna.

The digital data (20.6 GB) comprises photographs, raw survey/coordinate data, permits, maps and progress reports submitted to HWC. Five files of paperwork containing strat-unit-, lot number-, photography-, specialist-, bulk sample-, and shell samples forms were handed over including all field- and recorder note books for sites PPSMC1 to PPSMC4.

PPSMC1 - MAPCRM received one box of specialist samples, three boxes of 1.5mm, 3mm and 10mm sorted artefacts (OES, stone, fauna, quartz, ochre and charcoal) in addition to four boxes of 3mm and 10mm sorted shell.

PPSMC2 - MAPCRM received one box of specialist samples, five boxes of 3mm and 10mm sorted shell, five boxes of 3mm and 10mm sorted artefacts (OES, stone, fauna, charcoal, ochre and lithics) in addition to 10mm shell previously analyzed by Katharine Kyriacou.

PPSMC3 - MAPCRM received five boxes of sorted 3mm and 10mm shell, one box of specialist samples, one box of profile collapses and section clearings and six boxes of sorted 1.5mm, 3mm and 10mm artefacts (stone, charcoal, ochre, quartz, fauna, lithics, and pottery).

PPSMC4 - MAPCRM received one box of sorted 3mm shell, one box of specialist samples, five boxes of 3mm and 10mm sorted artefacts (ochre, quartz, OES, fauna, charcoal and beads) in addition to the 10mm shell analyzed by Katharine Kyriacou.

The remainder of the collection consist of five boxes of 1.5mm unsorted shell from all four PPSMC sites including the 10mm sorted shell from shovel tests 3, 5-10, 12-17, 20-23, 26-27 and 41. In addition to three boxes of bulk samples and twenty-nine boxes of 1.5mm unsorted material from sites PPSMC1 to PPSMC4.

Introduction

The PPSMC was discovered during a phase 1 survey (Kaplan, 2004). Plans for extensive residential building and associated road and utilities resulted in a plan to excavate portions of the discovered shell middens in what is known as the Oyster Bay locality. CHARM was contracted to conduct these excavations, and excavations began in 2006. CHARM divided the PPSMC into 5 separate study areas, designated Areas 1 to 5. A total of six excavations were completed covering Areas 1 to 4 (Figures 1 and 2). No excavations were undertaken in Area 5 as no development was planned.

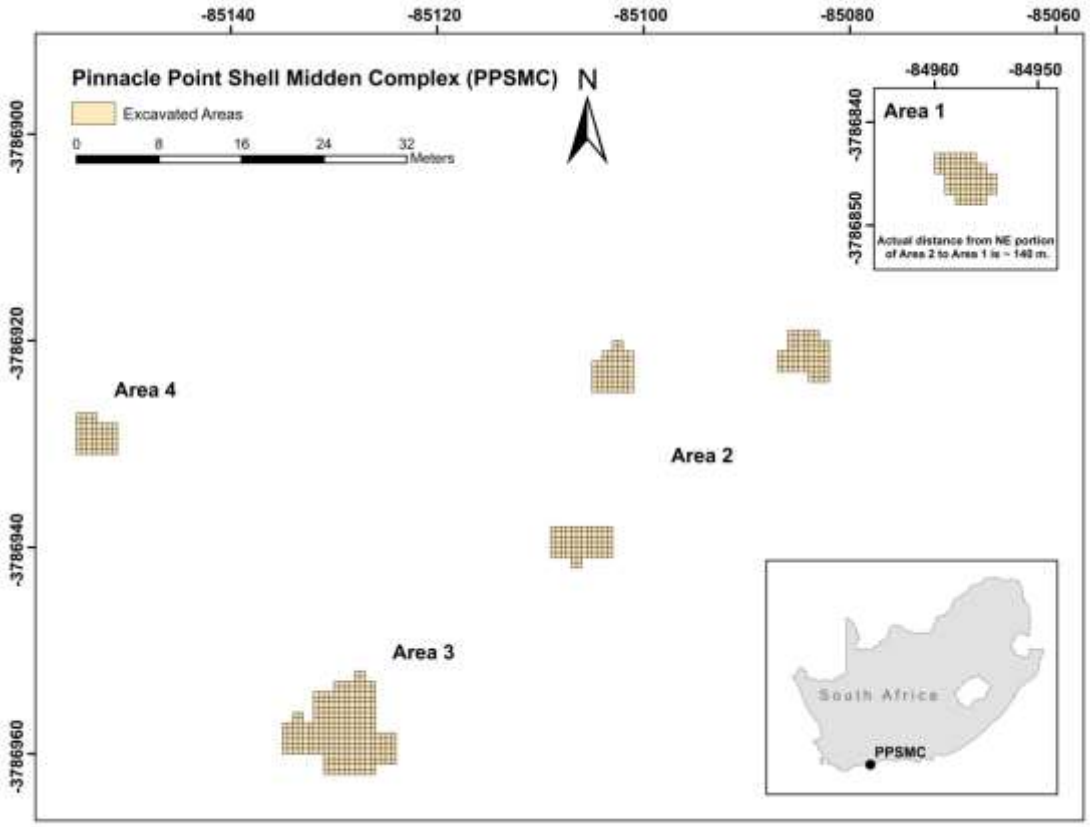


Figure 1. The location of the PPSMC and the designated Areas.

Excavation Methods

This description is taken from a report submitted to Heritage Western Cape (Nilssen and Mahire, 2009). CHARM established and documented the location of a 0.5 metre interval grid system that was locked into the SA National Grid System (South African National Grid Hartebeesthoek94 Lo23 coordinate system). All survey data was generated and captured with a Topcon GPT-3005N Total Station and Psion WorkAbout Pro hand held computer. The deposits were excavated utilizing this grid as the basic mapping control.

The first excavations in the shell middens were test holes that were not excavated stratigraphically and were instead dug to determine the vertical extent of anthropogenic

lenses. Following the test hole phase, excavations using the procedures detailed below were carried out in Areas 1-4.

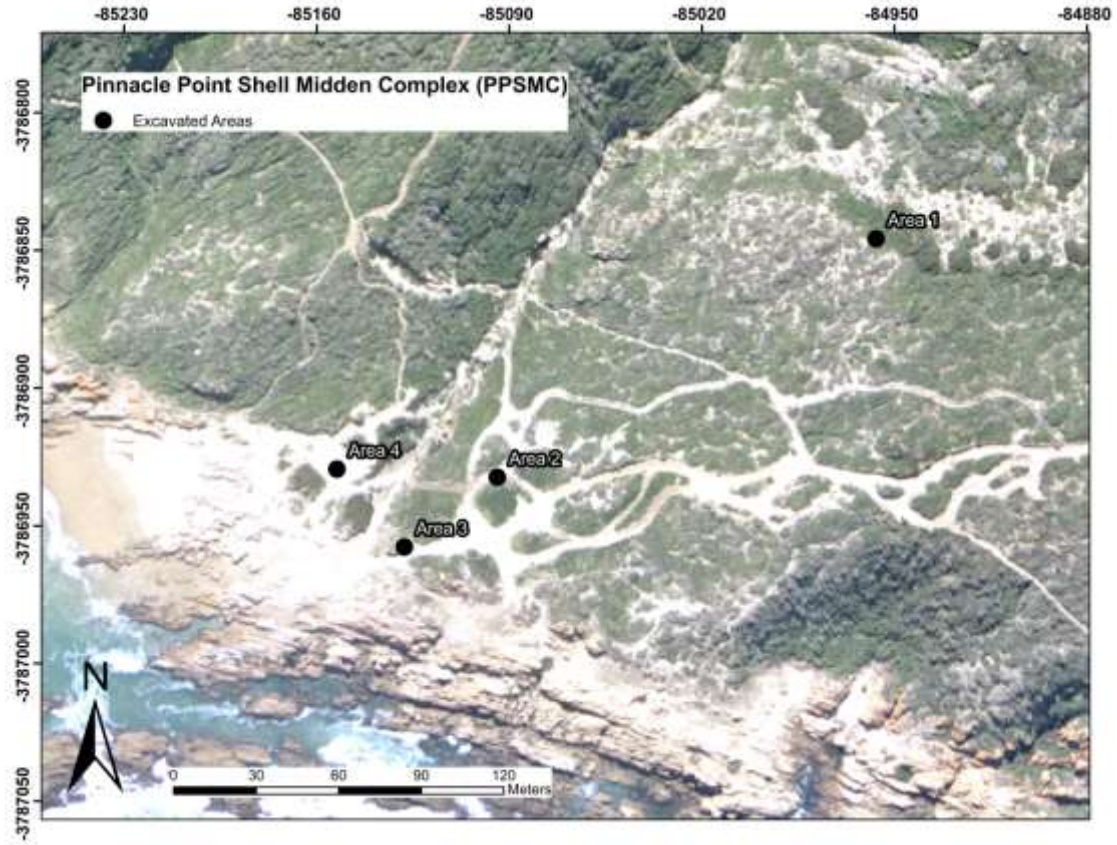


Figure 2. The location of the PPSMC Areas on an aerial photograph rectified to the South African National grid.

Where a depth of sediment with derived shell lay above *in-situ* deposits, the overburden was removed by spade prior to exposing intact strata. Excavations proceeded either from previously exposed sections created by road building and pipe laying operations or from spade-dug test holes excavated during the exploratory investigation that provided initial stratigraphic controls. Wherever possible, the endeavour was to follow the natural and/or anthropogenic stratification during the excavations as well as to remove the full depth of the anthropogenic sediments over the excavation area and to isolate the contents of intrusive animal burrows.

Larger pieces of stone artifacts, pottery, and charcoal were plotted by total station by the excavators. The deposits from anthropogenic sources were sieved through a nested 10, 3 and 1.5 mm size mesh (the implemented size being noted). Where relevant, deposits from non-anthropogenic sources were sieved through 10 and 3 mm size mesh. Shellfish were sampled both through depth and across space resulting in shellfish samples from about 20% of the total excavated volume (a 50 x 50 cm column was sampled for shell from nearly each excavated square meter). Notes were recorded on the volume, stratification and nature of sediments. Photography was done digitally (Canon EOS350D, 8 Mega pixels with an 18-35.5 mm EFS lens, as well as a Canon PowerShot A640 10 Mega pixel).

Status of Sorting, Curation, and Analysis of Excavated Materials

The excavation materials provided to MAPCRM were in various stages of processing. Some was sorted, but most was not. Some was sorted poorly. MAPCRM crew, all with substantial sorting experience gained from years of work in SACP4, re-sorted all the 10 mm and 3 mm material, sorted a sample of the 1.5 mm material completely, and searched through all the 1.5 mm material for important finds such as OES and animal teeth. The collection is now in storage at MAPCRM facilities in Mossel Bay and is well curated and organized.

All plotted, 10 mm and 3 mm shell was analyzed for this report. For other find classes, all plotted, 10 mm, and 3 mm material was identified and analyzed at some level for this report. The 1.5 mm material was mostly very fragmented shell, but there were some OES fragments and beads found, and these are included here in this analysis. The finds were analyzed by the following people:

Bird remains – analyzed by Leesha Richardson (UNISA) as part of her honors, supervised by Dr. Curtis Marean and Dr. Graham Avery.

Bone Tools - analyzed by Dr. Curtis Marean (Arizona State University), Betinna Gennari (MAPCRM), and Leesha Richardson (UNISA).

Excavation Data and GIS Analysis - analyzed by James McGrath (Arizona State University), Dr. Curtis Marean (Arizona State University), and Cindy Nelson (MAPCRM and now University of Edinburgh).

Mammal and Tortoise remains – analyzed by Dr. Curtis Marean (Arizona State University), Dr. Naomi Cleghorn (University of Texas at Arlington), and Betinna Gennari (MAPCRM).

OES - analyzed by Dr. Curtis Marean (Arizona State University) and Betinna Gennari (MAPCRM).

Other – there were other materials that were curated but not analyzed. These include mostly charcoal and other organics.

Pottery remains – analyzed by James McGrath (Arizona State University) under the supervision of Dr. Curtis Marean.

Radiocarbon Dating - Samples were selected for radiocarbon dating by Marean based on stratigraphic and horizontal position. MAPCRM submitted charcoal samples to BetaAnalytic for AMS dating and the results are summarized here. Dr. Andy Herries independently submitted samples for dating and his results are integrated with our report.

Shellfish remains – analyzed by Dr. Katharine Kyriacou (University of Cape Town) and Cindy Nelson (MAPCRM and now University of Edinburgh).

Stone Tools – analyzed by Dr. Jayne Wilkins (Arizona State University) and Christopher Shelton (University of Texas at Arlington).

Status of Excavation Records and Digital Data and Paperwork

As noted above, MAPCRM was provided with raw field data in the form of notes, digital photography, and raw survey files generated from the total station and survey software. None of the data was entered to database or GIS when provided to MAPCRM and was in a very raw form. MAPCRM personnel entered the field data to databases, transformed the raw survey data to coordinate data, and built an ArcGIS database from the survey data. A significant effort was invested in cleaning the data, but significant amounts of the form-based information and survey data had incomplete entries or even no entries at all. This compromised our ability to do some types of analyses. The data we have is now well organized into an Access database and an ArcGIS database.

Description of the Pinnacle Point Shell Midden Complex (PPSMC)

The PPSMC includes a series of Later Stone Age (LSA) occupations with varying levels of mollusk remains, most of which reach the density required to classify them as shell middens. Most are thin, possibly single-occupation, shell lenses separated by sterile sand. There are also several thicker shell lenses (Area 2 NW and Area 4) that occur stratigraphically above thinner lenses. Pottery is present some of the occupations, generally in rather low amounts, but not in all. Stone artefacts are present in the form of chipped stone, unmodified manuports, and various stones that show indications of having been used as hammerstones and anvils. The regular appearance of fire modified rock (FMR), charcoal, and at least one intact hearth clearly signal the presence of regular burning activities at the sites. Faunal remains include mammals, birds, reptiles, and fish. The presence of so many thin lenses occurring closely together suggests this area of the coast was a frequent stopping point for prehistoric people.

The PPSMC shell middens stand in contrast to the better-known Midde Stone Age (MSA) sites at PP. While there are open-air MSA occupations at PP, the majority of the dense MSA occurrences are in caves and rockshelters. Surprisingly, none of the investigated caves and rockshelters at PP at this time have displayed substantial LSA occupation. There is some evidence that PP5-6 South was once covered by an extensive LSA shell midden that was at some point probably dug away by people, perhaps for burning into lime.

The PPSMC shell middens occur in a slight depression caused by an erosion gully in a dune system that blankets Table Mountain Sandstone (TMS) cliffs and a pavement. Figure 2 shows that the sites are all located near to the current position of the coast, and that a gently descending quartzite wave-cut platform is exposed directly seaward. Such wavecut platforms are rich inter-tidal zones and provide people with outstanding shellfish collection and fishing possibilities. The location of the sites is likely due to the coastal foraging potential of the area.

Description of Area 1

Area 1 is the most north-easternmost of the excavation areas, and has the highest elevation (Figures 1 and 2). It measures ~6m east to west and ~5m north to south. At its highest point, Area 1 is ~61.4m above sea level and at its lowest, 58.2m above sea level. Area 1 lies ~230m north of the shore. It consists of a sandy disturbed overburden with some mixed bone and lithics on top of two discrete shell lenses (SMCA1A, SMCA1C/D). There is a mostly sterile sandy layer between both lenses.

It appears that a trench mapped to be offset from Area 1 was most likely placed within Area 1 (Figure 3 and 4). Our examination of the scanned field notebooks (PPSMCA1, MAGGIE &LANDA, 2013_06_04, IMG_003) notes that "Previously a trench was dug in this quad + NE back-filled it and that is why there is only a certain parts of the shell lens left – disturbed area." This previously dug test hole from the surface was backfilled. As excavators excavated overburden in Area 1 they did not differentiate between overburden and backfill. It was not until the first shell lens was reached that the excavators made note of the trench.

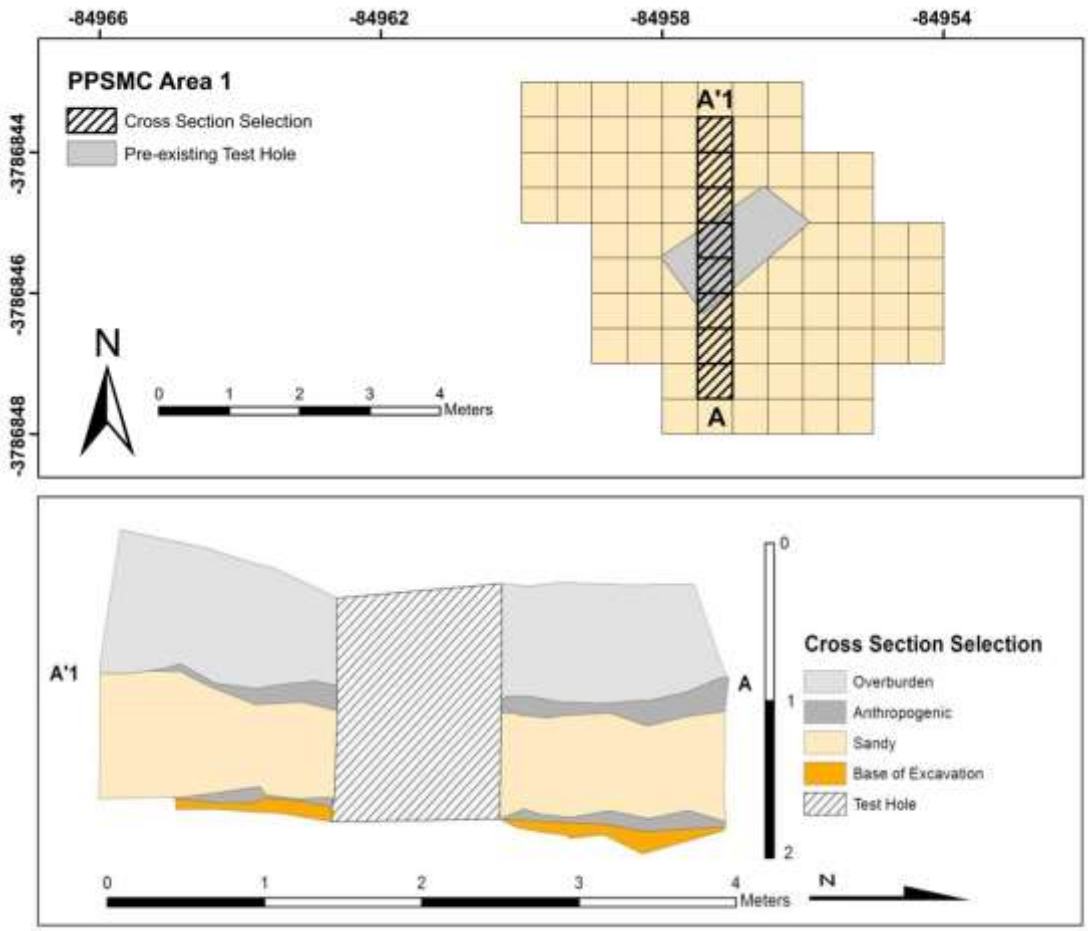


Figure 3. The horizontal plan of Area 1 (above) showing where the test hole likely was, and a vertical cross-section through the trench.

There are two distinct anthropogenic layers in Area 1 (SMCA1A and SMCA1C/D) separated by a nearly sterile layer of Aeolian sand (Figure 5). Capping the deposit is an organic disturbed horizon (SMC1OB). SMCA1A has 29 plotted faunal remains and 14 plotted lithics (Figure 6). Of the lithics, 8 are Hammer/Manuport/Grindstones, 3 are flakes, 1 is a core, and 2 are shatter. SMCA1C/D has two plotted quartzite lithics (1 Hammer/Manuport/Grindstones and 1 flake), and there are no plotted bones in the lower lens. The radiocarbon ages are presented in full in the report on the radiocarbon ages, and are 2180 +/- 30 BP (Cal BC 350 to 300 and Cal BP 2300 to 2250) for SMCA1A and 2920 +/- 30 BP (Cal BC 1125 to 975 and Cal BP 3075 to 2925) for SMCA1C/D.

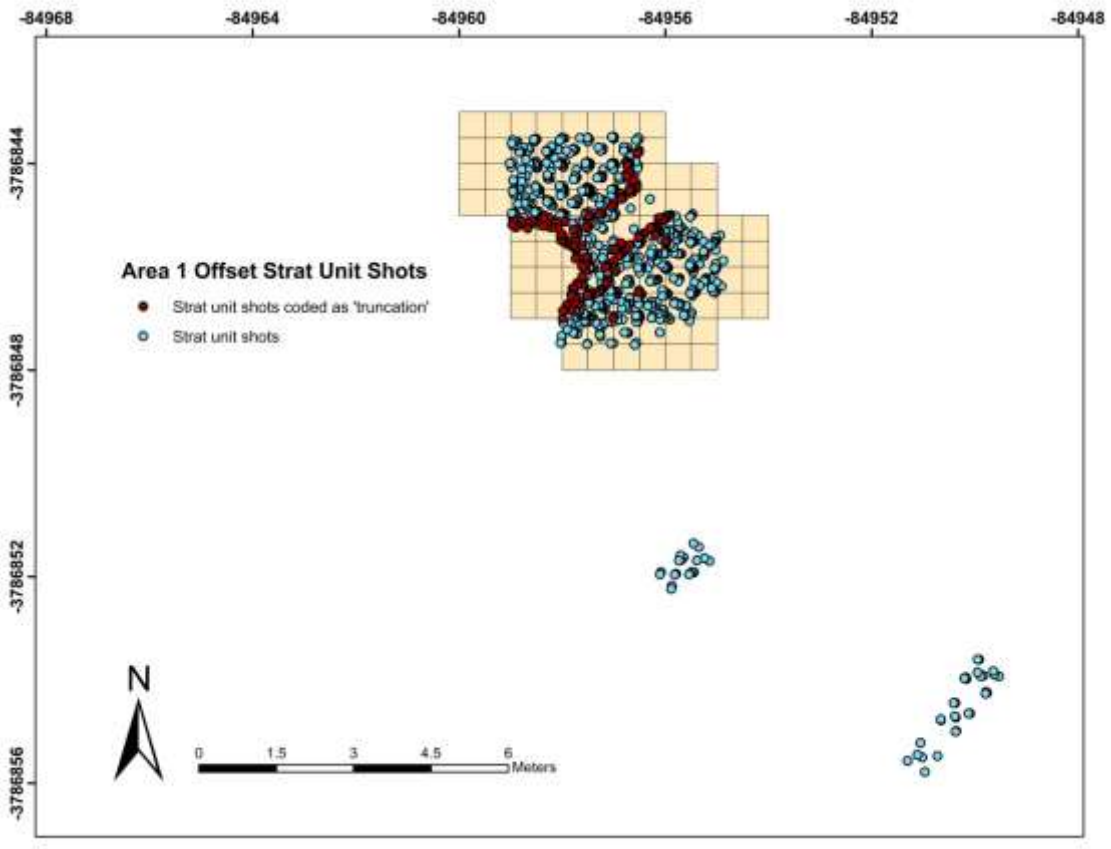


Figure 4. The coordinates of the points showing where the test hole was shot to, and its likely position in Area 1.

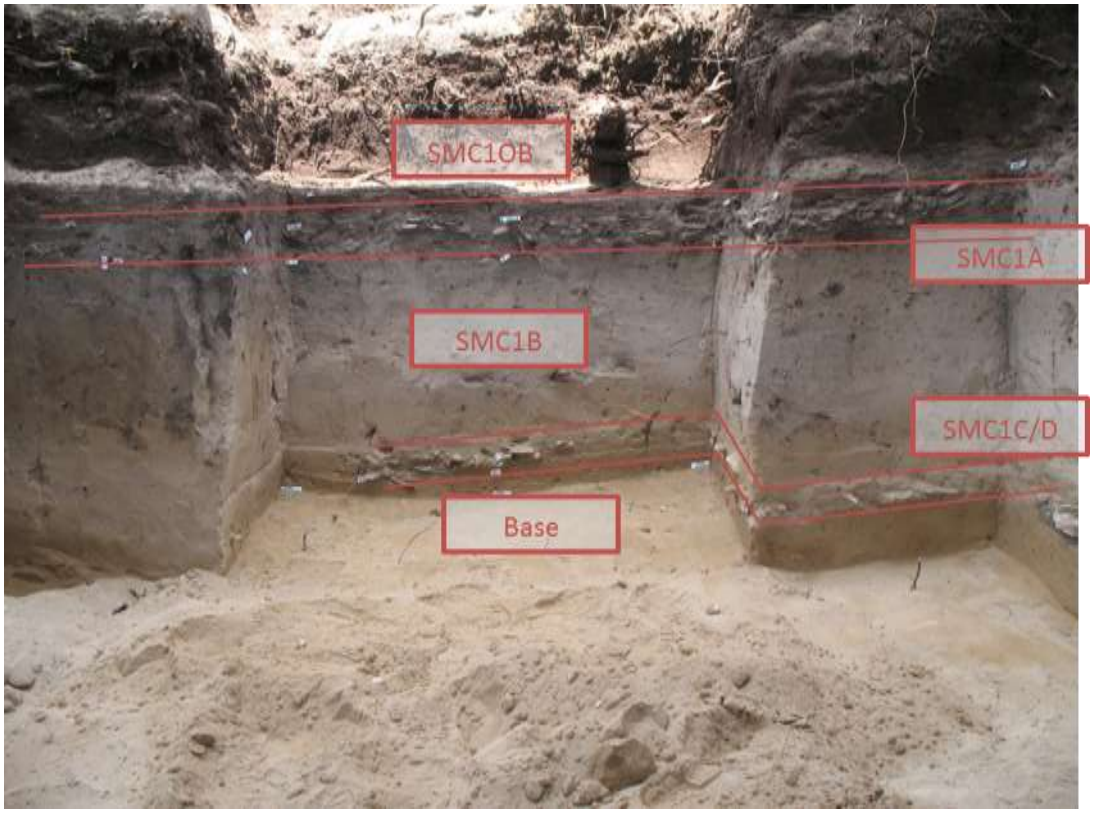


Figure 5. A photograph of the section in Area 1 and the main stratigraphic divisions.

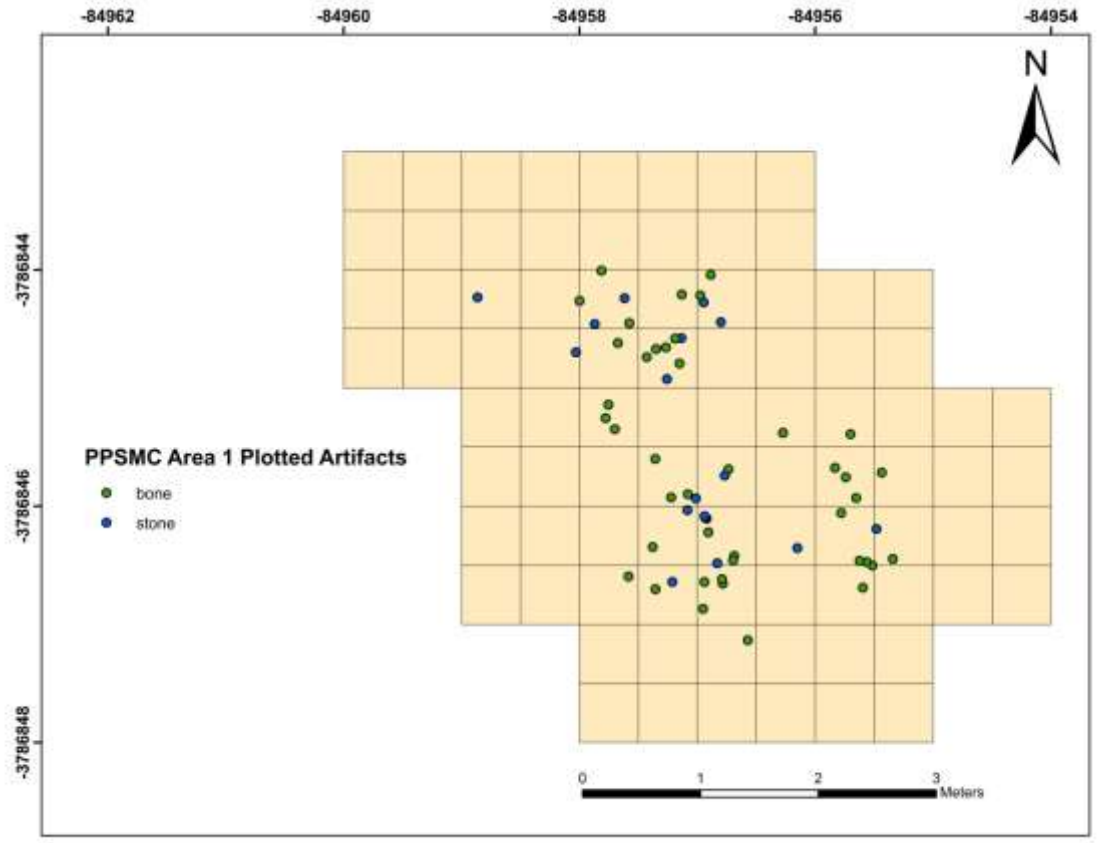


Figure 6. The distribution of plotted stone artefacts and bone in Area 1.

Description of Area 2

PPSMC Area 2 consists of three spatially separated excavated zones: (Northwest (Hole 17 &20), Northeast (Hole 15), and Southwest (Hole 21)). The Northeast excavated area (Figure 7) covered 4.5m^2. The excavated area constitutes a small portion of the visible shell midden as building and recreational activities have impacted and reduced the areas of intact archaeology (Nilssen and Mahire, 2009). The northeast excavated portion measures ~4m east to west and ~4m north to south. At its highest point, the northeast portion is ~32.4m above sea level and at its lowest, 31.5m above sea level. This portion of area 2 lies ~110m north of the shore. "The shell midden centred on Hole 15 had been severely impacted by successive episodes of road building and pipe laying operations as well as 4x4 quadbike exposure. The sandy track, running north-south, has cut through the midden exposing the shell lens in the west facing bank of the road. The excavation revealed a thick shell lens extending only a short way to the east, away from the sandy track. The excavation was disappointing as it showed that a large, and possibly major, portion of the midden had been destroyed by vehicle and pedestrian traffic as well as trenching operations" {Nilssen, 2009 #6951}. A small bonus was the discovery of a second, lower shell lens towards the south of the site. It was fairly thin and, unlike the upper, main lens, consisted mainly of brown mussel (*Perna perna*)." {Nilssen, 2009 #6951}.

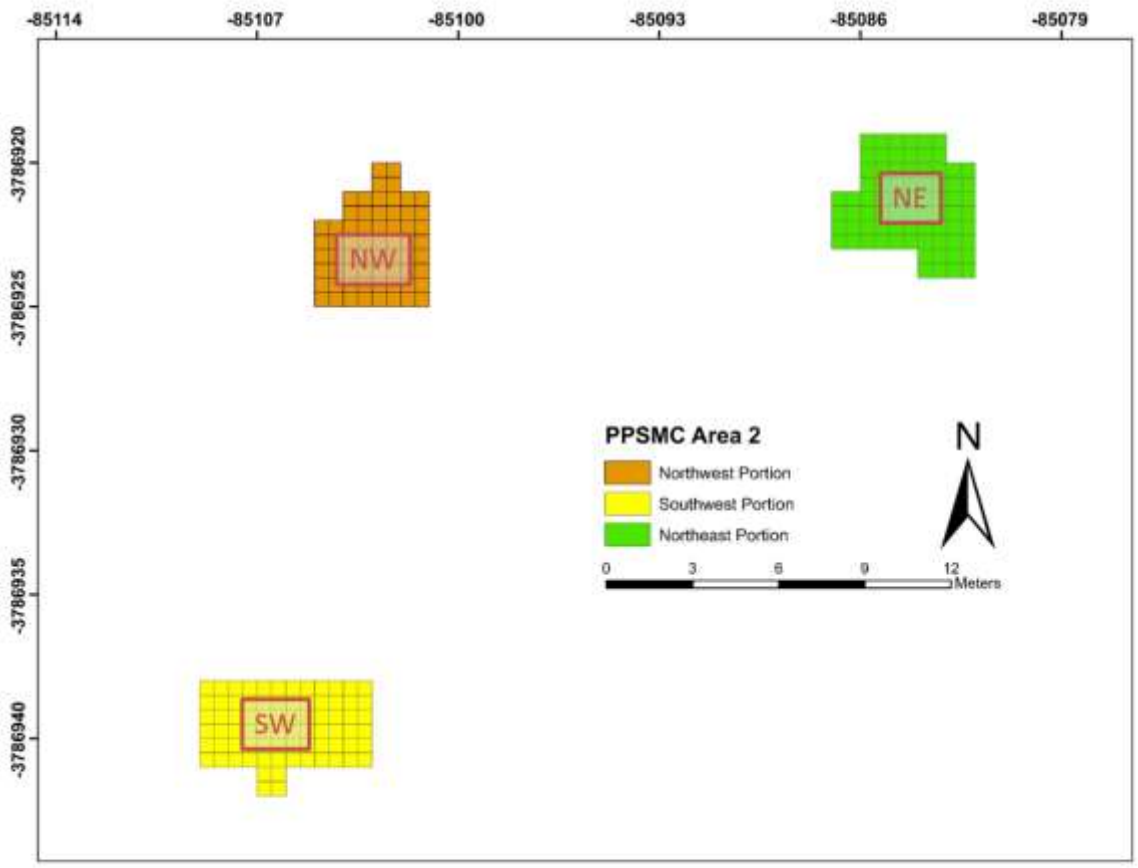


Figure 7. The location of the excavations in Area 2.

The main midden, albeit rather thin, did extend some way south towards the sea. There is a total absence of any pieces of pottery (common at other sites nearby in Area 3). Two radiocarbon dates from the upper and lower layers yielded ages of 1680 +/- 30 BP (Cal AD 360 to 475 and Cal BP 1590 to 1475) and 2470 +/- 30 BP (Cal BC 745 to 685 and Cal BP 2695 to 2635), respectively. One point of interest was the large number of white mussel shells (*Donax serra*) which are notably rare at other sites. This is particularly interesting as the current shoreline offers few opportunities for collecting these sand-based mussels indicating that the sea level and/or sand regime must have been quite different during its occupation.

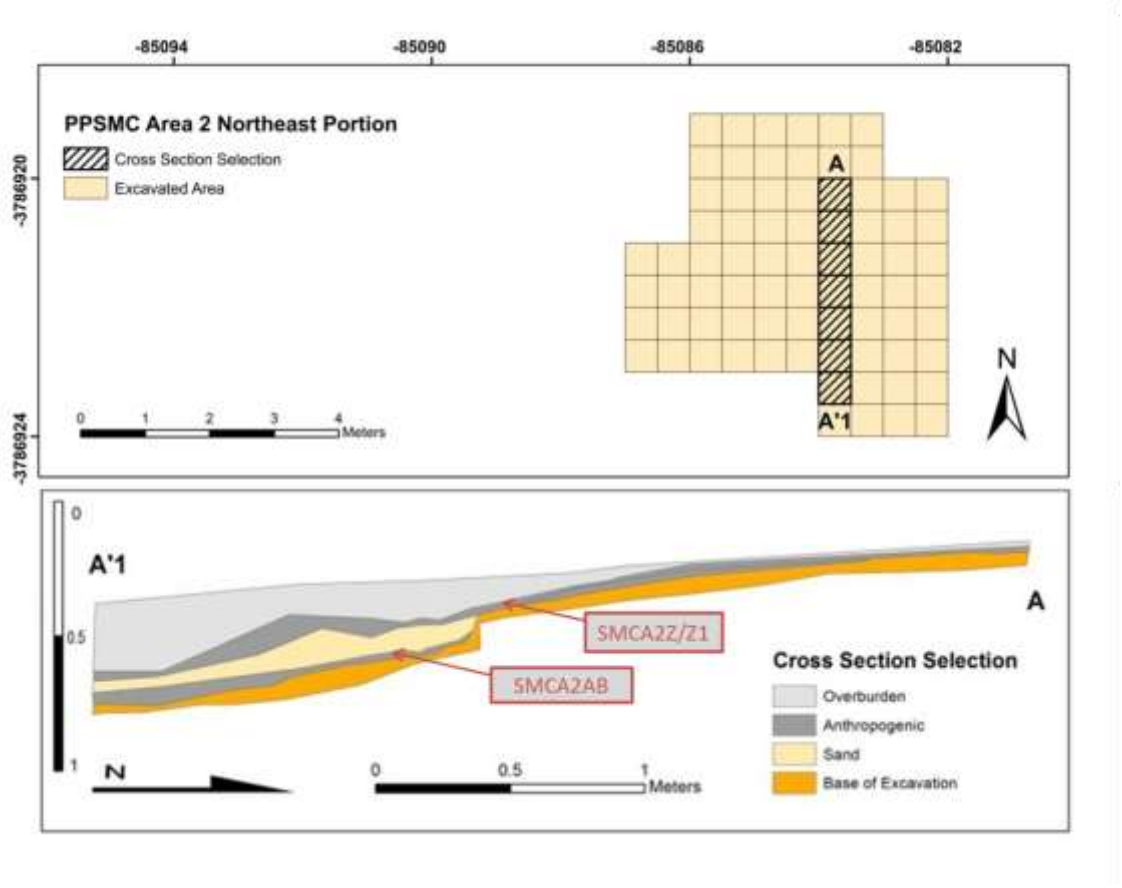


Figure 8. A drawn stratigraphic section of the Area 2 northeast portion of the shell midden (below) and the horizontal position of the stratigraphic section (above).

The northeast portion contains two visible shell lenses (Figures 8 and 9). The topmost layer extends across the extent of the excavated area while the lower lends extends ~1.5m northwards from the southern excavation boundary. The plotted artifacts consist of 57 plotted bone and 57 plotted lithics with the vast majority of plotted artifacts falling within the uppermost anthropogenic lens (~90%) (SMCA2Z and SMCA2Z1). The remaining (10%) plotted finds occur in either the overburden or the 'sterile' lens (SMCA2AA). There were no other kinds of plotted artifacts from the northeast portion.

There appears to be some spatial patterning of the artifacts (Figure 10). The vast majority of plotted bone occurs along the western edge of the excavated area while the plotted lithics are

more dispersed and in the center of the area. The lithics found in the Northeast section are all quartzite flakes (33), shatter (11), or hammer/manuport/grindstones (9).

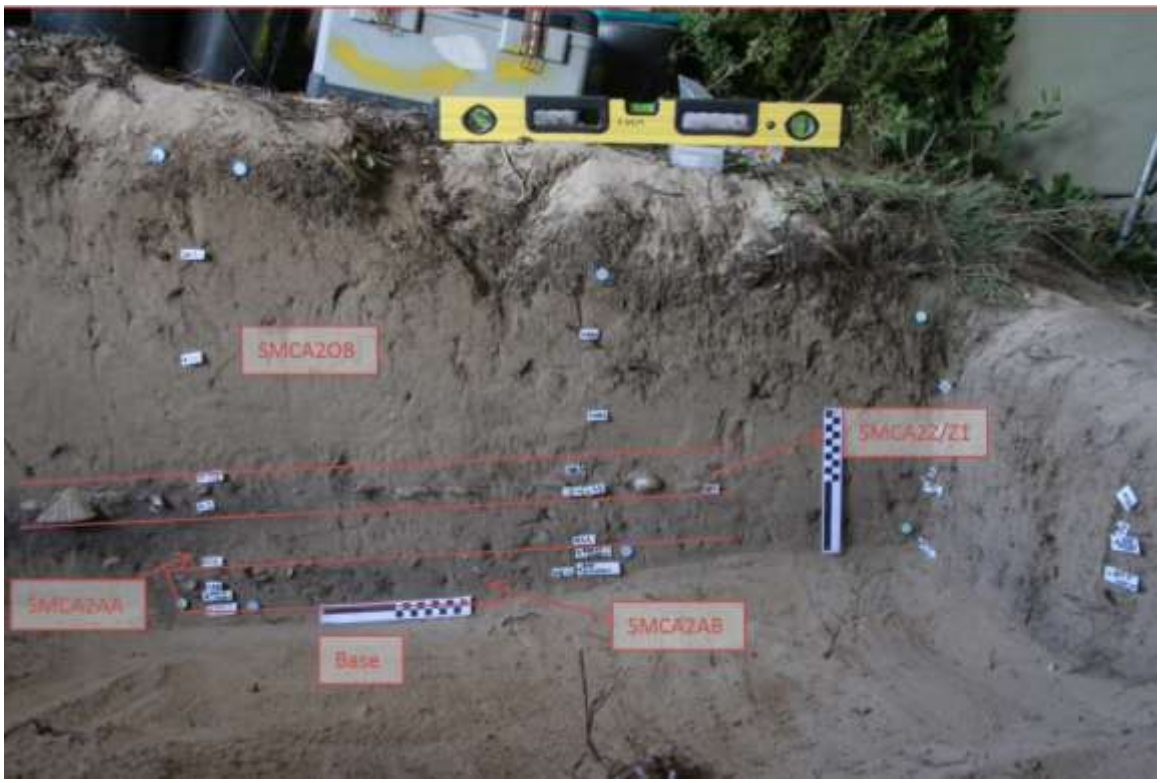


Figure 9. A photograph of the stratigraphy of Area 2 north-east, and drawn indicators of the main strata.

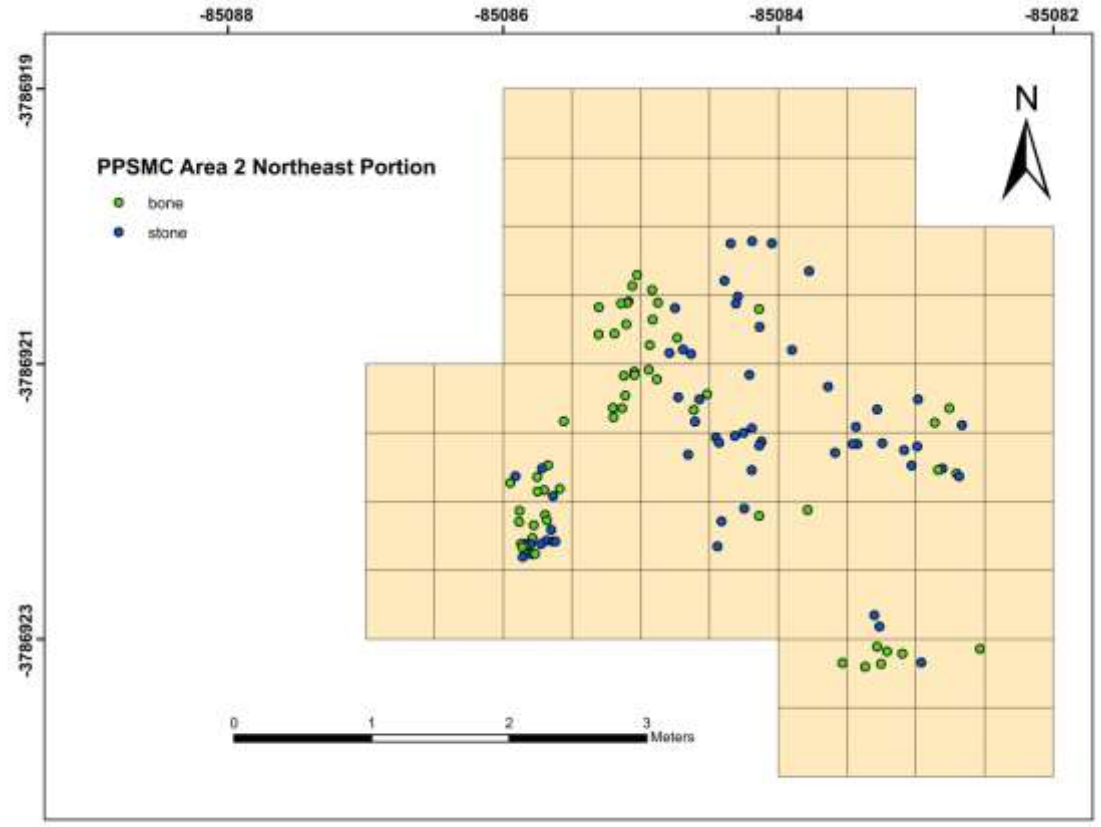


Figure 10. The distribution of plotted bone and stone in the Northeast portion of Area 2.

The Southwest excavated area (indicated in yellow in Figure 7) covered 4m^2. The progress report states "The excavation revealed the presence of six anthropogenic layers. In general, shell fragmentation was high with inclusions such as stone chunks, water worn pebbles and scattered charcoal. No pottery was recovered." {Nilssen, 2009 #6951}. The six lenses mentioned in Progress Report October 2009, and indicated in the field recording by the presence of strat-units labelled as anthropogenic, group in the GIS as two large strat-units. There doesn't appear to be stratigraphic breaks in the GIS inside of the two large anthropogenic strat-units (see cross-section below, Figure 11) to warrant separating them into six. When reviewing the photography (Figure 12) it appears as though the lower large shell lens is two distinct lenses (SMC2Q and SMC2U/U1) separated by a sandy layer. The sandy layer appears to have some large shell mixed in from the surrounding layers which may have been why that layer was described as anthropogenic in the strat-unit forms. Unfortunately the sandy layer was excavated as a continuation of the upper lens and the lower lens was shot in as a spit of the upper lens making the contextualization of the artifacts difficult.

There is similar artifactual content between both major anthropogenic lenses (SMC2Q and SMC2U/U1). The assemblages are made up primarily of lithics (~85%) followed by bone (~6-10%) and then a few pieces of ochre, modified shell, and a bead (<10%). There was no pottery found in the SW portion. The lithics in the SW portion are mostly quartzite (45%) and there is one piece of hematite. Of the 27 lithics present in SMC2Q there are 11 flakes or

flake fragments, 3 FMR, 8 hammer/manuport/grindstones, and 5 cores. In SMC2U/U1 there are 11 hammer/manuport/grindstones, 5 pieces of shatter, and 2 cores.

The Northwest excavated area (indicated in orange in Figure 7) covered 5.25m^2. The northwest excavated portion measures ~3m east to west and ~3m north to south. At its highest point, the northwest portion is ~28.3m above sea level and at its lowest, ~27.2m above sea level. This portion of area 2 lies ~110m north of the shore. "The excavation commenced at Hole 17 and was extended to include Hole 20. Test holes dug during the exploratory investigation revealed a complex stratigraphy involving three discrete shell lenses containing considerable volumes of shell. The first shell lens, just below the surface, was extremely dense and contained a wide variety of shell species as well mammal and fish bone and a significant stone artefact component. The second shell lens encountered at a depth of ±60cm below the surface. Whilst not on the scale of the first lens, it was fairly dense and also contained a varied collection of shell species. The final lens, at a depth of nearly 100cm below the surface was less dense but notable for the presence of large numbers of *Turbo sarmaticus* in association with brown mussel and various limpet species. Continued excavation produced a total of nine anthropogenic layers. Material recovered included fish vertebrae, bird and mammal bone as well as stone flakes." {Nilssen, 2009 #6951}.

The GIS and Photography shows two distinct shell lenses. The upper shell lens is decidedly thicker than the lower and is divided into strat-units SMC2A, SMC2C, and SMC2D. SMC2E is a thick sterile sandy layer. SMC2I is the lower shell lens. There are no lenses below SMC2I. Artifactually, SMC2A/C/D differ from SMC2I. SMC2A/C/D contain lithic, bone, ochre and charcoal, while SMCC2I contains just lithic and bone. The lithics in SMC2A, SMC2C, and

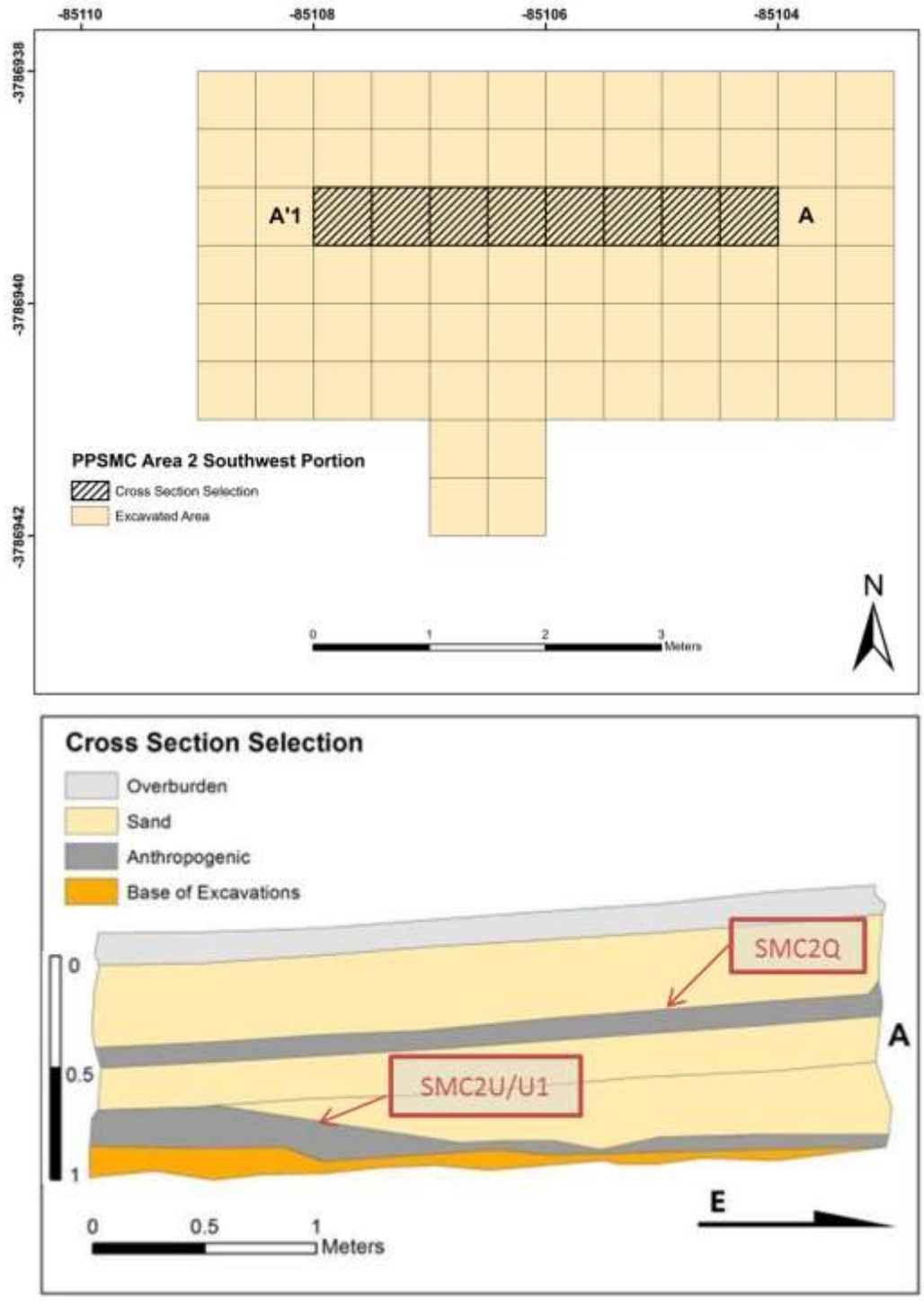


Figure 11. A drawn stratigraphic section of the Area 2 southwest portion of the shell midden (below) and the horizontal position of the stratigraphic section (above).

SMC2D consist of a combination of quartzite (121), silcrete (2), quartz (1), ochre (2), calcrete (1), and a plotted piece of dark gravelly material (1). Of these materials there are 37 flakes or flake fragments, 8 cores, 3 FMR, 54 hammer/grindstones, 2 retouched pieces, and 24 pieces of shatter. SMC2I contains 2 blade or blade Fragments, 2 flakes, 1 core, 2 pieces of shatter, and 2 hammer/manuport/grindstone.

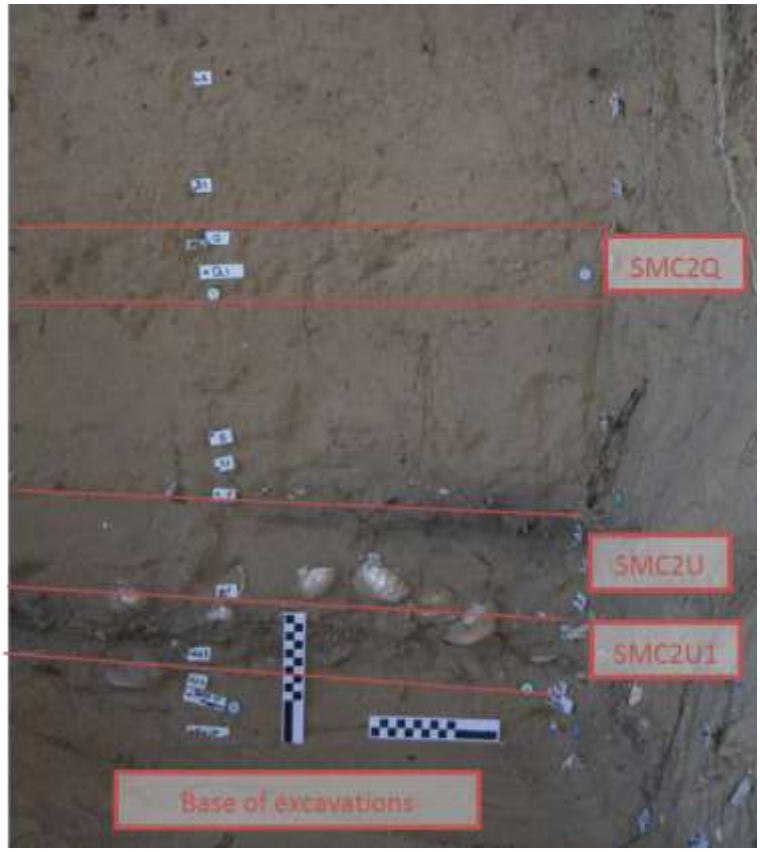


Figure 12. Figure 9. A photograph of the stratigraphy of Area 2 southwest, and drawn indicators of the main strata.

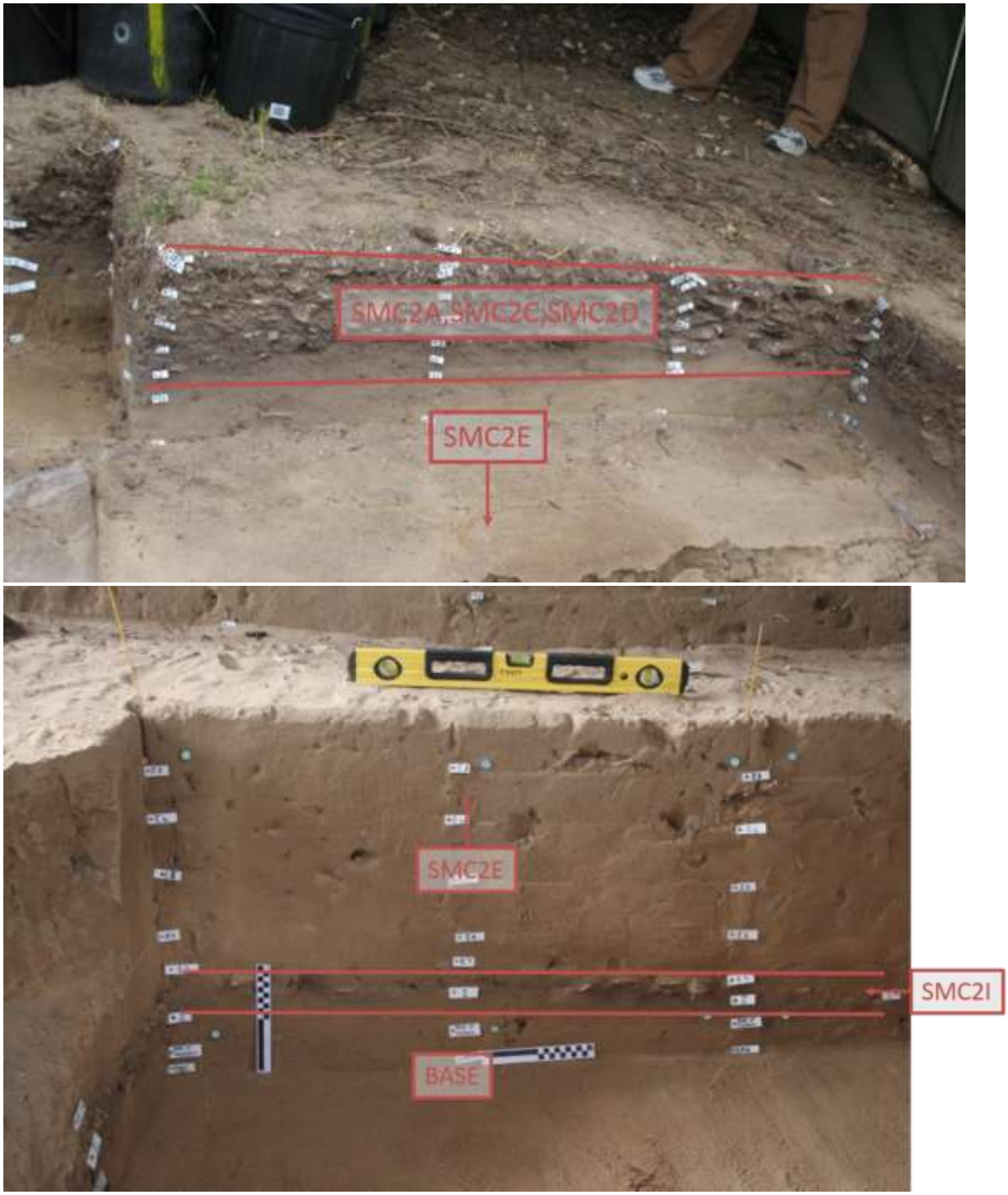


Figure 13. Photographs of the stratigraphy of Area 2 southwest, and drawn indicators of the main strata. One photograph of the complete stratigraphic sequence was not taken. The sequence is shown in complete with both photographs.

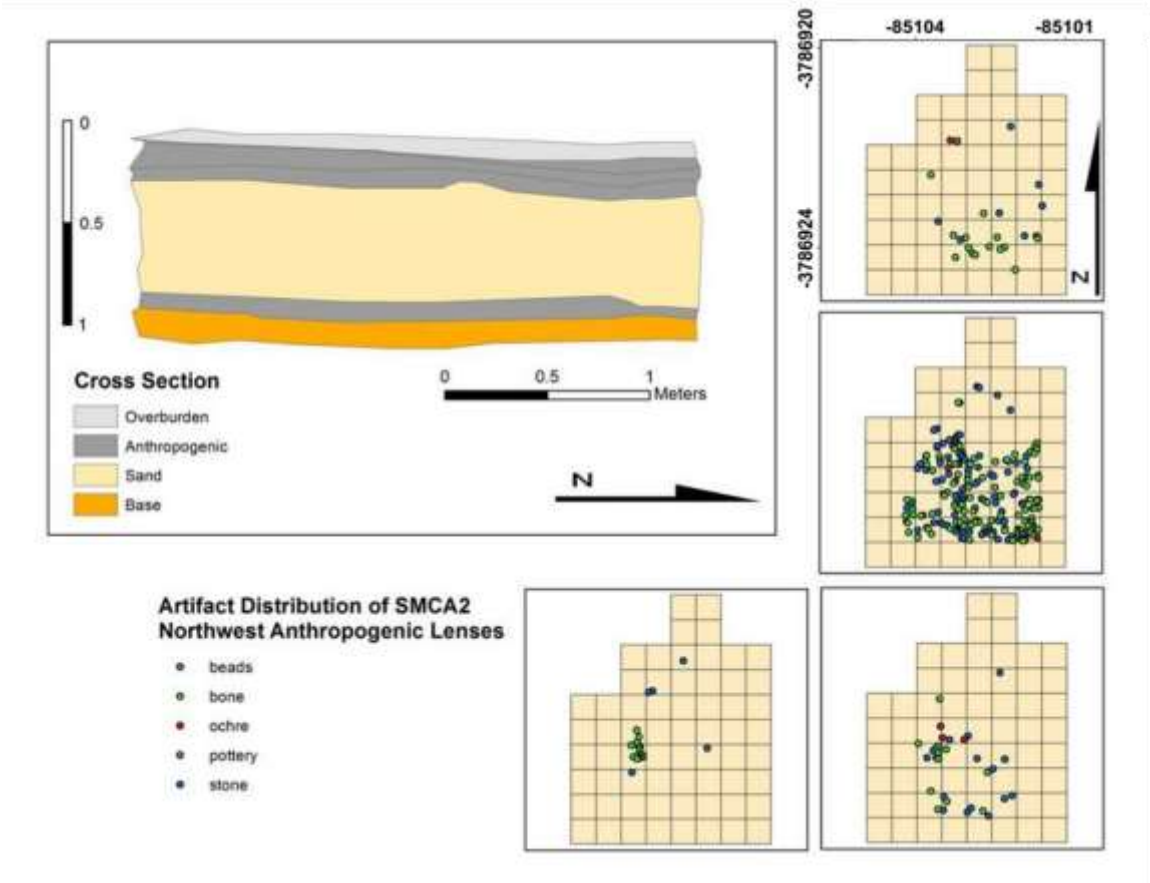


Figure 14. A drawn stratigraphic section of the Area 2 northwest portion of the shell midden and artifact distributions within it.

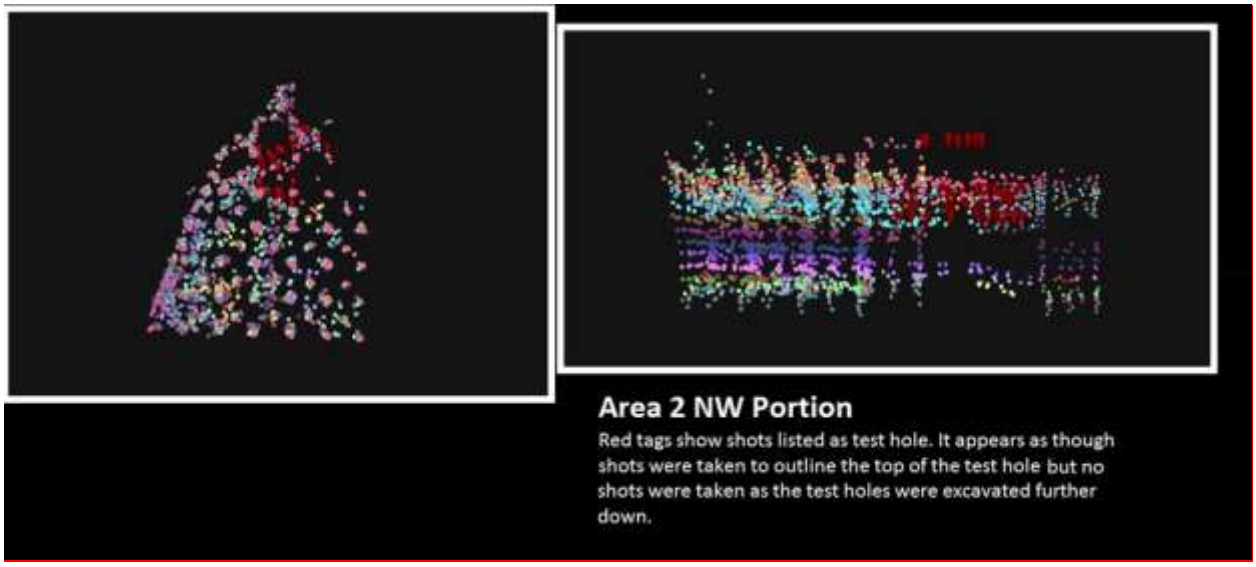


Figure 15. A 3D plot from ArcGIS of the main artifact concentrations on the Area 2 northwest portion.

Description of Area 3

PPSMC Area 3 is an area of Aeolian sand deposits close to the current shoreline. Road cutting and continual usage severely impacted the area. The excavations include a total excavated area of 49.5 m^2, and these are located about 50 m from the current coastline. The site is 10 m from north to south at its longest point and 11 m east to west at its widest. PPSMC3 is 24.02 m above sea level at its lowest point and 26.87 m about sea level at its highest. This area was excavated more completely than other areas because of prior heavy damage from bulldozer activity, and an anticipated road and pump station being built in the area.

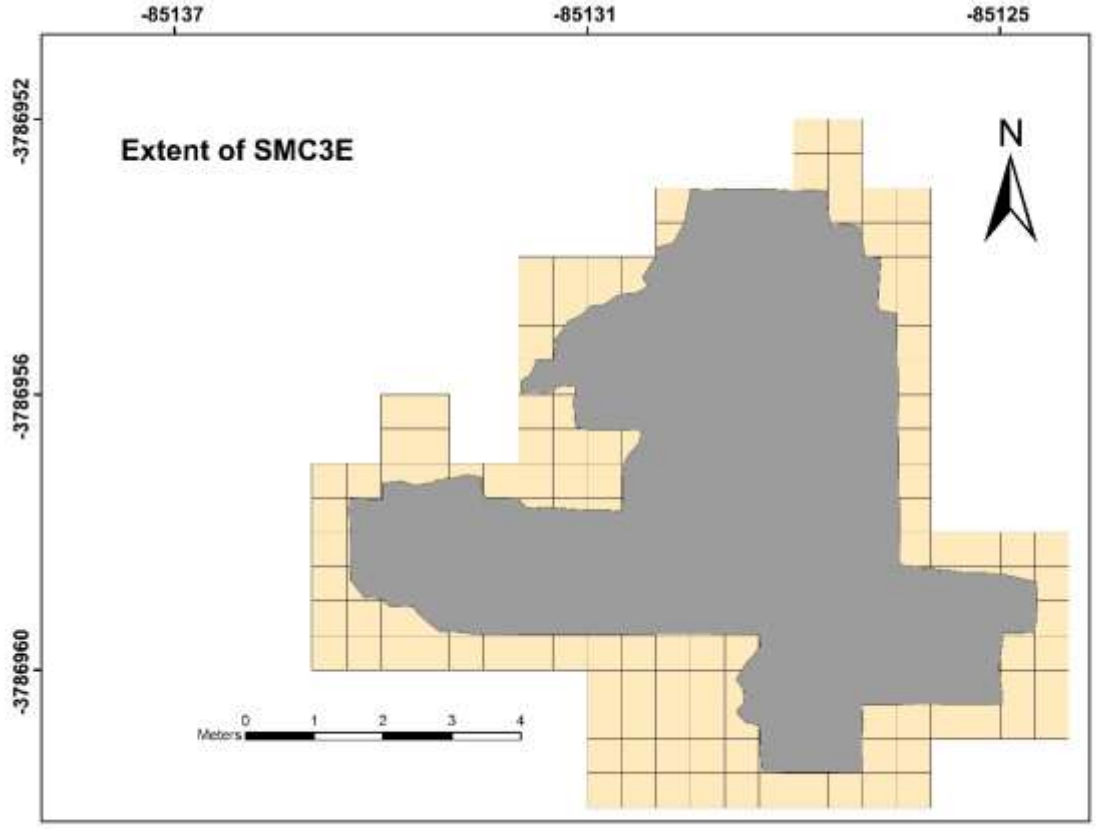


Figure 16. The extent of the occupation layer in Area 3.

The Area 3 consists of two distinct areas. The southerly part of the area, centered on Test Holes 22 and 23 {Nilssen, 2009 #6951}(not shown) was preserved while the northerly portion of the site , centered around Test Holes 24 through 29, was extensively excavated (see graphic below). This portion of the site consist of a disturbed top layer {Nilssen, 2009 #6951}(~30cm deep) (SMC3A) covering an expansive but thinner (~10cm deep) strongly anthropogenic layer (SMC3E). SMC3E is easily identifiable by darker sediment and change in artifactual content such as the increased presence of lithics, faunal remains, pottery and large amounts of shell.

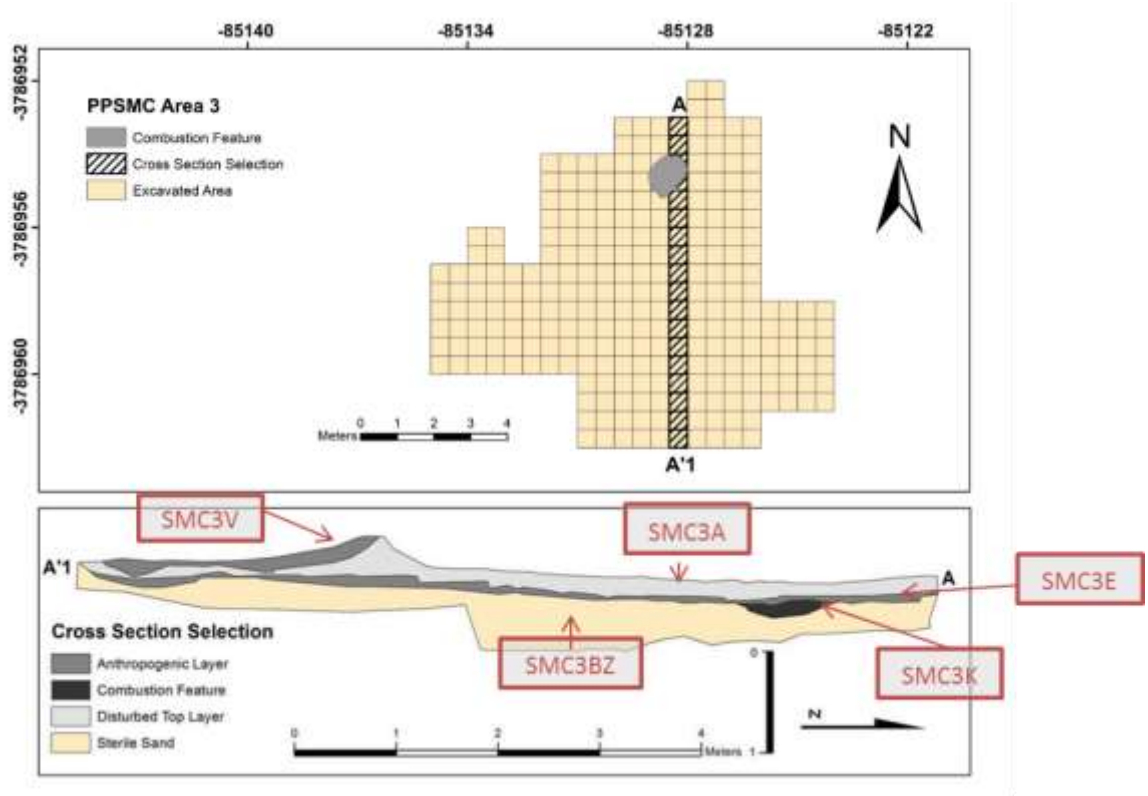


Figure 17. A drawn stratigraphic section of the Area 3 of the shell midden (below) and the horizontal position of the stratigraphic section (above).

Figure 16 shows the extent of the excavated portion of the shell midden, and Figure 17 shows the stratigraphic character of the excavation.

In the northern extent of the excavated area there is an occupational lens covering a bowl shaped stone-lined hearth (combustion feature) named strat-unit SMC3K (Figure 17-19). The hearth itself is approximately ~86cm N-S, ~70cm E-W, and ~10cm deep at the deepest point. The hearth is recognizable by the increased presence of FMR and darkening of surrounding sediment. The hearth is built atop a thin shell lens (SMC3K). The combined occupational lenses and hearth represent the thickest deposits of anthropogenic activity. SMC3G and SMC3J are located just to the south of SMC3K. The strat-unit forms describe the strat-units as probable hearths, but our analysis does not support this interpretation. Based on the photography and the GIS data, SMC3G/J (Figure 20) lack the distinct form and artifactual content of SMC3K (hearth). It seems reasonable that SMC3G/J are a mixture between SMC3E above and the sterile sand layer below. A review of the strat-unit forms and GIS suggests that there are many such small strat-units that are most likely mixing from the main anthropogenic layer (SMC3E).

Two radiocarbon ages on charcoal from the hearth are 971 ± 43 BP and 962 ± 43 BP, and these were attained and provided to us by Dr. Andy Herries from ANSTO. A thirds radiocarbon age on an opercula fragment provided an age of 890 ± 30 BP, which must be corrected or the sea water effect. We attained a radiocarbon date of 1160 +/- 30 BP (Cal AD 775 to 970 and Cal BP 1175 to 980) from the southern portion of the area, and together these

suggest an age range of about 200 years during the time of pastoral occupation of the south coast.

The more southerly extent of the excavated area shows a thinning of SMC3E extending from the north and the addition of a separate dark shell-filled lens (SMC3V) on top of SMC3A intruding from the southeast (Figure 20 and 21). This may have resulted from prior bulldozer activity.

Figure 18. A rectified and stitched photograph of the stone-lined hearth in Area 3.

The strat-unit forms describe a layer containing stone fragments and shell (SMC3D) that appears ~25cm lower than SMC3E. SMC3D is separated from SMC3E by the sterile sandy layer that was the base of excavations for the rest of Area 3. While we do have strat-unit plots for SMC3D in one quad, we unfortunately we do not have any plotted finds in the GIS data. A note is made in the strat-unit forms that SMC3D could have potentially been the Holocene beach. This interpretation seems inconsistent with the data as SMC3D lies directly in the middle of the site with anthropogenic activity to both the north and the south. In addition there were no further excavations to the depth of SMC3D anywhere else in Area 3.

Area 3 contains large amounts of faunal remains, pottery, lithics, charcoal, and some ochre and modified shell. SMC3E is by far the most artifactually rich stratigraphic unit of the site. The other three major anthropogenic layers, SMC3A, SMC3K, and SMC3V differ in

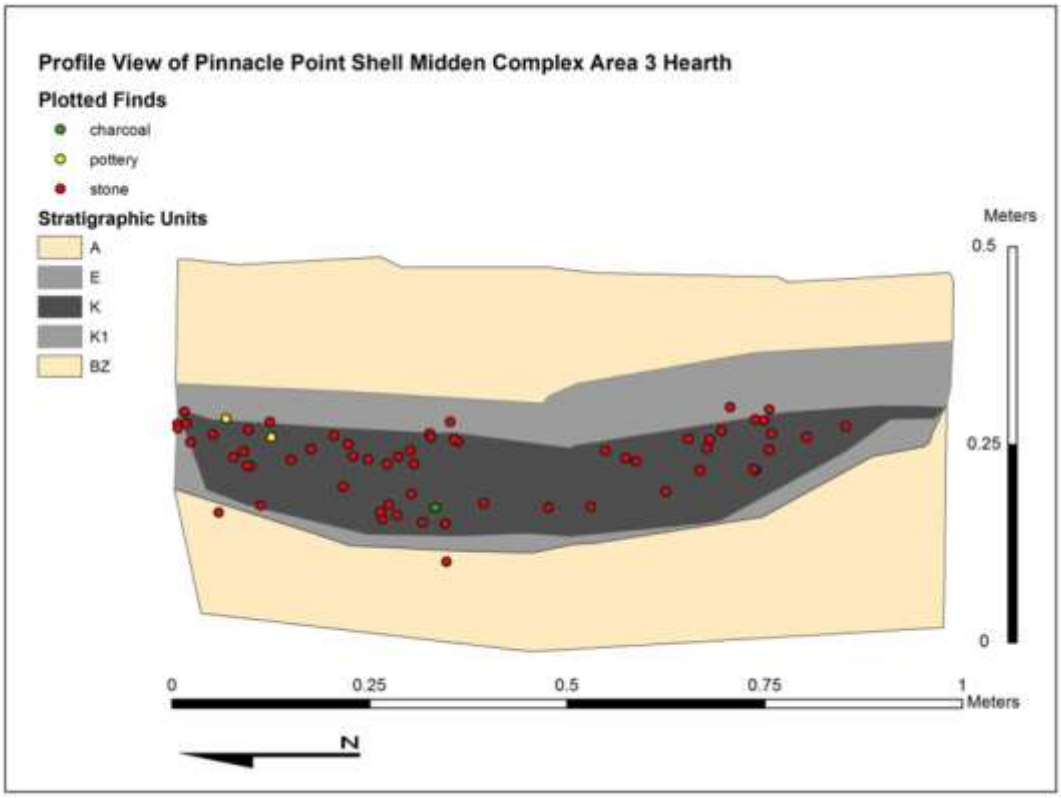


Figure 19. A cross-section of the stone lined hearth and the plotted finds in association with it.

Figure 20. A photograph of the stratigraphy in Area 3 south.

artifactual content. Artifacts of various types appear over the majority of the site, but the major artifact types do show clustering in distinct parts of the site (Figures 22-24). There is a clustering of fauna in the southern portion of the site, while pottery, FMR, and stone artefacts cluster to the north around the hearth. When examining the fauna by general classification

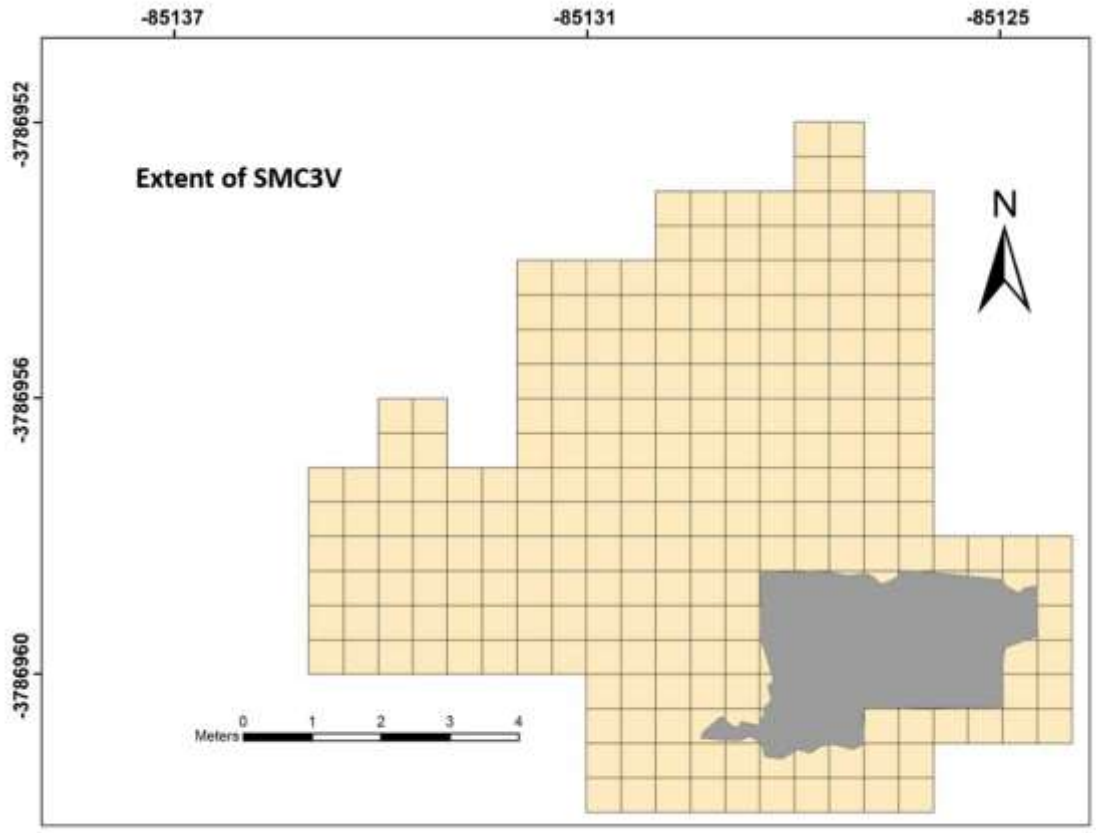


Figure 21. The horizontal distribution of the SMC3V.

we see that the majority of clustered points are bird, pinniped, or unidentifiable mammal. There is a clustering of FMR to the north of Area 3 and a more dispersed regular patterning to the south. The lithics in Area 3 consists of mostly quartzite (592), a mix of various 'other' materials (21), and quartz (1). Of these materials 3 are blade or blade fragments, 192 are flakes or flake fragments,36 are cores, 179 are FMR, 115 are hammer/grindstones, 6 are retouched pieces, and 83 are shatter. Within the hearth itself are 31 flakes, 98 FMR, 12 are Hammer/Grindstones, and 9 are shatter. The lithics found within the hearth are 23.4% of the total lithic assemblage for Area 3 (The hearth falls within a 1m x 1m square).

When overlaying the plotted find lithics of area 3 with the sieved material from area 3 there appears to be a slight relationship between the number of plotted finds and the number of 10mm finds. Also, two quads, N958 E127 NW and SW contain a large number of plotted finds compared to the rest of the excavated areas (aside from the hearth). The plotted lithics include 5 hammerstone/manuport/grindstones, 1 retouched flake, 2 FMR, 21 flake fragments or shatter, and the sieved material shows 18 flake fragments or shatter. These results suggest that there may be knapping occurring near the hearth. The pottery sherds are spatially

clustered to the area just south of the hearth and to the far west side of the site. The vast majority (~75%) of sherds and just over half of the decorated and rim sherds occur in the circled areas (Figure 22 and 24).

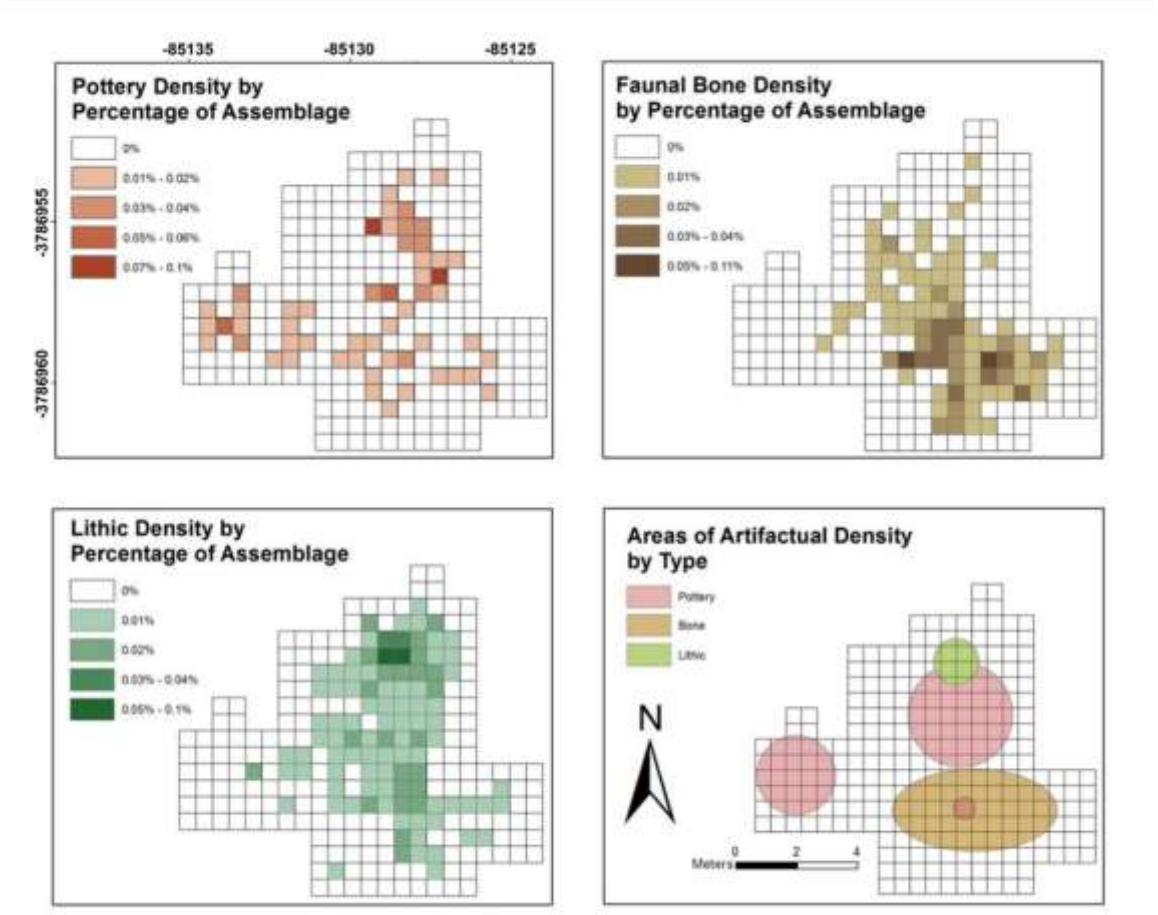
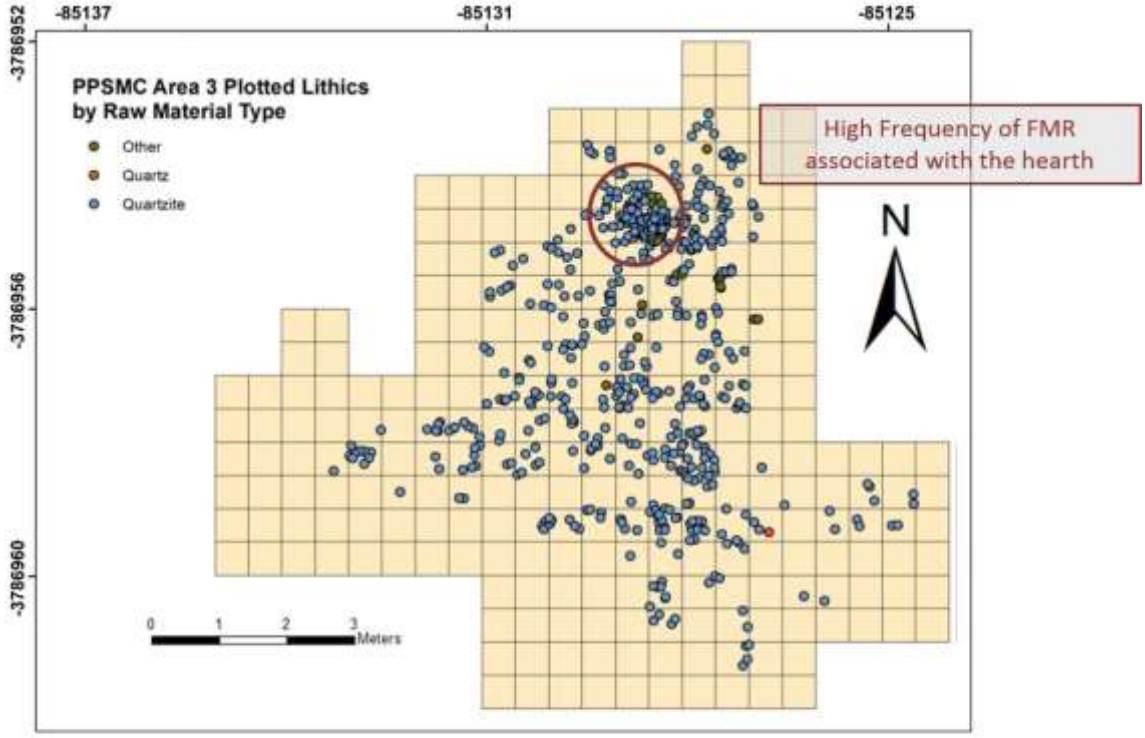


Figure 22. The horizontal density of pottery, fauna, and stone artifacts in Area 3. On the lower left is shown the overall patterns of artifactual density.



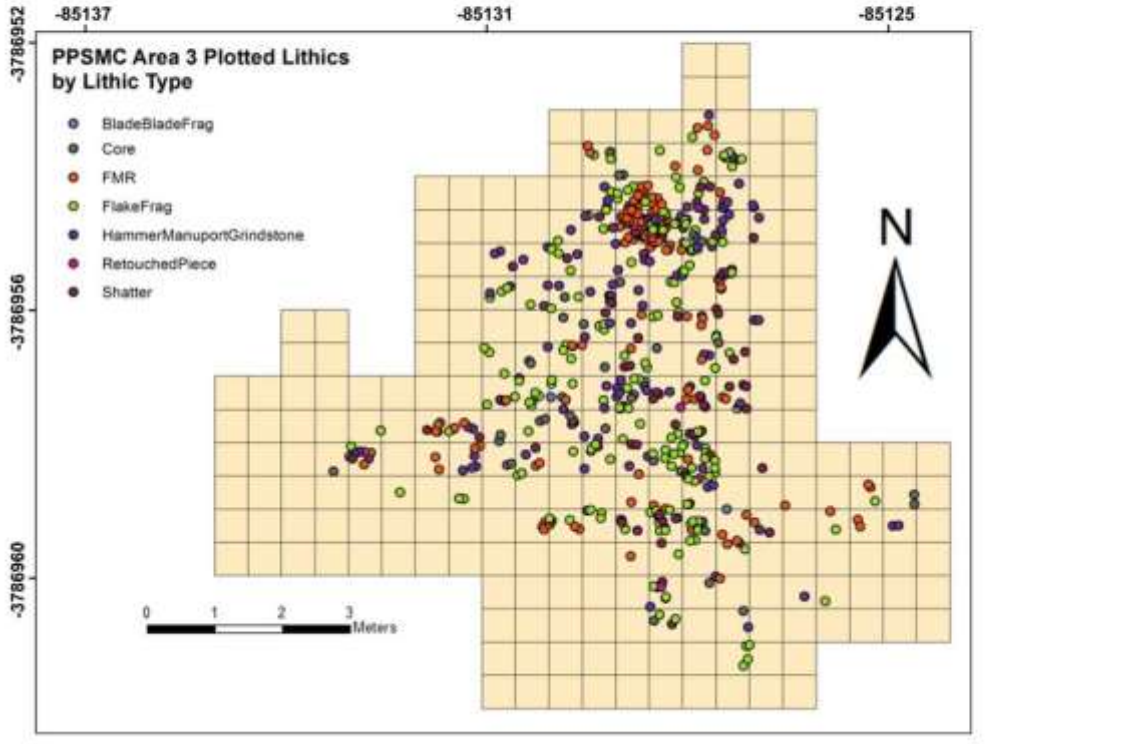


Figure 23. A plot of the plotted FMR and stone artefacts in Area 3.

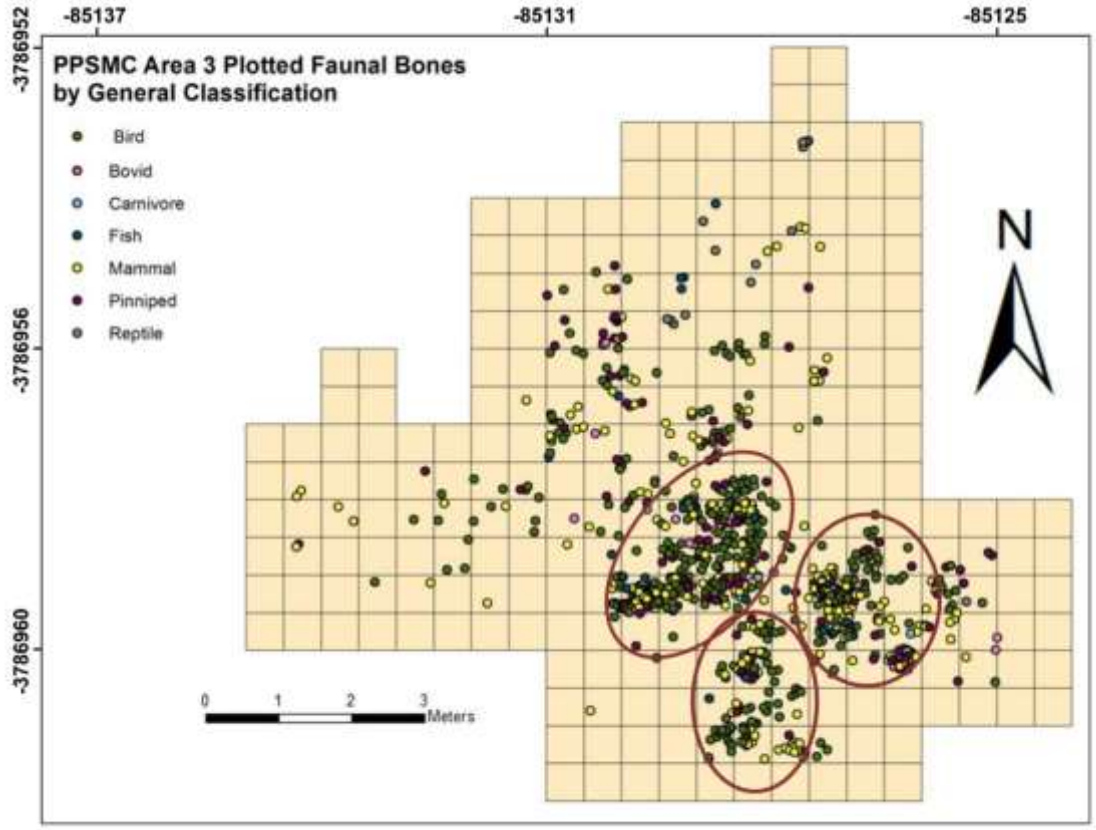


Figure 24. A plot of the bones of different classes of animals in Area 3.

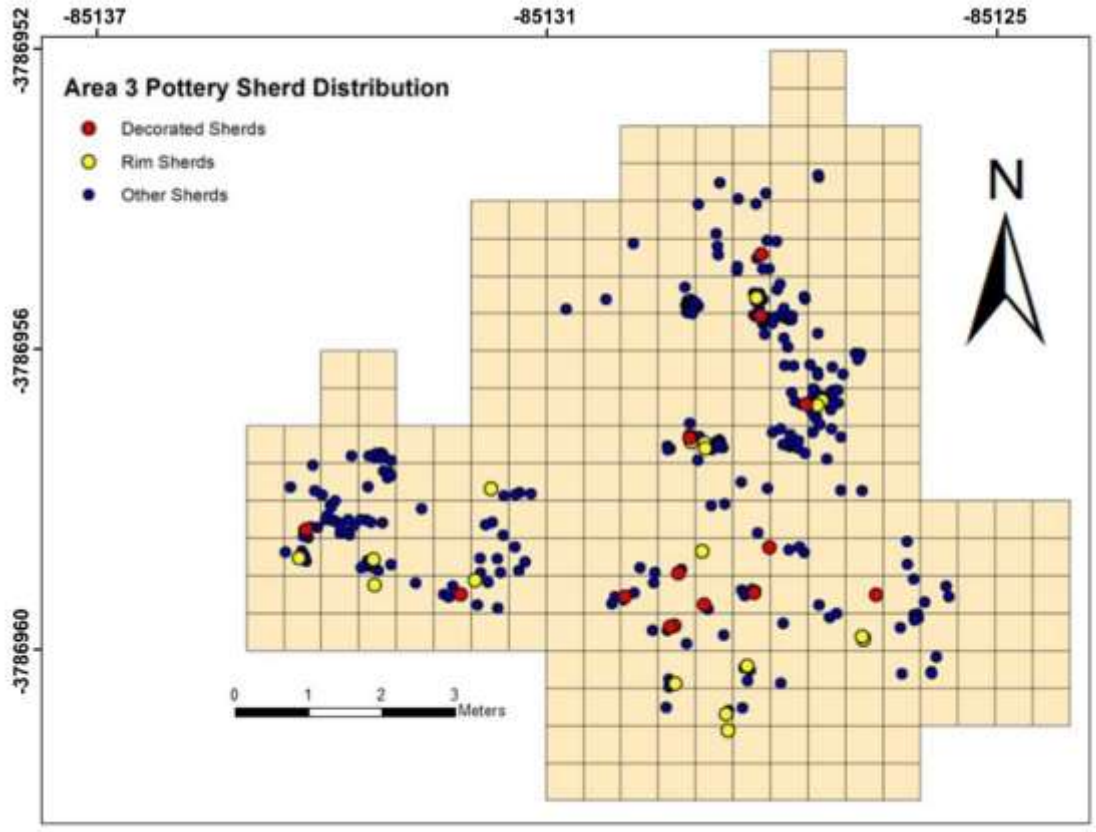


Figure 25. A plot of the bones of different classes of pottery in Area 3.

Description of Area 4

Area 4 is located on the west bank of the stream and transected by the "Old Road". A total of seven test holes (numbered Holes 30 to 36) were excavated in Area 4. Area 4 is dominated by the presence of a very large shell midden, the importance of which is already known. Referred to as PP19, it has already been impacted by road building episodes. The so-called "Old Road" actually passes through the southern end of the midden. Apart from PP19 there are a number of smaller middens representing separate archaeological occurrences. The large shell midden PP19 is to be conserved in perpetuity.

Area 4 is the westernmost excavated area of the entire Pinnacle Point Shell Midden Complex (Figures 1 and 2). The excavated area forms an "L" shape (Figure 29) that at its tallest point is 2.5m N-S and at its widest is 3m E-W. The lowest point of area 4 is at ~27.2m while its highest point is ~27.78m.

Area 4 has multiple test holes put in surrounding the excavation area (Figure 26). It is unclear as to whether the lenses that were found in the test holes are a continuation of the shell midden located in Area 4 or if they are discrete phenomena.

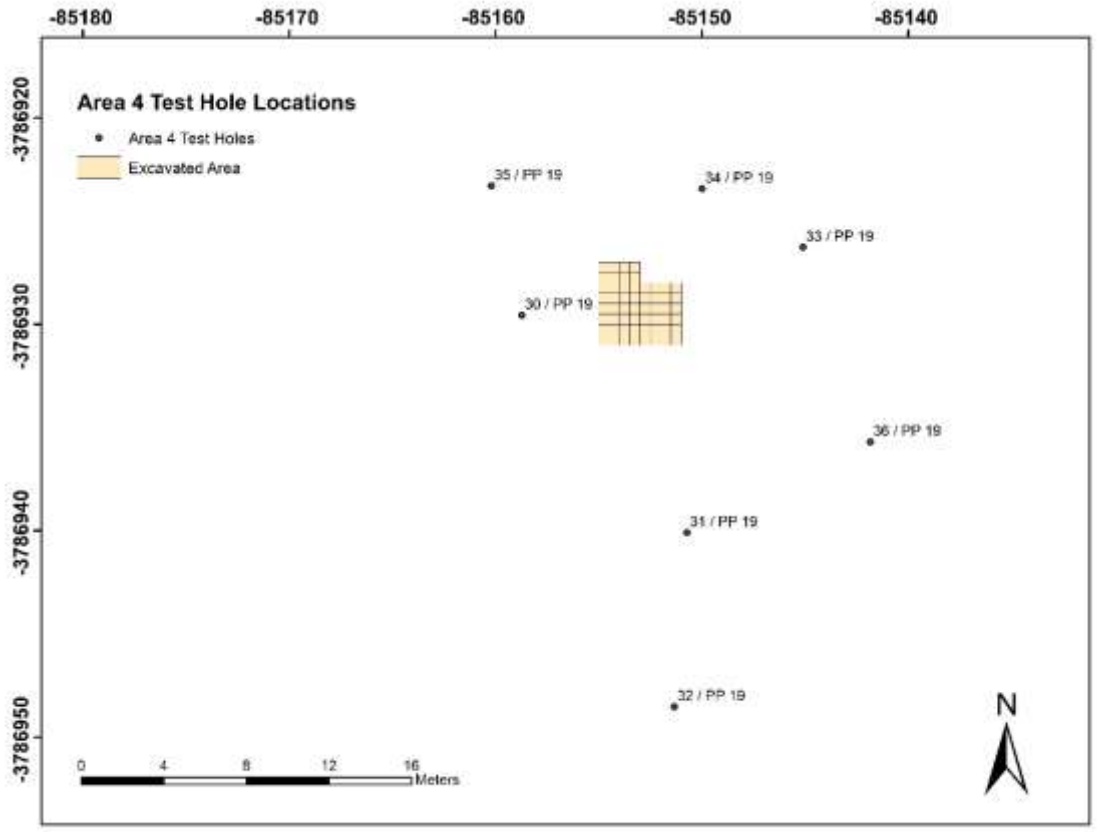


Figure 26. The location of the test holes around Area 4.

Based on the photography, there appears to be at least three distinct anthropogenic lenses present in Area 4. The GIS is difficult to read on account of what appears to be mislabeling of stratigraphic units (sandy lens listed as anthropogenic) and seemingly arbitrarily subdividing stratigraphic units (i.e. 1 shell lens subdivided into 2 or 3). We see a high frequency of plotted artifacts in most of the excavated 'L' shaped area. The artifacts are dispersed both horizontally and vertically. There is a slight break in artifacts that separates the top of the 'L' with the bottom. A continuation of strat-unit shots through the gap in plotted finds implies that what we are seeing is in fact an absence of artifacts. In the plots there are 3 plotted bones listed as 'bone tool' and 1 plot listed as 'formal tool'. Two radiocarbon dates from this 'L' shape provides ages of 2430 +/- 30 BP (Cal BC 540 to 395 and Cal BP 2490 to 2345) and 2410 +/- 30 BP (Cal BC 735 to 690 and Cal BP 2685 to 2640).

There are a total of 119 lithics found in Area 4. Out of these 115 are quartzite, 2 are chert, and 1 is quartz. There of 2 blade or blade fragments, 43 flake or flake fragments, 7 core, 25 FMR, 41 Hammer/Grindstone, and 17 shatter. Area 4 contains predominantly *P. perna* with small amounts of other shell.

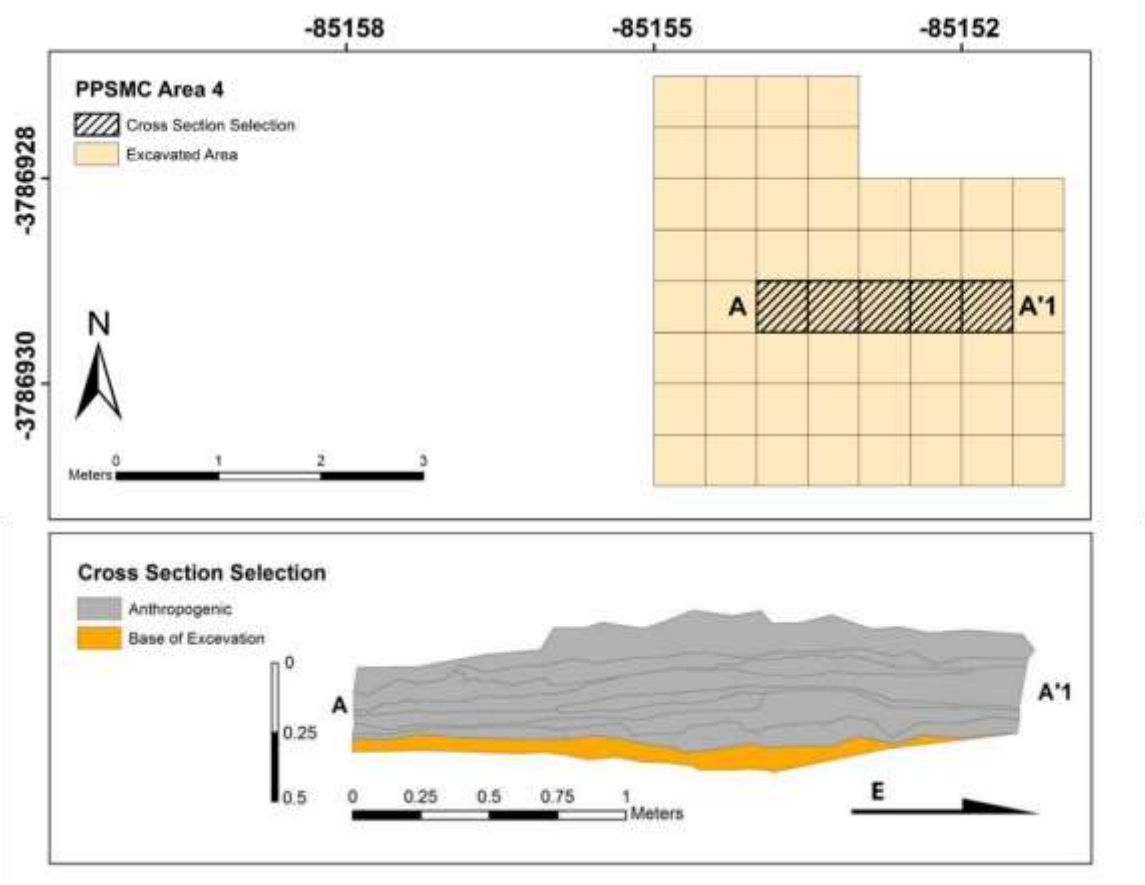


Figure 27. A drawn stratigraphic section of the Area 4 of the shell midden (below) and the horizontal position of the stratigraphic section (above).

Figure 28. A photograph of the section in Area 4.

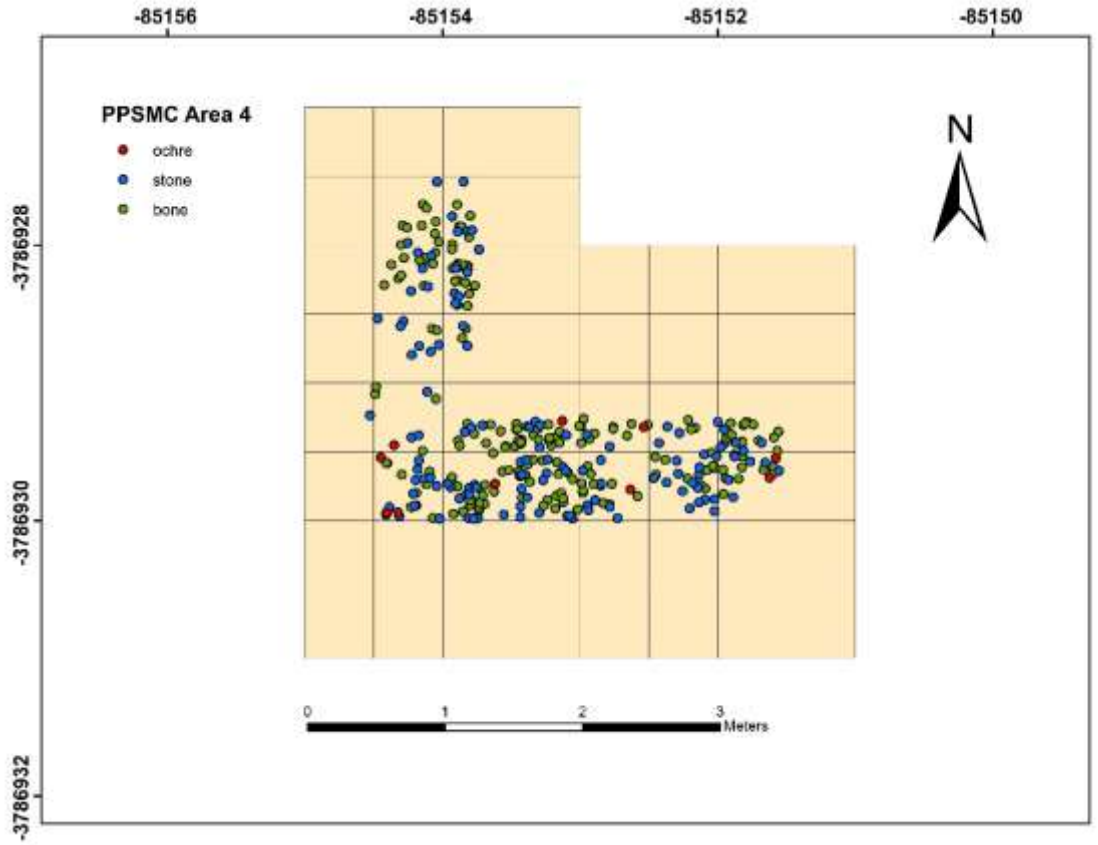


Figure 29. A plot of the main types of plotted finds in Area 4.

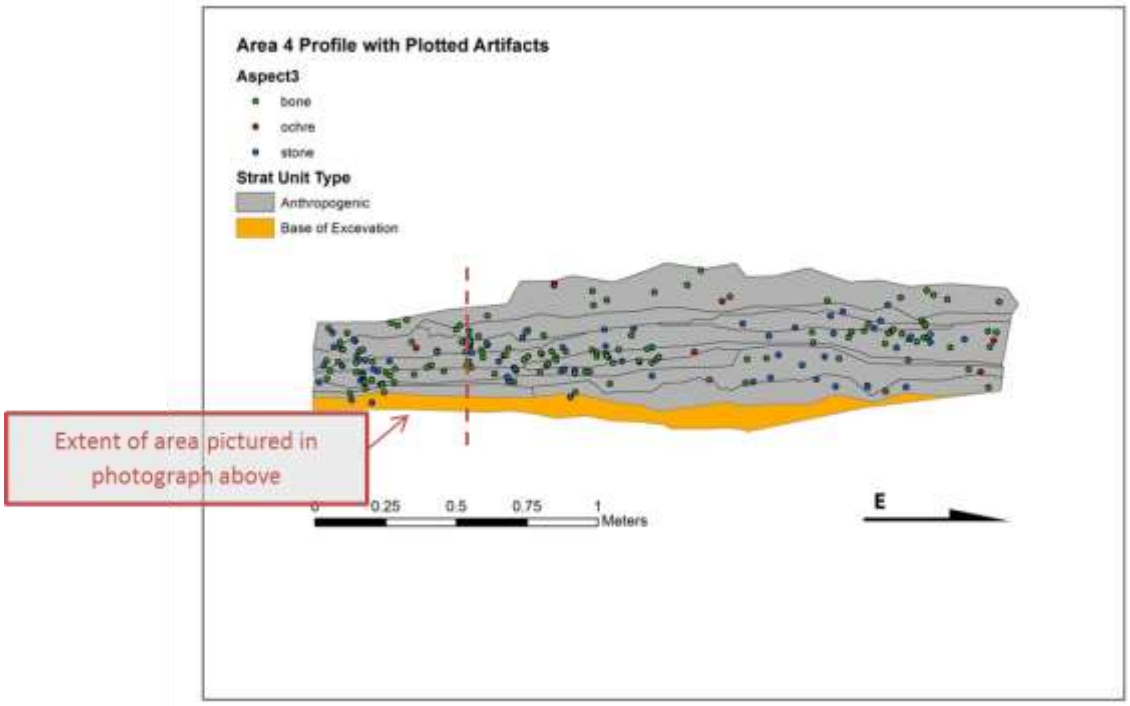


Figure 30. A vertical plot of the finds in Area 4.

Reports on Excavated Materials

Report on the stone artefacts from the PPSMC

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The PPSMCA lithic artifacts were examined by seven lithic analysts between July 2013 and May 2014. The methods of analysis were designed to complement the analyses at the nearby Middle Stone Age sites of Pinnacle Point 5-6 (Brown, 2011; Brown et al., 2009; Brown et al., 2012), and Vleesbaai (Oestmo et al., in review). Originally, we recorded many of the traits used by Brown so that the two sets of databases could be compared. An additional set of traits that expands the range of possible inter-site comparisons and research questions, were documented between Jan and May 2014. A total of 93 different attributes were recorded, which included metric, technological, and functionally-relevant traits. These traits and definitions were compiled from multiple sources on South African lithic assemblages (Conard et al., 2004; Deacon, 1978, 1984; Kuman, 1989; Porraz et al., 2013; Soriano et al., 2007; Villa et al., 2005; Villa et al., 2010; Villa et al., 2012; Wadley, 1996, 2005; Wadley and Harper, 1989; Wurz, 2000, 2002). An open source software (E4, http://www.oldstoneage.com/software/e4.shtml) was used for data entry. This program is designed to reduce analysis time and to minimize data entry errors. The trait definitions and E4 code are available online (Wilkins et al., 2014).

The analyzed sample (n=1492) includes all PPSMCA lithic plotted finds and artifacts recovered from the 10 mm sieve from Lots designated as ‘anthropogenic’ or ‘shell layer’.

Results

Industrial affiliation

The PPSMC assemblages represent mainly the early stages of flake-based lithic reduction on quartzite, though there is also a very low frequency of flakes and cores on fine-grained raw materials such as silcrete, chalcedony, and quartz. Diagnostic retouched tools, such as backed pieces and thumbnail scrapers, are absent at PPSMC. Bipolar cores, consistent with an LSA designation are rare, but present.

Major lithic artifact classes

The knapped components (n=1066) of the lithic assemblages at PPSMC consist mainly of shatter (43%, lithic debris without discernable ventral and dorsal surfaces), flake fragments (36%), and complete flakes (14%). Cores (6%), retouched pieces (1%), and blades and blade fragments (1%), and together make up ~8% of the assemblages. The relative frequencies of

these different artifact classes are similar between the three areas. PPSMCA1 lacks blades and blade fragments, and retouched pieces, and PPSMCA4 lacks retouched pieces.

Raw material use

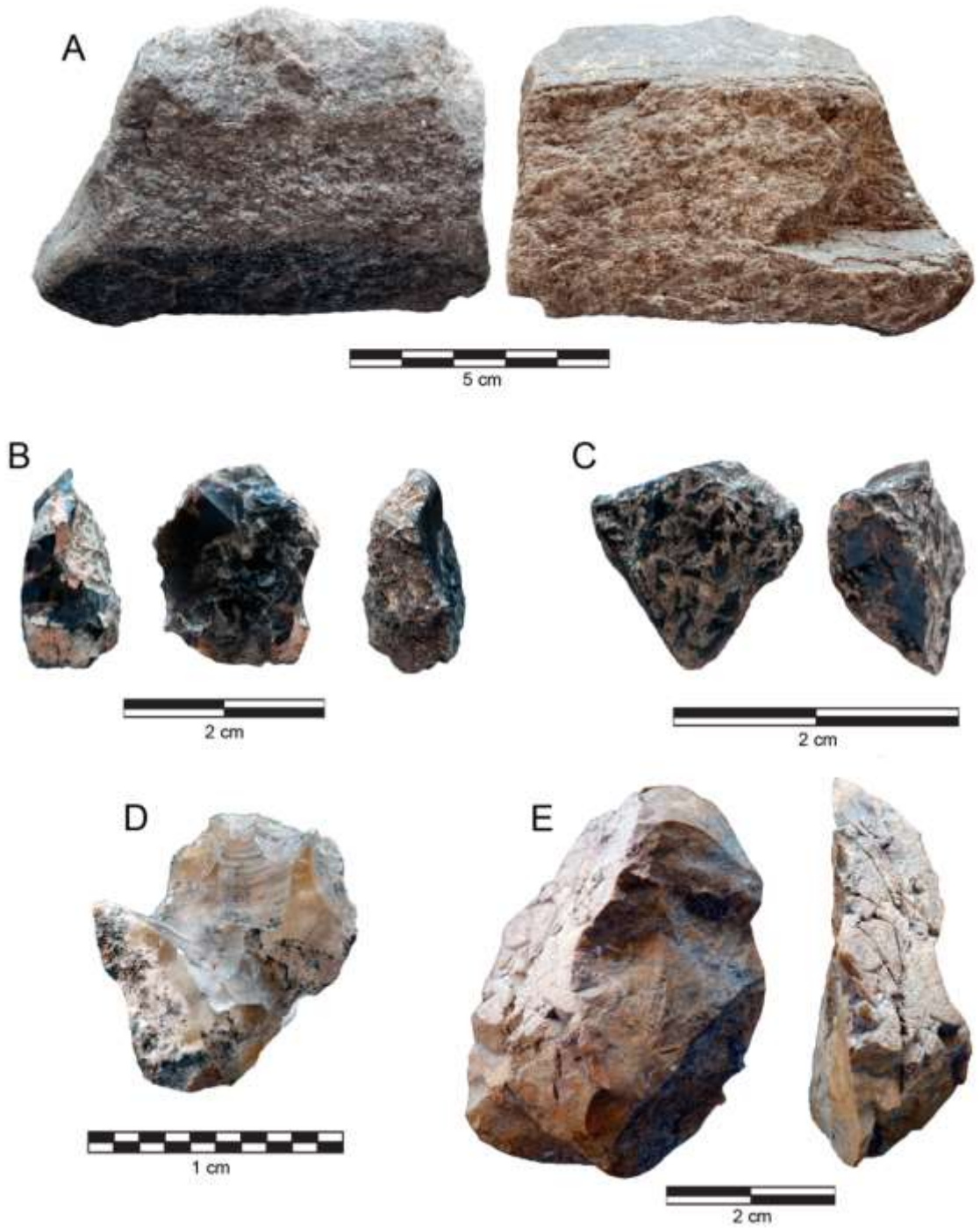

Figure 31. Notable lithic artifacts from PPSMC. A. 'Heavy-duty' scraper with cortex, quartzite, PPSMCA3. B. Bipolar core, chert, PPSMCA4. C. Bipolar core or pieces esquillees, chert, PPSMCA4; right hand side of upper edge shows extensive battering, a single large step-terminating scar initiates from the lower edge. D. Retouched piece, chalcedony, PPSMCA4. E. Silcrete flake with cobble cortex, PPSMCA4.

Nearly 94% of the knapped artifacts are quartzite (Table 1). Other types include silcrete (2.4%), chert/chalcedony (1.6%), quartz (1.2%), and hornfels (0.9%), and occur in very low frequencies.

For knapped pieces where a distinction was possible, we identified two types of cortex. Cobble cortex is usually created by high-energy environments such as coastal cobble beaches and stream and river beds, and was identified based on the presence of chatter marks, smooth surface, and well-rounded to rounded edges. Outcrop cortex has not been subjected to high-energy water transport and is identified based on the absence of chatter marks, a rough surface, and sub-rounded to very angular edges. At PPSMC, 76% (n=135) of quartzite plotted finds with an identifiable cortex type exhibit what we identify as cobble cortex. The high frequency of cobble cortex indicates that high-energy secondary sources of quartzite were predominately knapped at PPSMC. However, there is evidence that quartzite was also brought to PPSMC from primary outcrops or lower-energy stream beds (24%, n=43). The samples for the other raw material types are too small to make a statement about the role of different source types.

Quartzite component

Quartzite core reduction at the PPSMC localities was focused mainly on earlier stages of reduction. Refitting sets of large quartzite flakes were recovered near each other *in situ*, and often plotted as a single find. The amount of cortex on a flake dorsal surface is related to its relative position in the reduction sequence, with high amounts of cortex reflecting mainly earlier stages of reduction and the absence of cortex reflecting mainly later stages of reduction (Mauldin and Amick, 1989; Morrow, 1984). Of the quartzite knapped artifacts at PPSMC for which cortex area was recorded, 56% (n=271) exhibit some cortex on their dorsal surface, and 12% (n=58) exhibit an entirely cortical surface.

Most (64%, n=32) of the quartzite discarded cores are minimally worked, usually exhibiting fewer than ~5 scars. Several of the discarded cores appear to be tested cobbles with one or two removals only.

Most platforms on the quartzite detached pieces from PPSMC are not prepared (81%, n=158). Some of them are prepared with two or more facets (19%, n=36), and this preparation sometimes occurred immediately prior to detachment based on the presence of negative bulbs.

There are some other core types in quartzite, and these include multiplatform cores (6%, n=3, radial cores (4%, n=2) and bipolar cores (4%, n=2). The diversity of core types suggests multiple flake reduction strategies were carried out at PPSMC, but the strategies were not extensively formalized. Flakes clearly dominate the quartzite assemblage at PPSMC; blades and blade fragments are present (n=9), but very rare; points are absent. There are diverse dorsal scar patterns on the quartzite detached pieces; 47% unidirectional, 30% radial or subradial, 13% unidirectional or bidirectional, 9% bidirectional.

The quartzite pieces discarded at PPSMC were rarely retouched. Retouched pieces compose less than 1% (n-7) of the knapped quartzite assemblage. Of the quartzite retouched pieces that are present, most (n=4) are large 'heavy-duty' scrapers (Figure 1A). One of these scapers is on a complete flake with steep retouch on the distal end. The other three were manufactured on indeterminate blanks that retain some cortex. There is no strong pattern for any particular form and retouch is often minimally distributed. Two notched/denticulated pieces were recovered. PPSMCA1 and PPSMCA4 did not yield retouched quartzite pieces.

Non-quartzite component

Silcrete, quartz, chalcedony and other raw material types were discarded at PPSMC, but in very low frequencies. Together, all non-quartzite raw materials make up just 6% of the knapped artifact plotted finds.

These finds include two small chert bipolar cores, 14 and 20 mm in maximum length, at PPSMCA4, and a small (Figure 31B,C) silcrete radial core, 67 mm in maximum length, at PPSMCA2. One of the bipolar cores (Figure 31C) may alternatively be described as a *piece esquillee* based on the presence of several small step-terminating fractures (Villa et al., 2012), but these are present on one side only. A single retouched piece in finer-grained raw material (chalcedony) was discarded at PPSMCA4 (Figure 31D). It is not possible to typologically assign the small piece because it is irregular in form, though it does resemble the kinds of small scrapers common at other LSA sites (Deacon, 1984:387). Ten silcrete flakes with a glossy luster may indicate that at least some silcrete was heat-treated (Brown et al., 2009). One of these silcrete flakes exhibits cobble cortex (Figure 31E).

Other stone artifacts

Large numbers of fire modified rock (FMR, n=205) and other types of unknapped stone (n=221) were also recovered from PPSMC. The FMR is generally quartzite and identified based on intense color change, sometimes crazing, and angular edges with no flake features. The unknapped stone includes large quartzite pebbles and cobbles that are unmodified. Many of these stones are flattened ovoid in form and have abundant charcoal and ash residue concentrated on one side. Some grindstones with facetted and striated surfaces were also recovered. A small proportion of these had ochre staining. There are also several quartzite hammerstones and hammerstone fragments. These hammerstone exhibit localized regions of battering and pock-marks on small quartzite cobbles. Some small pieces of ochre, and water-worn stone (indicative of transport of mussels to site) were also recovered.

Table 1. Counts of knapped lithic artifact types and other stone artifacts at PPSMCA by area and raw material. Counts included all lithic plotted finds and 10 mm sieve material from anthropogenic and shell layer contexts.

	Knapped Lithic Artifacts							Other Stone Artifacts			
	Shatter	Flake Fragment	Complete Flake	Core	Retouched Piece	Blade or Blade Fragment	Total	Fire Modified Rock	Hammer/Manuport/Grindstone	Total	Grand Total
PPSMCA1	4	3	1	1			9		7	7	16
Quartzite	2	1	1	1			5		7	7	12
Silcrete		1					1			0	1
Chalcedony		1					1			0	1
Quartz	2						2			0	2
PPSMCA2	117	88	57	17	1	4	284	4	64	68	352
Quartzite	113	86	53	16	1	4	273	4	61	65	338
Silcrete	2	1	3	1			7			0	7
Quartz	2						2			0	2
Hornfels		1	1				2			0	2
Other							0		3	3	3
PPSMCA3	232	236	69	37	6	3	583	177	114	291	874
Quartzite	223	232	69	37	6	3	570	166	108	274	844
Silcrete	1	2					3			0	3
Quartz	5						5			0	5
Hornfels	1	2					3			0	3
Other	2						2	11	6	17	19
PPSMCA4	101	60	18	8		2	190	24	36	60	250
Quartzite	77	49	17	5		2	150	24	36	60	210
Silcrete	5	8	1				14			0	14
Chalcedony	3	1		1	1		6			0	6
Chert	9			2			11			0	11
Quartz	4						4			0	4
Hornfels	3	2					5			0	5
Total	454	387	145	63	8	9	1066	205	221	426	1492

Report on the shellfish remains from the PPSMC

By

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Introduction

This report describes the shellfish remains excavated from the Pinnacle Point Shell Midden complex (PPSMC), located at Pinnacle Point Beach and Golf Resort near Mossel Bay in the Western Cape province of South Africa. Due to the size of the midden, the shell assemblage was sub-sampled because of the unfeasibility of retaining all the shell from the site for curation and storage (Nilssen, 2006). Shell samples were excavated in 50 x 50 cm quadrants, wet screened through 10 mm, 3 mm and 1.5 mm sieves, dried, sorted and labelled according to stratigraphic unit, lot number and mesh size. The shell remains discussed in this report represents specimens accumulated by humans for subsistence and were examined to identify the species utilized by the PPSMC occupants.

Methodology

The shell remains from the >10 mm fraction of all five areas (PPSMCA1 – PPSMCA5) were identified, as were those recovered from the 3-10 mm fraction from PPSMCA2. Individual specimens were identified to species level where possible on the basis of their morphological features (Appendix A). Where species could not be identified specimens were grouped into genus or family classifications. Several mollusk species of abalone, limpet, mussel, turban shell, whelk and winkle were present including unidentifiable chiton fragments belonging to the class Polyplacophora and crustacean fragments of barnacle, belonging to the subclass Thecostraca. Most of the species identified can still be found in the area today.

Number of Identified Specimens (NISP) of all species were determined by adding up the separate totals of all identifiable fragments (Appendix C and E). Identified fragments include any fragmentary element, specimen or complete anatomical unit that can be identified to either Order, Family, genus or species (Claassen, 1998; Giovas, 2009; Lyman, 1994). Minimum number of Individuals (MNI) for the bivalve species *Perna perna* (brown mussel) and *Choromytilus meridionalis* (black mussel) were determined by adding up the separate

totals for the right and left hinges (valves) and then using the higher number to indicate MNI figures. MNI refers to non-repetitive elements (NRE) and are defined as "any hard shell skeletal element [or portion thereof] that is diagnostic of a single species or genus and can only be counted a limited and set number of times for one individual to have been present" (Mason et al., 1998). For the bivalve species *Donax serra* (white mussel) right and left hinges are more difficult to distinguish with incomplete specimens. MNI for *D. serr*a was thus established by dividing the NISP value by two. This method was also used to determine the MNI values for *Aulacomya atra* (ribbed mussel), *Barbatia obliquata* (oblique ark shell) and C*rassostrea spp*. (unidentifiable oyster) which constitute a negligible proportion of the total shell assemblage. MNI values for abalone, limpets, whelks and winkles were determined by counting their apices. For the alikreukel *Turbo sarmaticus* (South African turban) MNI values are based on counts of either the apices or opercula, whichever of these elements yields the highest MNI per area. No evidence of predators and parasites in the form of holes caused by boring sponges, algae or calcified worm casts were observed on the shell remains. Pathological conditions are however rare in archaeological assemblages due to the fragility of shells leading to flaking off of layers removing damaged areas (Plug, 2006). Water worn specimens were identified in PPSMCA1 to PPSMCA4 and summarized in Appendix F. No humanly modified shell specimens were identified. This report also incorporates the data and report submitted by Kyriacou (n.d.) to MAPCRM of her analysis on a small portion of the >10 mm fraction from PPSMCA2 and PPSMCA4 in 2008.

Pinnacle Point Shell Midden Area 1 (PSMCA1)

A NISP total of 7915 individual fragments were identified weighing 40.20 kg (Appendix B). MNI values are summarized in Figure 32. *P. perna* is by far the best represented species making up 70.42% of this assemblage. This pattern is fairly typical of LSA sites located along the southern Cape coast, where brown mussels are available in large numbers both in the low intertidal zone and sub-tidally (Branch et al., 2008). *D. serra,* inhabiting sandy beaches in the mid intertidal zone, constitutes the second most abundant species accounting for 8.85% of the assemblage. This is followed by the rocky shore gastropod *T. sarmaticus* constituting 6.34% of the identified shell. This species inhabits rock pools in the mid-intertidal when immature, and lives lower on the shore during adulthood (McLachlan and Lombard, 1981). Use of this species as dietary resource by LSA hunter-gatherers has been documented at numerous southern Cape coastal sites such as Noetzie (Orton and Halkett,

2007) and the LSA layers at Blombos cave (Henshilwood et al., 2001). The two fairly large rocky shore limpets *S.*

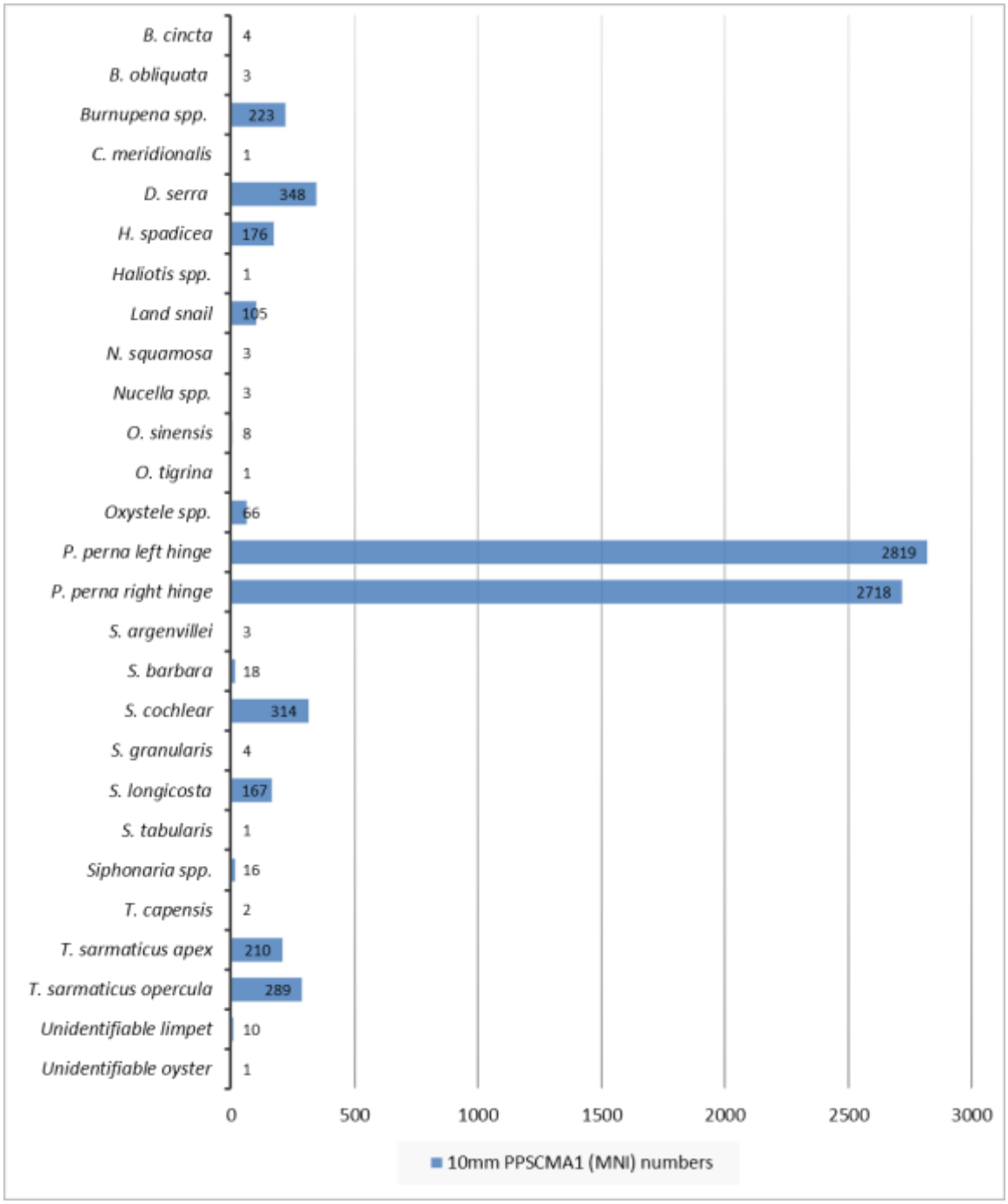


Figure 32. MNI numbers of the >10 mm material identified from PPSMCA1.

cochlear and *S. longicosta* are also relatively abundant constituting 3.99% and 2.12% of the assemblage respectively. Followed by the large abalone *H. spadicea* (2.24%) and whelk *Burnupena spp.* (2.83%), which inhabit the low intertidal and sub-tidal zones. The remainder of the assemblage is made up of the limpet *S. barbara* (0.23%), *Siphonaria spp*. (0.20%),

numerous unidentifiable limpets (0.13%), *S. granularis* (0.05%), *S. argenvillei* (0.04%) and *S. tabularis* (0.01%). Top shells are not very abundant in the assemblage with slightly elevated frequencies of *Oxystele spp.* (0.84%), *O. sinensis* (0.10%) and *O. tigrina* (0.01%) present throughout the sequence. The bivalves *B. obliquata* (0.08%), *C. meridionalis* (0.01%) and unidentifiable oyster fragments (0.01%) represent a negligible percentage of the assemblage. Determining the significance of the cold water black mussel *C. meridionalis* on the basis of a single specimen is not possible other than indicating its presence in the assemblage. The remainder of the shell assemblage is made up of the gastropods *B. cincta* (0.05%), *N. squamosa* (0.04%), *Nucella spp.* (0.04%), *T. capensis* (0.03) and *Haliotis spp.* (0.01%) representing a minute fraction of the total assemblage identified from PPSMCA1.

Juvenile specimens were identified from test pits 5, 7, 8, 12 and 13 and represent mostly unidentifiable limpet remains. None of the identified remains from PPSMCA1 form part of the plotted find material excavated from PPSMC and no width or length measurements were taken. It must be noted that not all land snails identified from archaeological deposits are necessarily part of the refuse left behind by human behavior and may be late intrusions since these animals aestivate during dry seasons and could therefore have buried themselves in the archaeological deposit (Plug, 2009 pers. comm.). The unidentified terrestrial snails, representing 1.33% of the assemblage, are thus not considered to have been collected by the LSA occupants and are believed to have burrowed into the deposit during more recent times. On the whole, the shell remains from PPSMCA1 are indicative of an exploitation strategy focused on the adjacent rocky shores, centered around the low and mid-intertidal zones, and to a lesser extent sandy beach areas as indicated by the presence of *D. serra.*

Pinnacle Point Shell Midden Area 2 (PPSCMA2)

The identified shell material from PPSMCA2, a larger midden with more complex stratigraphy (Kyriacou, n.d.), included both >10 mm and 3-10 mm material and yielded a total NISP of 10005 fragments weighing 68.90 kg (Appendix C and B). MNI numbers for both the >10 mm and 3-10 mm fraction of this site is presented in Figure 33. For the purpose of clarity the >10 mm and 3-10 mm material will be reported on separately below.

Pinnacle Point Shell Midden Area 2 (PPSMCA2) – >10 mm fraction

From the material identified *P. perna* constitutes the best represented species at the site, accounting for 28.19% of the total assemblage, but it is less dominant than at PPSMCA1. *T. sarmaticus* is the next most abundant species, making up 25.38% of the assemblage as a whole. With a NISP of 1446, the *T. sarmaticus* assemblage from PPSMCA2 is the largest

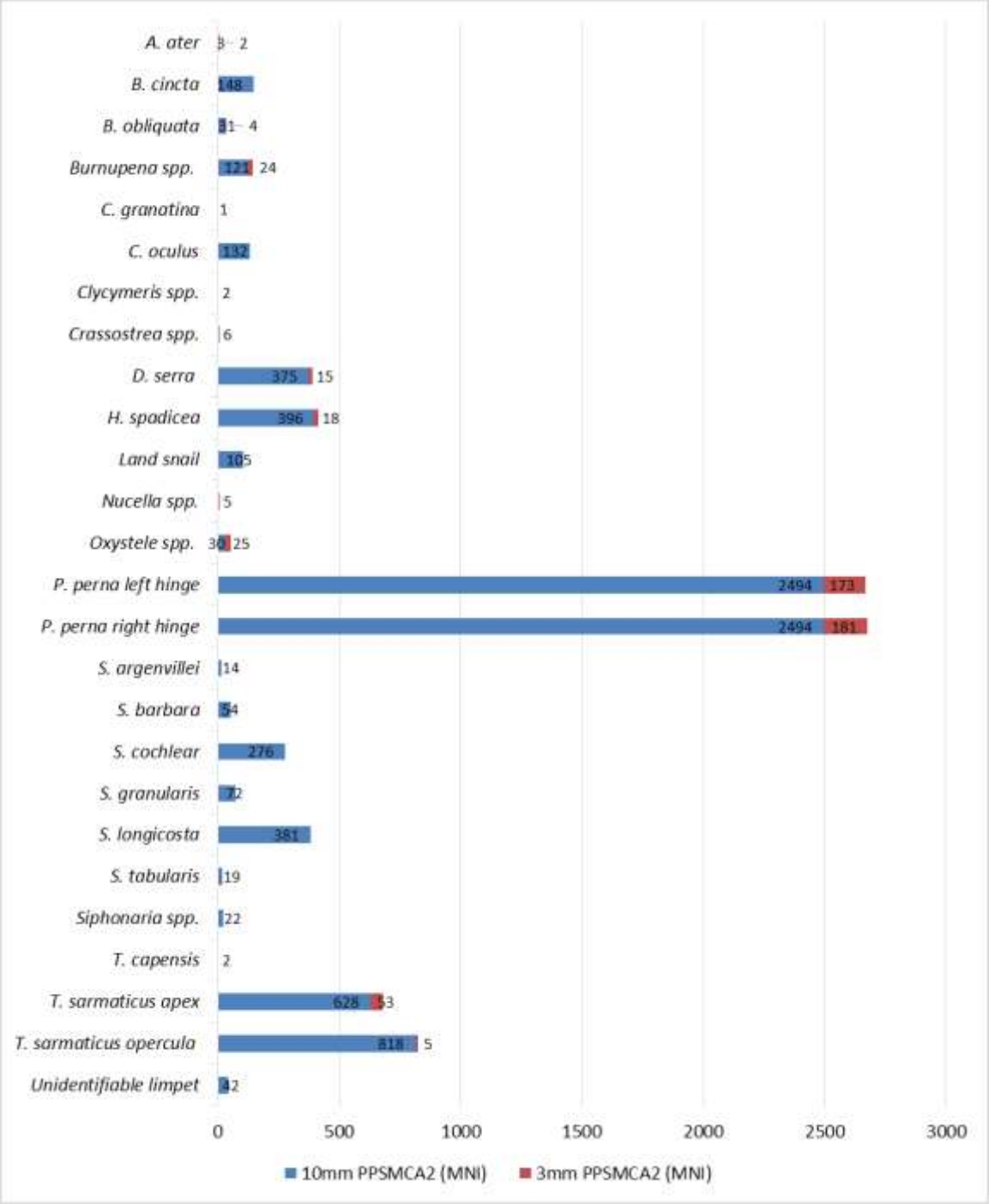


Figure 33. MNI numbers of the >10 mm and 3-10 mm material identified from PPSCMA2.

yield of this species from all five PPSMC areas. *D. serra* constitutes 13.15% of the total assemblage from PPSMCA2 and is followed by the large abalone *H. spadicea* (6.95%). The

limpet species from PPSMCA2 also constitutes the largest collection of limpets from all five PPSMC areas with a total NISP of 972, and are best represented by *S. longicosta* (6.69%), *S. cochlear* (4.84%), *C. oculus* (2.32%), *S. granularis* (1.26%) and *S. barbara* (0.95%). Along the southern Cape coast, *S. cochlear* inhabits closely packed colonies occurring in the so-called cochlear zone, located low on the shore (Branch et al., 2008). *B. cincta* and *Burnupena spp*. too, constitute a minor component of the shell assemblage from PPSMCA2 accounting for 2.60% and 2.12% of the remains respectively. These species are more abundant at PPSMCA2 than at PPSMCA1. The remainder of the assemblage is made up of the bivalves *B. obliquata* (1.07%), *Crassostrea spp.* (0.21%), *Glycymeris* spp. (0.05%) and *A. atra* (0.09%). Kyriacou (2013, pers. comm.) noted that the three *Glycymeris* spp. fragments likely point to decorative uses and would not have been used for subsistence. Similarly to PPSMCA1 the top shell *O. sinensis* is not abundant at PPSMCA2 and comprises 0.53% of the assemblage. *T. capensis* constitutes a negligible 0.04%. The 105 (1.84%) terrestrial snail fragments identified are not considered as part of the collected resources, similar to those from PPSMCA1.

Kyriacou (n.d.) noted that large number of measurable specimens were recovered for PPSMCA2 and the metric data for *T. sarmaticus* opercula, three limpet species and *P. perna* are presented in Table 2 and Figures 34 to 37. The measured samples are from stratigraphic units D (lot 46 and 176), E (lot 195), I (lot 100 and 302), U (lot 714), X (lot 676) and AB (lot 884). According to Kyriacou (n.d.) the mean and median sizes of *T. sarmaticus* opercula measured from PPSMCA2 are similar to those measured from PPSMCA4, with the majority of 'measurable individuals' falling between the 20.0 and 34.9 mm size categories. For the limpet *S. cochlear*, which grow to a maximum size of 70 mm (Branch et al., 2008), mean and median values of 51.8 and 54.4 mm were measured (Kyriacou, n.d.). The phenomenon whereby juveniles of this species live on the backs of larger, mature individuals in dense colonies (Branch, 1975) may result in the transportation of small specimens with little food value into archaeological deposits. According to Kyriacou (n.d.), this in turn may produce bi-modal size distributions for this species in which relatively large individuals collected by prehistoric hunter-gatherers as well as smaller individuals (<3 mm) appear to be well represented. This pattern was observed by Kyriacou (2009) at the Late Holocene site of Hoffman's/Robberg Cave in the Western Cape. Ten out of the 66 individuals measured from PPSMCA2 are within the two smallest size categories (25-29.9 mm and 30-34.9 mm) and according to Kyriacou (n.d.) the size distribution of *S. cochlear*, measured from PPSMCA2,

is not markedly bimodal; likely because the measured samples are derived from the >10 mm sieved fraction whereas at Hoffman's Robberg Cave, the largest mesh size used was 3 mm. Kyriacou (n.d.) also indicate that the mean and median lengths for the measured *C. oculus* samples from PPSMCA2 are slightly larger than those from PPSMCA4. With the majority of

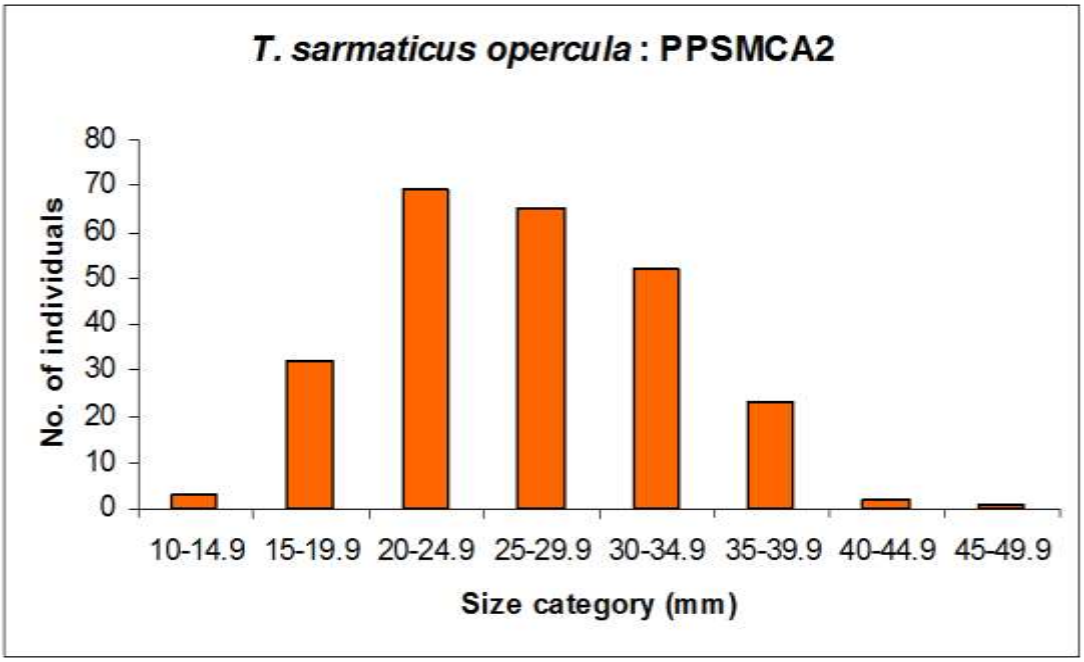


Figure 34. Histogram illustrating size distribution of T. sarmaticus opercula measured from PPSMCA2.

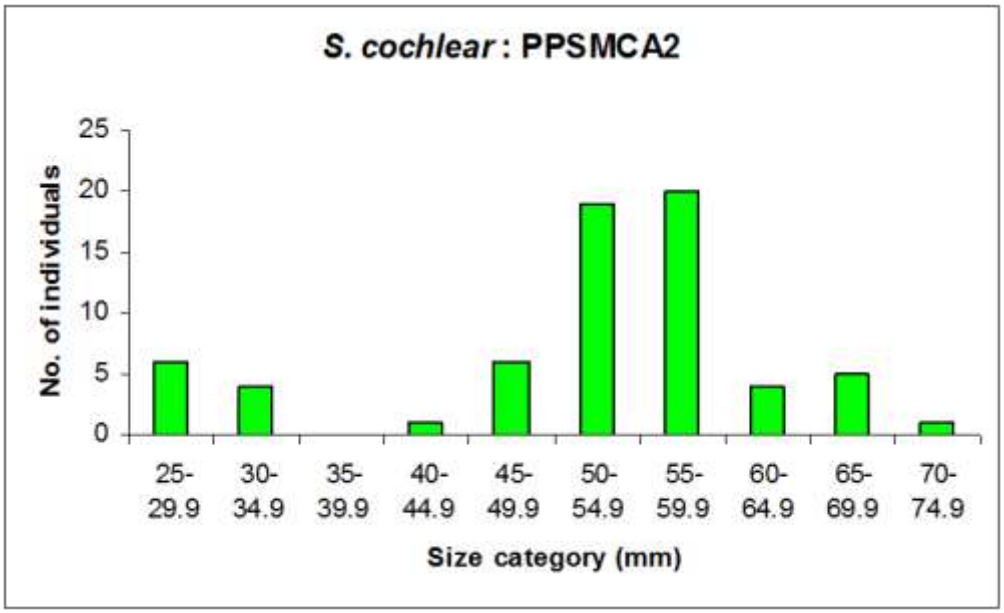


Figure 35. Histogram showing the size distribution of S. cochlear measured from PPSMCA2

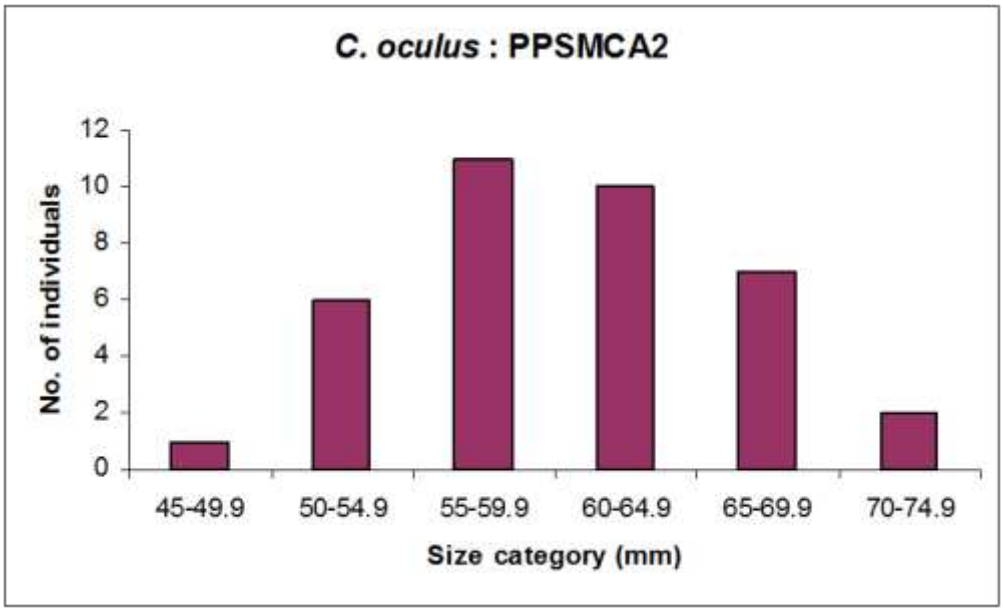


Figure 36. Histogram showing the size distribution of C. oculus measured from PPSMCA2.

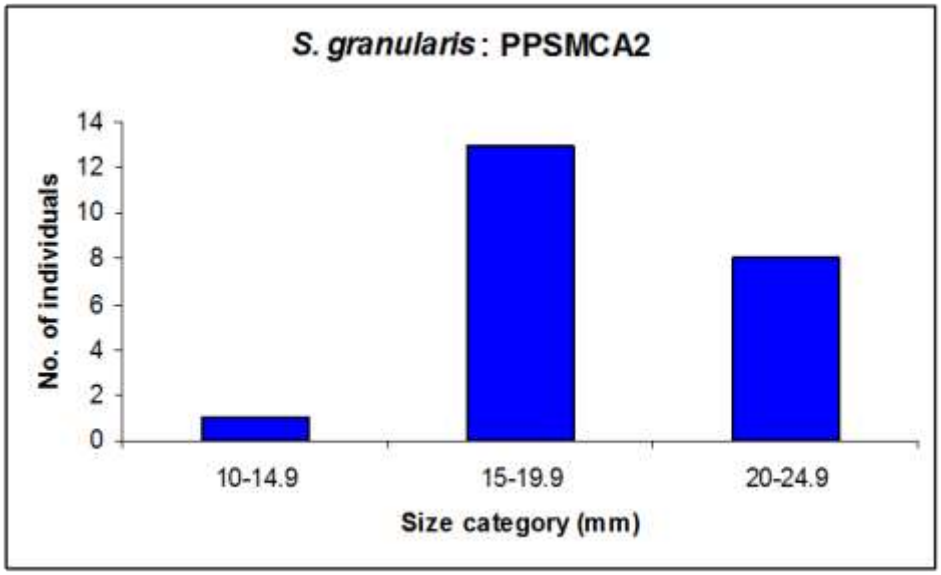


Figure 37. Histogram showing the size distribution of S. granularis measured from PPSMCA2.

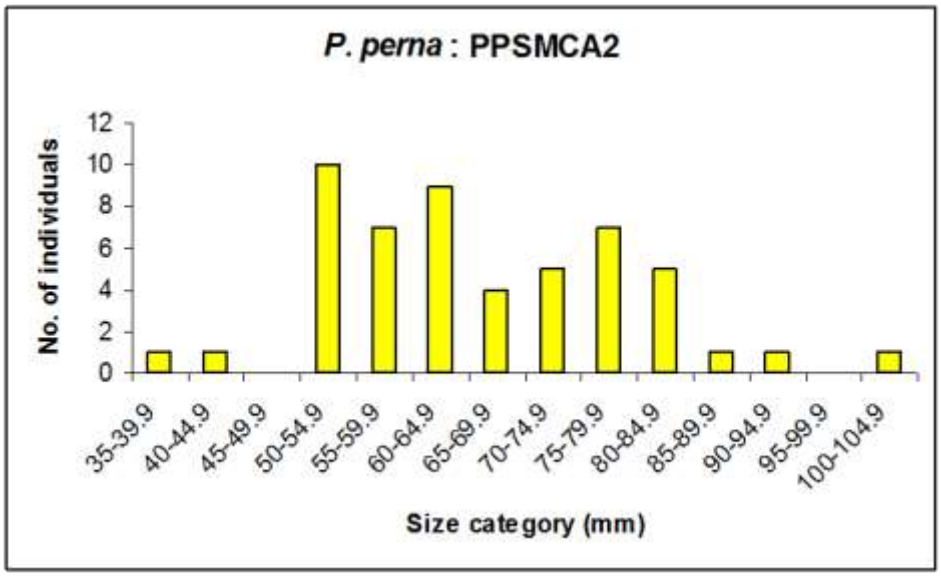


Figure 38. Histogram showing the size distribution of P. perna measured from PPSMCA2.

Table 2. Basic descriptive statistics for measured specimens from PPSMCA2 (all measurements in mm)

(Kyriacou, n.d.)

Species	***n***	**Mean**	**Median**	**Minimum**	**Maximum**	**Standard Deviation**
T.sarmaticus opercula	247	26.7	26	14.1	47.8	6.1
S. cochlear	66	51.8	54.4	25.2	72.3	11.3
C. oculus	39	60.2	60.3	48.8	74.5	5.8
S. granularis	22	18.7	18.6	13.5	23	2.1
P. perna	52	66.1	64.2	35.4	100.1	13.1

measured specimens from the former site falling between 50.0 mm and 69.9 mm in total length. Kyriacou (n.d.) notes that these sizes are still below the maximum size reached by *C. oculus*. From the *S. granularis* sample measured from PPSMCA2, small mean and median sizes of 18.7 mm and 18.6 mm were recorded, similar to the PPSMCA4 measured material with the majority of individuals within the 15.0-19.9 mm size category (Kyriacou, n.d.). The largest specimen measured 23 mm in length, not even half the size of the 60 mm observed for specimens from the productive west coast (Branch et al., 2008). *P. perna* hinges measured from PPSMCA2 range between 34.5–100.1 mm in maximum length with the best represented size categories falling between 50.0 mm and 84.9 mm (Kyriacou, n.d.).

Pinnacle Point Shell Midden Area 2 (PPSMCA2) – 3-10 mm fraction

The 3-10 mm fraction identified from PPSMCA2 is derived from stratigraphic unit A (lot numbers 18, 121 and 266), D (lot 46 and 53), G (lot 71), I (lot 96 and 100), K (lot 107), L (lot 113), Q (lot 490), Z (lot 854) and AB (lot 851). *P. perna* are the best represented species accounting for 67.43% of the assemblage, followed by the large alikreukel *T. sarmaticus* (11.05%). *D. serra* represents 5.71% of the assemblage with *Oxystele spp*. (4.76%) and *Burnupena* spp. (4.57%) also being relatively abundant. The remainder of the identified material is made up of *H. spadicea* (3.43%) and *B. obliquata* (1.33%) with negligible contributions from *Nucella* spp. (0.95%) and *A. atra* (0.76%). Unlike the >10 mm fraction identified from PPSMCA2 the 3-10 mm fraction yielded no identifiable limpet remains nor any oyster or terrestrial snail specimens.

From both the >10 mm and 3-10 mm fraction of PPSMCA2 juvenile specimens were identified from test holes 14, 17, 20 and 21 and represent mostly unidentifiable limpet remains. Only one *P. perna* specimen from the identified >10 mm fraction forms part of the plotted find material (PF 143). Several crustacean fragments of barnacle (weighing 0.048 kg) were identified from both the >10 mm (test pit 31) and 3-10 mm (lot 8, 100, 121 and 854) fraction. The higher number of *T. sarmaticus* versus *D. serra* material identified from PPSMCA2 in relation to PPSMCA1 indicate an exploitation strategy largely focused on the adjacent rocky shores (centered around the low and mid intertidal zones) with less reliance on sandy beaches than at PPSMCA1.

Pinnacle Point Shell Midden Area 3 (PPSCMA3)

Despite being the 3rd largest shell assemblage excavated from PPSMC, with a total NISP of 3594 (Appendix C and E), PPSMCA3 yielded an identified sample weight of only 15.88 kg (Appendix B) with little species variability. MNI counts are presented in Figure 39. The identified sample indicates that PPSMCA3 is dominated by *P. perna* accounting for 77.82% of the total assemblage, the largest percentage of this species from PPSMC1 to PPSMCA3. The next most numerous contributors are *T. sarmaticus* (4.72%) and *S. longicosta* (4.10%), followed by the limpets *S. granularis* (3.76%), *C. oculus* (2.23%), *S. barbara* (1.24%) and *S. cochlear* (observed at certain points throughout the sequence). The remainder of the limpet

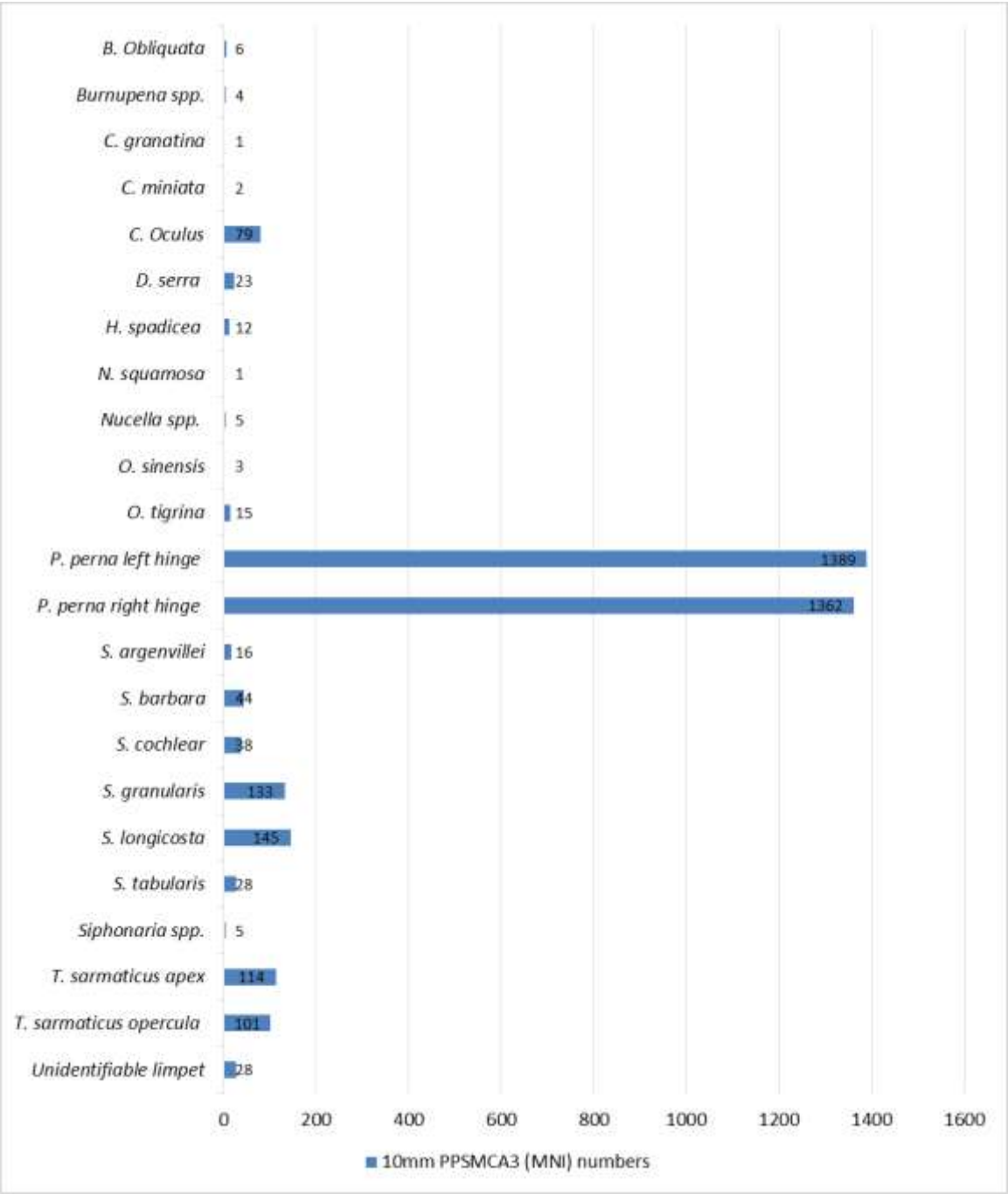


Figure 39. MNI numbers of the >10 mm material identified from PPSCMA3.

assemblage is made up of unidentifiable limpets (0.79%), *S. tabularis* (0.79%), S. *argenvillei* (0.45%), *Siphonaria* spp. (0.14%), *C. miniata* (0.06%) and *C. granatina* (0.03%). The white mussel *D. serra* constitutes 1.30% of the sample but is significantly less dominant at PPSMCA3 than at PPSMCA1 to PPSMCA5. Winkles and whelks including *O. sinensis, O. tigrina, Nucella* spp., *Burnupena* spp. and *N. squamosa* together make up 0.78% or the assemblage. With negligible contributions of 0.34% each from *B. obliquata* and *H. spadicea.*

Juvenile specimens were identified throughout the sequence from PPSMCA3 and are dominated by limpet remains. No chiton or terrestrial snail remains were observed and no measurements were taken from the identified material. Five specimens from PPSMCA3 form part of the plotted find material and were excavated from stratigraphic unit E [PF 483 (S. *argenvillei),* PF 484 (*C. granatina*) P674 (*P. perna*) and PF 1982 (*D. serra*)] and V [PF 810 (*S. argenvillei*)]. The dominance of *P. perna* and *T. sarmaticus* at PPSMCA3 is consistent with an exploitation pattern focused primarily around the mid and low intertidal zones of the rocky shoreline in the vicinity of Pinnacle Point with very little reliance on sandy beach species such as *D. serra*.

Pinnacle Point Shell Midden Area 4 (PPSCMA4)

A total of 2571 specimens were identified from the smaller midden PPSMCA4 (Appendix C and E) and represent the largest variety in species from all five PPSMC areas excavated. MNI counts are summarized in Figure 40. The brown mussel *P. perna* is by far the best represented species, making up 79.16% of the assemblage as a whole. It is the most abundant species in each of the individual strata from which the shell remains were recovered. *T. sarmaticus* is the next best represented species accounting for 4.84% of the total remains identified and is followed by the bivalve *D. serra* (4.36%) and limpets *S. longicosta* (2.20%) and *S. granularis* (1.53%). The abalone *H. spadicea* and whelk *B. cincta* respectively constitute 1.26% and 1.18% of the assemblage. The remaining limpet sample from PPSMCA4 accounts for 2.6% of the shell remains and are represented by *S. cochlear, C. oculus, S. barbara, S. argenvillei, H. pectunculus, S. tabularis* and *Siphonaria* spp. The bivalve *B. obliquata* represent 1.02% of the assemblage, while the ribbed mussel *A. atra* constituted only 0.12% of the excavated

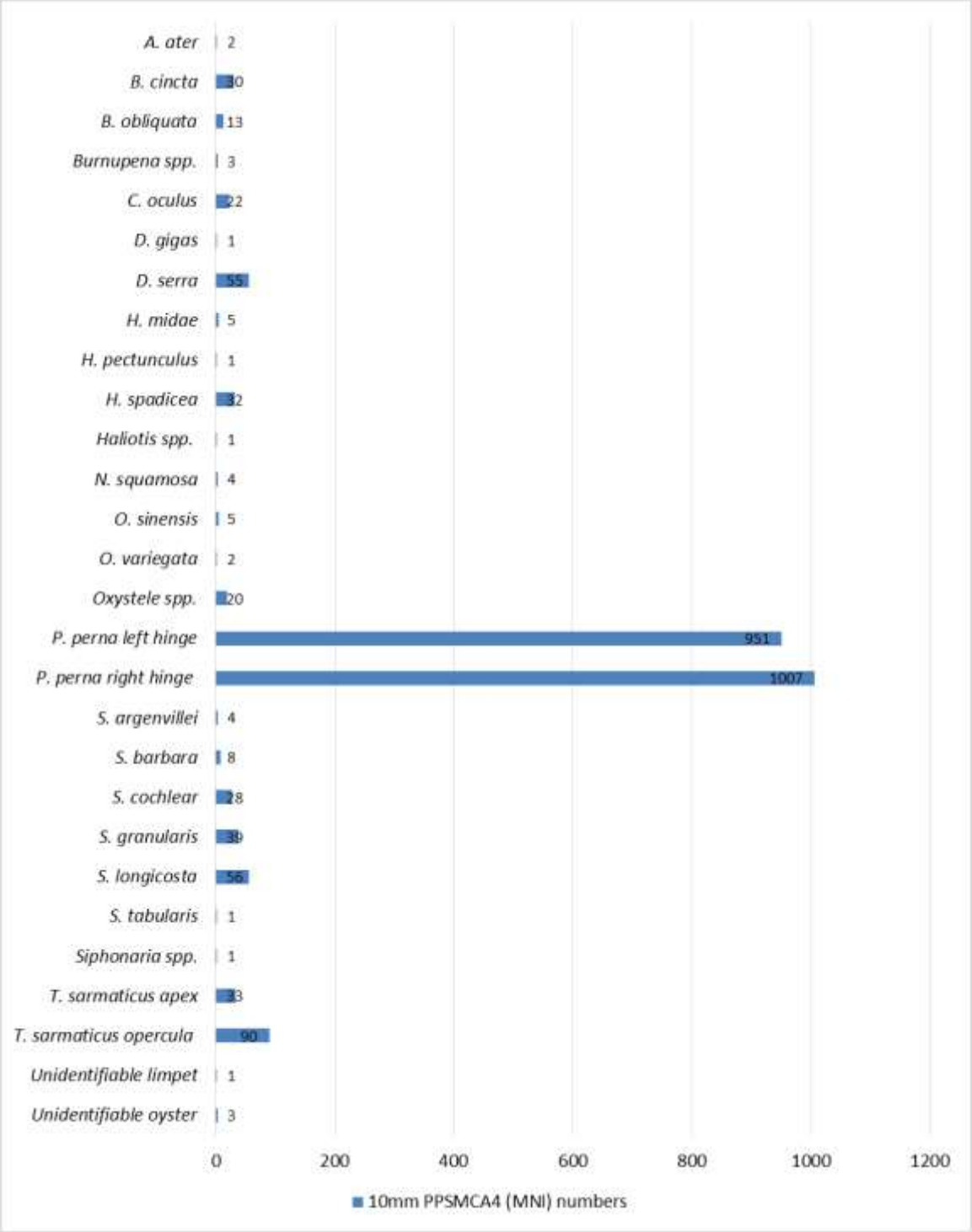


Figure 40. MNI numbers of the >10 mm material identified from PPSCMA4.

remains. Top shells are not very abundant in the assemblage and are best represented by *Oxystele* spp. (0.79%), *O. sinensis* (0.20%) and *O. variegata* (0.08%). The remainder of the identified material from PPSMCA4 is represented by negligible amounts of *H. midae*

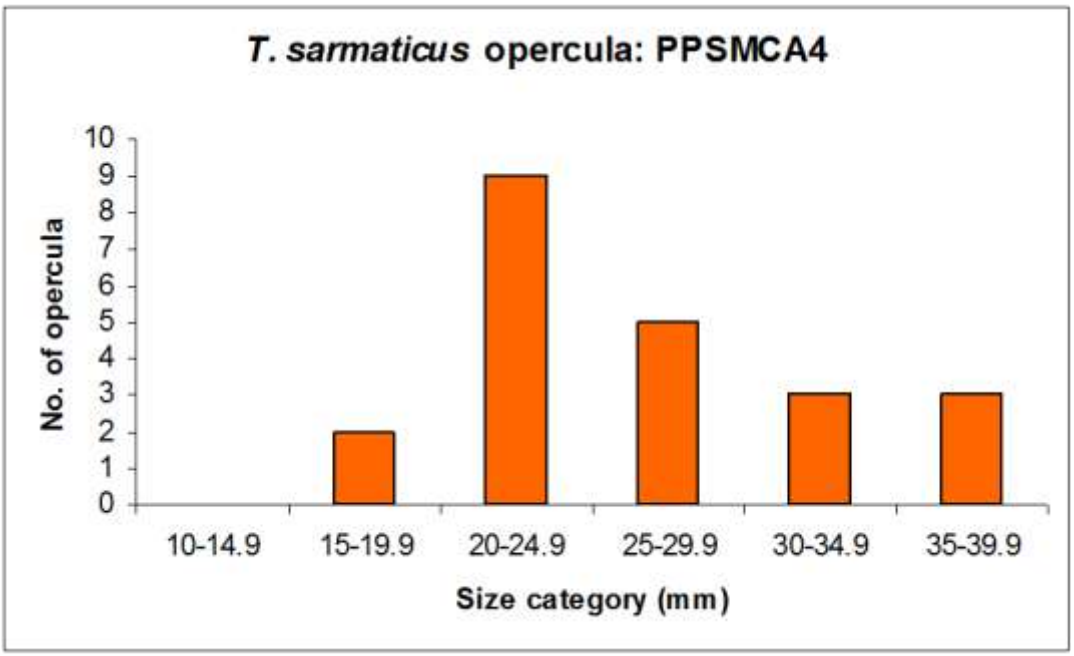


Figure 41. Histogram showing size distributions of T. sarmaticus opercula measured from PSMCA4.

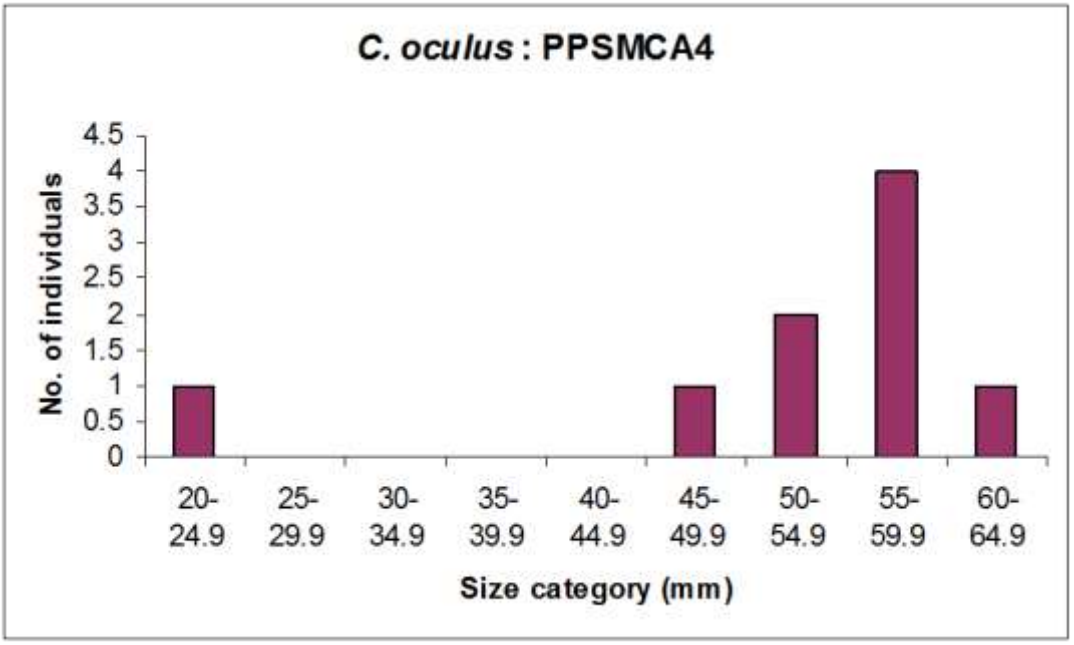


Figure 42. Histogram showing the size distribution of C. oculus measured from PPSMCA4.

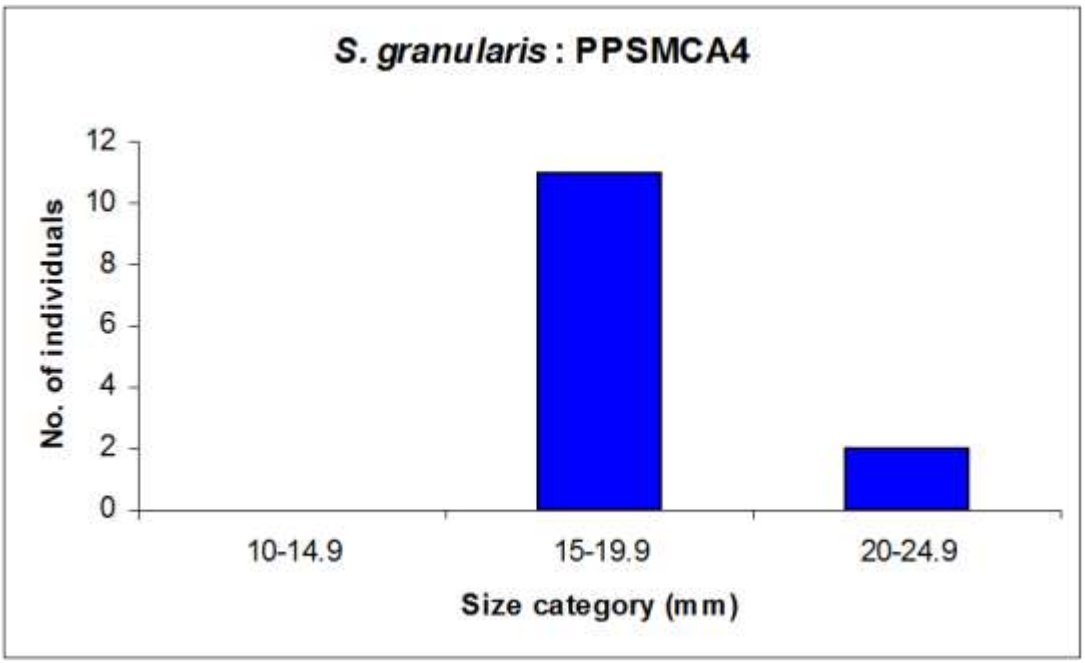


Figure 43. Histogram showing the size distribution of S. granularis measured from PPSMCA4.

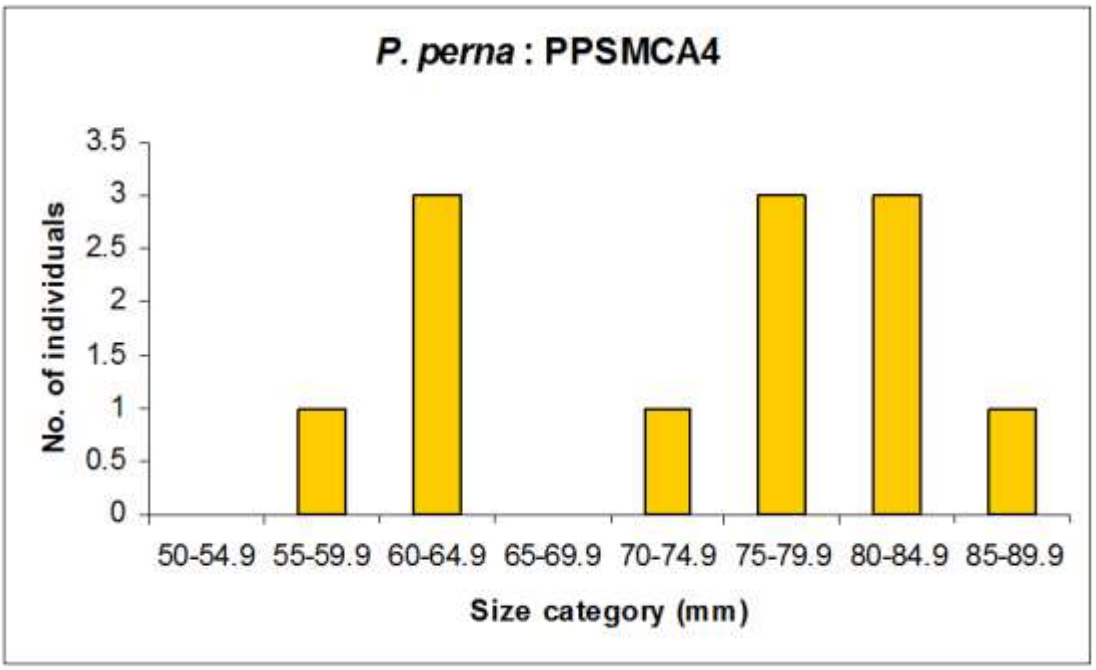


Figure 44. Histogram showing the size distribution of P. perna measured from PPSMCA4.

Table 3. Basic descriptive statistics for measured specimens from PPSMCA4 (all measurements in mm)

(Kyriacou, n.d.).

Species	***n***	**Mean**	**Median**	**Minimum**	**Maximum**	**Standard Deviation**
T. sarmaticus opercula	22	26	25.1	15.8	37.2	6.1
C. oculus	9	52.3	56.2	23.9	63.6	11.4
S. granularis	13	18.8	18.3	16.8	22.5	1.8
P. perna	12	73.4	75.5	55.5	86.6	10.1

(0.20%), *N. squamosa* (0.16%), *Burnupena spp*. (0.12%), *Haliotis spp*. (0.04) and unidentifiable oyster remains (0.12%).

Basic descriptive statistics for the specimens measured from PPSMCA4 were summarized by Kyriacou (n.d.) and are presented in Table 3. These are derived from measurements taken of the maximum diameter of *T. sarmaticus* opercula, the total length of the limpets and the maximum length of the mussel hinges (Kyriacou, n.d.). The star-shaped limpet *S. longicosta* was excluded on account of its spiky, projecting ribs which vary considerably in length and render total lengths an unsuitable measure of average size for this species (Kyriacou, n.d.). The size distributions of *T. sarmaticus* opercula, two limpet species and *P. perna* are presented in Figures 41 to 44. The material measured was selected from stratigraphic units B (lot 194), G (lot 141), H (lot 98), I (lot 153), L (lot 170 and 218), N (lot 76 and 113), Q (lot 81), R (lot 213), W (lot 125), X (lot 241), AB (lot 157), AD (lot 220), AE (lot 230) and AF (lot 238). According to Kyriacou (n.d.) the majority of the measured *T. sarmaticus* opercula are within the 20.0-24.9 mm and 25.0-29.9 mm size categories, and have an average

maximum diameter of 26 mm. With mean and median sizes of 52.3 mm and 56.2 mm recorded for the limpet *C. oculus* (Kyriacou, n.d.). The majority of the measured specimens of this species, of which there were only nine, are within the 50.0-54.9 mm and 55.0-59.9 mm size categories. Kyriacou (n.d.) noted that given the maximum size of 100 mm attained by this species, the specimens measured from PPSMCA4 are relatively small. With small sizes of less than 20 mm obtained for the granular limpet *S. granatina.* According to Kyriacou (n.d.) this is relatively common on the southern Cape coast, where this species is less productive than in the colder waters of the Atlantic west coast (Branch et al., 2008). The unusual distribution obtained for *P. perna* (Figure 13) is described by Kyriacou (n.d.) as the product of the small sample size measured from PPSMCA4. With the majority of the measured specimens appearing to be within the 60.0 mm to 84.9 mm size range. No individuals greater than 89.9 mm in length were measured. Kyriacou (n.d.) concludes that the individuals from PPSMCA4 are below the maximum size of 125 mm attained by *P. perna* along the southern Cape coast (Branch et al., 2008).

On the whole, the shell remains from PPSMCA4 are indicative of exploitation strategies focused on the adjacent rocky shore (centered around the low and mid intertidal zones) and sandy beach to a lesser extent. No terrestrial snails were identified from the PPSMCA4 assemblage and only two specimen from the shell excavated form part of the plotted find material; PF 35 from lot 40 (*S. tabularis*) and PF 283 from lot 162 (*P. perna*).

Pinnacle Point Shell Midden Area 5 (PPSMCA5)

PPSMCA5, the smallest assemblage from all of the five areas analyzed, yielded a total NISP of 481 (Appendix C and E) with the least diversity of species identified. MNI numbers are summarized in Figure 45. From this assemblage no water worn specimens were identified, in addition to no oyster, chiton or terrestrial snail fragments. The bivalves *P. perna*, *D. serra* and *B. obliquata* are the dominant species from PPSMCA5 accounting for 56.19%, 22.66% and 1.51% of the identified remains respectively. *T. sarmaticus* (7.85%) are the next most abundant species followed by the limpet *C. oculus* (2.42%) and *S. cochlear* (0.91%). *S. barbara* and *S. longicosta* contributes 0.60% each to the assemblage with *C. granatina*, *S. granularis* and *Siphonaria* spp. making up 0.9% toward the total sample identified. The large abalone *H. spadicea* (4.53%) is also relatively abundant, with the remainder of the identified assemblages made up of *N. squamosa* (0.91%), *Oxystele* spp. (0.60%) and *Burnupena* spp.

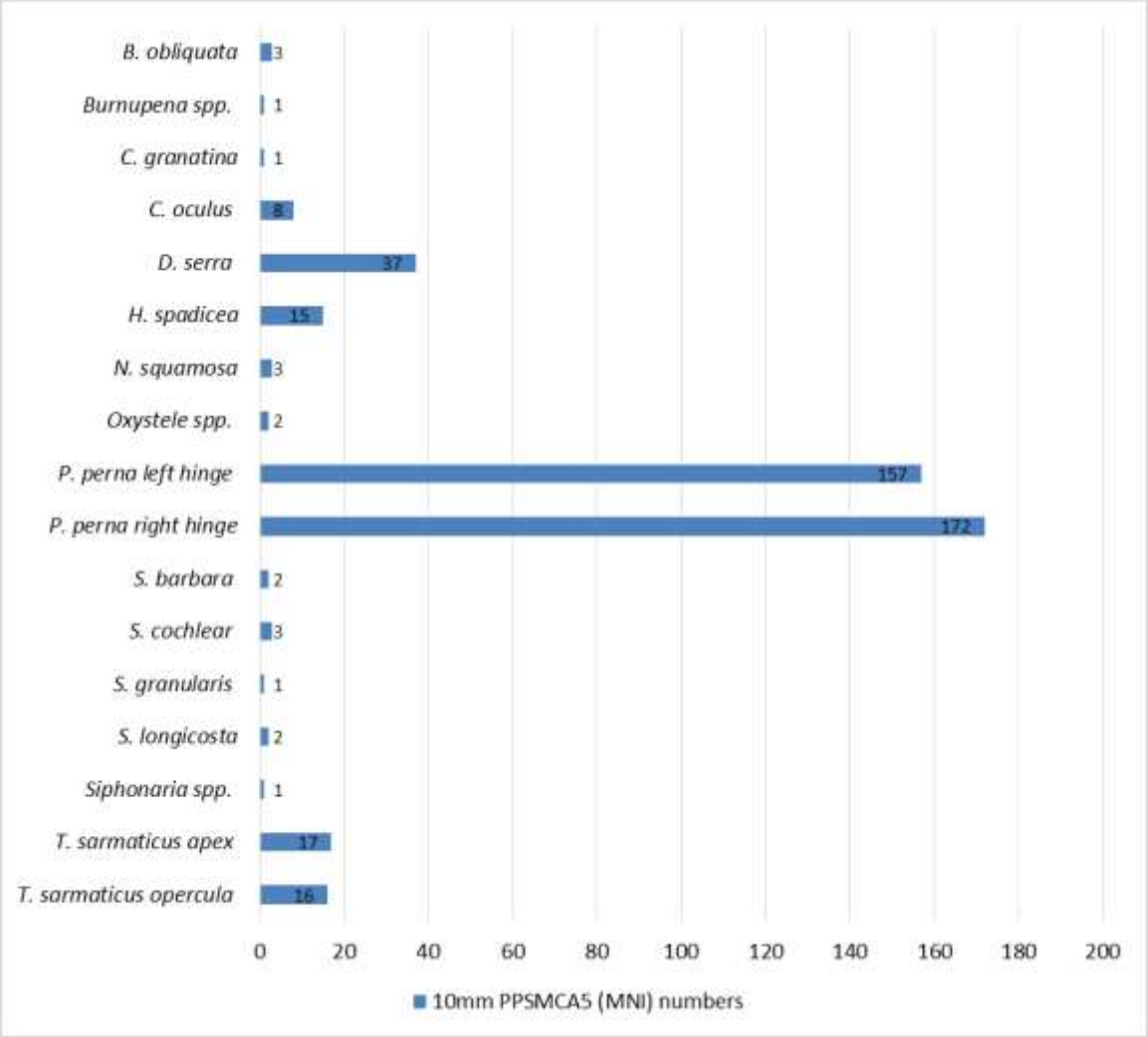


Figure 45. MNI numbers of the >10 mm material identified from PPSCMA5.

(0.30%). Only two unidentifiable limpet juveniles were identified from test pit 41 and 37. No measurements were taken and none of the PPSMCA5 material represent specimens from the plotted find samples. On the whole, the shell remains identified from PPSMCA5 indicate an exploitation strategy mainly focused on rocky shore species around the low and mid-intertidal zones with some reliance on sandy beaches as indicated by the presence of *D. serra*.

Discussion and Conclusion

The shell remains identified from PPSMC are consistent with an exploitation pattern primarily focused on the rocky shoreline in the vicinity of Pinnacle Point, centered around the mid- and low intertidal zones. With the majority of the assemblage consisting of large, easily collected rocky shore species with high to moderate flesh yields, i.e. *P. perna*, *T. sarmaticus*,

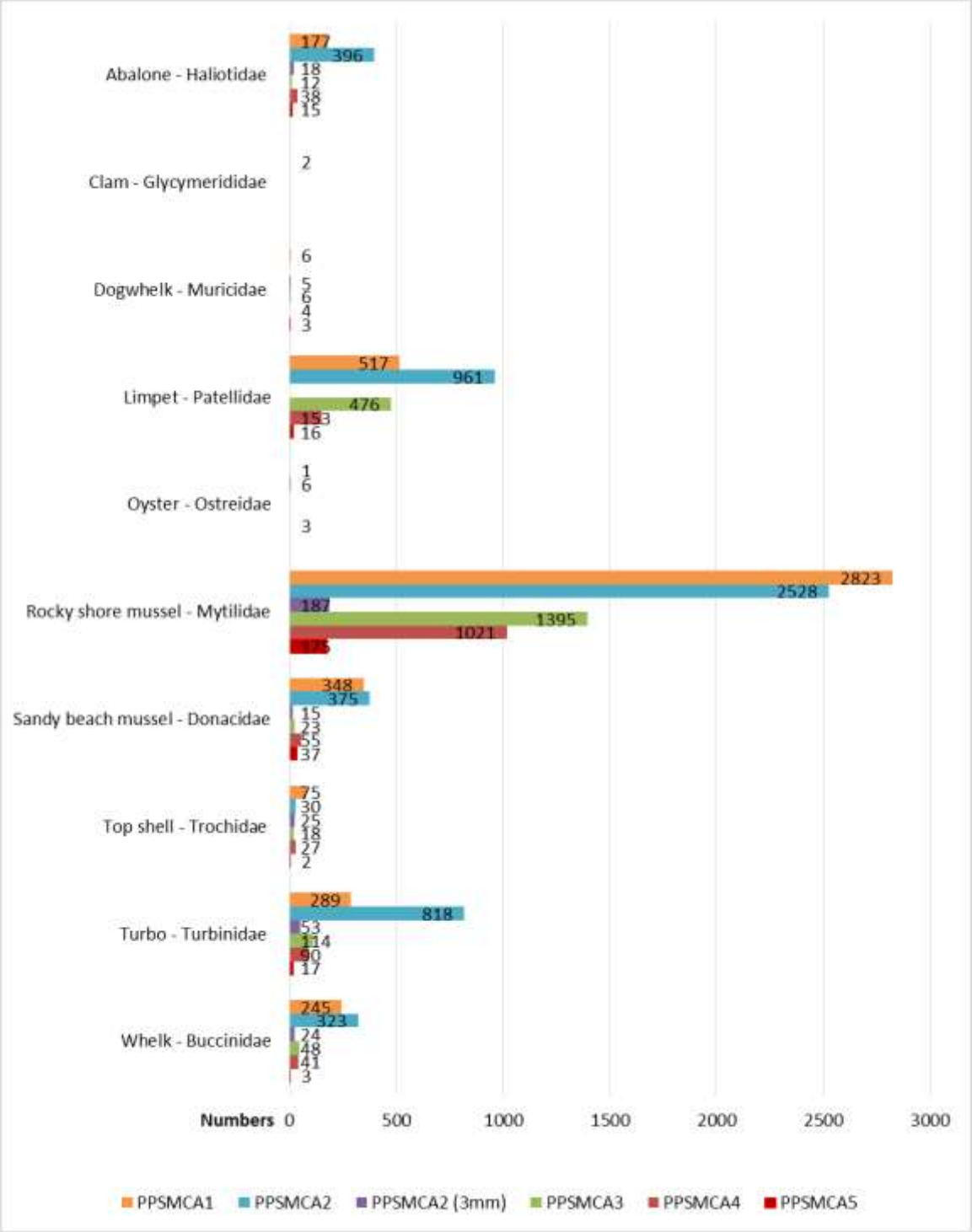


Figure 46. Family distribution from PPSMCA1 to PPSMCA5 shell based on MNI values.

various limpets and to a lesser extent *H. spadicea* (Figure 46). Buccinidae, known as true whelks, particularly *B. cincta*, are also relatively abundant. The presence of the sandy beach mussel *D. serra* identified from all five PPSMC areas also indicate exploitation of the long stretches of sandy beach areas visible from the site (Kyriacou, n.d.). The PPSMCA3 remains indicate the least reliance on this species. Though shellfish exploitation patterns were not

stable during the Holocene in the Western Cape, with species dominance fluctuating between mussels and limpets (Buchanan et al., 1984) the exploitation pattern at PPSMC, centered on the above mentions species, is a common pattern at LSA sites. The most commonly found species in LSA shell middens are *P. perna, D. serra, S. granularis, C. granatina, H. midae, T. sarmaticus, Burnupena* spp., and *Oxystele* spp. with inclusions of barnacle fragments of the Order Acrothoracica and rock lobster *Jasus lalandii* (Galimberti, 2010; Parkington, 2006; Steele and Klein, 2008). Though numerous barnacle fragments were identified from all five PPSMC areas they are not considered to have been actively collected for consumption but rather included into the deposits by being attached to other shells gathered as resource. No lobster fragments were identified from PPSMC.

Molluscan family distribution patterns at PPSMC (Figure 46), based on MNI values, indicate that the PPSMC occupants relied heavily on rocky shore mussels, limpets and turbo shell, with lesser reliance on abalone, whelks and sandy beach mussels. The dominance of *P. perna* at all five PPSMC areas is perhaps because it can be kept alive for some time after collection and thus transported back for later consumption (Jerardino and Marean, 2010; Waselkov, 1987). The most commonly exploited limpet species from PPSMC, i.e. *S. cochlear* and *S. longicosta* (Appendix C), have according to Kyriacou (n.d.) also been reported to be dominant for open air sites in the Garcia State Forest, as well as at Paapkuilfontein and Noetzie (Henshilwood, 1995; Hine, 2008; Kyriacou, 2009). Limpets are relatively easy to harvest as many species live intertidally in the mid- to upper shore, often close to the high-water mark (Steyn and Lussi, 1998). PPSMCA5 is the only area where limpet species are superseded by *D. sera, T. sarmaticus* and *Haliotis* spp. (Figure 46). Though this might be due to the smaller assemblage size, it does indicate that the occupants at PPSMCA5 utilized both rocky shore and sandy beach species more evenly. Top shells contributed the least amount to subsistence at all five PPSMC areas with virtually no reliance on clams, dog whelks or oysters by the LSA occupants of Pinnacle Point (Figure 46).

Lastly, no humanly modified mollusk shells or beads were identified from PPSMC. With the numerous small *Nassarius kraussianus* (tick shell) beads found at LSA sites in KwaZulu-Natal (Mazel, 1989), at Sk4 in the Kruger National Park (Plug, 1989), Sehonghong and Likoaeng in Lesotho (Plug and Mitchell, 2008) and the LSA and MSA levels of Blombos Cave (d'Errico et al., 2005; Henshilwood et al., 2004), in addition to the perforated limpets, pendants and worked shell at LSA sites such as Grootrif G (Jerardino and Maggs, 2007),

Noetzie (Orton and Halkett, 2007), Dunefield (Parkington et al., 2009) Diepkloof and De Hangen (Parkington, 1976).

Shell Report Appendix A.

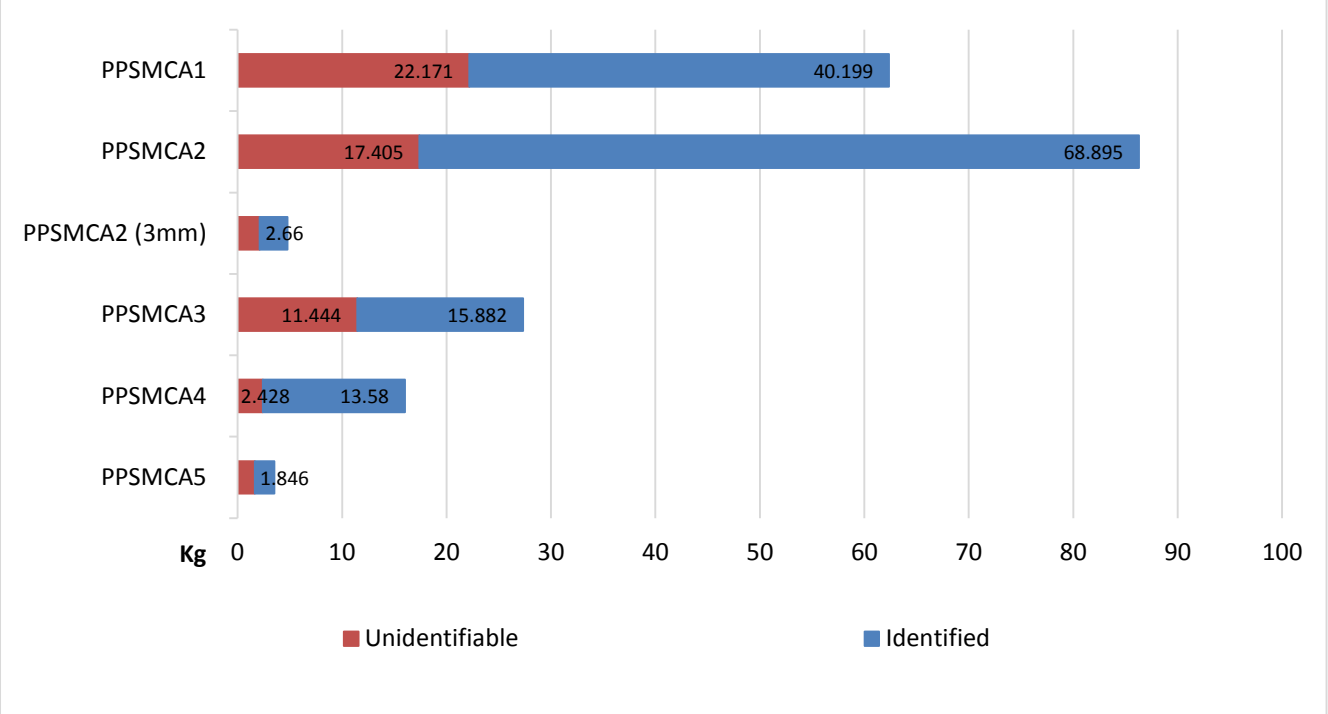
Species list of identified specimens from PPSMCA1, PPSMCA2, PPSMCA3, PPSMCA4 and PPSMCA5

Genus and species name	Common name	Class and Family name
Aulacomya atra	Ribbed mussel	Bivalvia - Mytilidae
Barbatia obliquata	Oblique ark shell	Bivalve - Arcidae
Burnupena cincta	Ridged Burnupena	Gastropoda - Buccinidae
Burnupena spp.	Unidentified whelk	Gastropoda - Buccinidae
Choromytilus meridionalis	Black mussel	Bivalvia - Mytilidae
Crassostrea spp.	Unidentified oyster	Bivalvia – Ostreidae
Cymbula granatina	Sandpaper limpet	Gastropoda - Patellidae
Cymbula miniata		Gastropoda - Patellidae
Cymbula oculus	Goats eye limpet	Gastropoda – Patellidae
Donax serra	White mussel	Bivalvia - Donacidae
Diodora spp.	Unidentified keyhole limpet	Gastropoda – Fissurellidae
Glycymeris spp.	Unidentified clam	Bivalvia – Glycymerididae
Haliotis midae	South African abalone	Gastropoda – Haliotidae
Haliotis spadicea	Blood spotted abalone	Gastropoda – Haliotidae
Haliotis spp.	Unidentified abalone	Gastropoda – Haliotidae
Helcion pectunculus	Prickly limpet	Gastropoda – Patellidae
Nucella spp.	Unidentified dogwhelk	Gastropoda – Muricidae
Nucella squamosa	Scaly dogwhelk	Gastropoda – Muricidae
Oxystele sinensis	Pink-lipped top shell	Gastropoda – Trochidae

Oxystele spp.	Unidentified top shell	Gastropoda – Trochidae
Oxystele tigrina	Tiger top shell	Gastropoda – Trochidae
Oxystele variegata	Variegated top shell	Gastropoda – Trochidae
Perna perna	Brown mussel	Bivalvia – Mytilidae
Scutellastra argenvillei		Gastropoda – Patellidae
Scutellastra barbara		Gastropoda – Patellidae
Scutellastra cochlear	Pear limpet	Gastropoda – Patellidae
Scutellastra granularis	Granular limpet	Gastropoda – Patellidae
Scutellastra longicosta	Long-spine or Duck-foot limpet	Gastropoda – Patellidae
Scutellastra tabularis		Gastropoda – Patellidae
Siphonaria spp.	Unidentified Limpet	Gastropoda – Siphonariidae
Thais capensis		Gastropoda – Muricidae
Turbo sarmaticus	South African turban	Gastropoda – Turbinidae

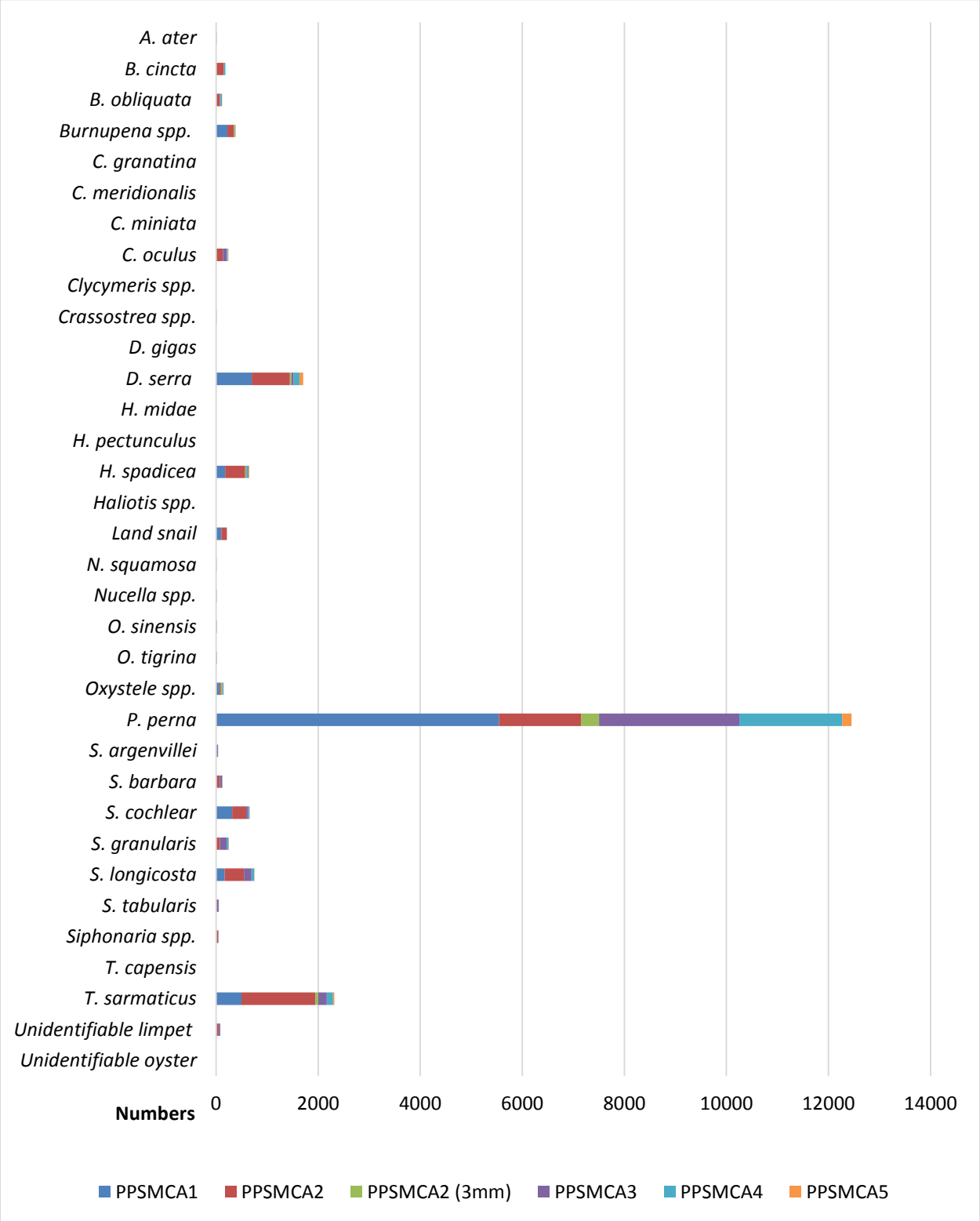
Shell Report Appendix B:

Unidentifiable vs. Identified specimen weights from PPSMCA1 to PPSMCA5



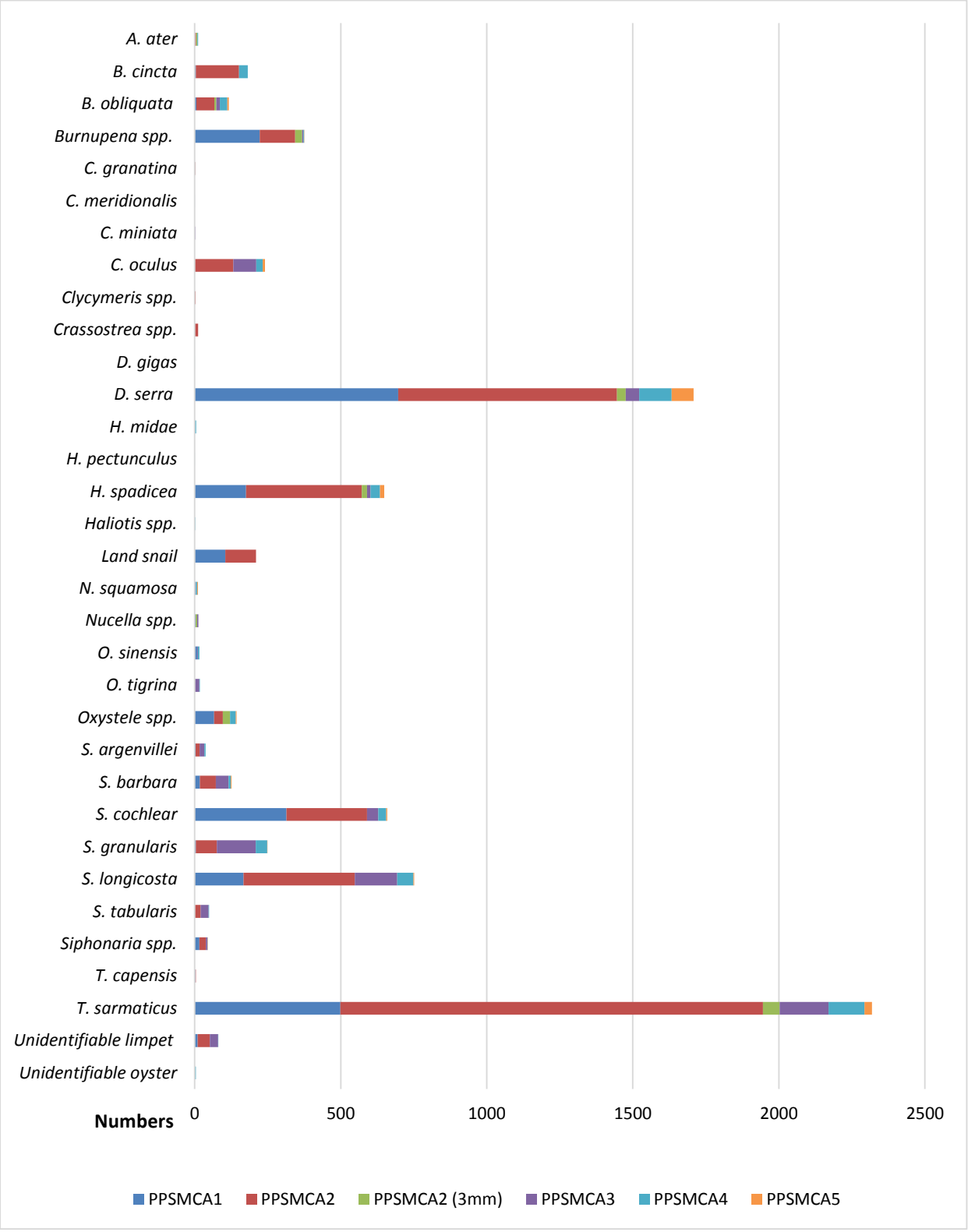
Shell Report Appendix C.

NISP values from the >10 mm and 3-10 mm fraction of PPSMCA1 to PPSMCA5 with *P. perna* included



Shell Report Appendix D

NISP values from the >10 mm and 3-10 mm fraction of PPSMCA1 to PPSMCA5 with *P. perna* excluded



Shell Report Appendix E

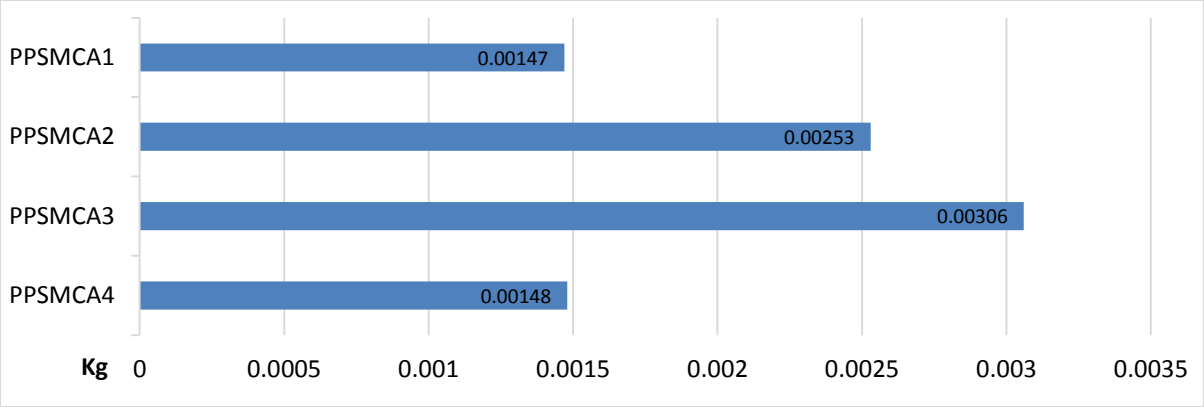
NISP numbers from the >10 mm and 3-10 mm fraction from PPSMCA1 to PPSMCA5

Species name	PPSMC A1 (>10 mm)	PPSMC A2 (>10 mm)	PPSMC A2 (3-10 mm)	PPSMC A3 (>10 mm)	PPSMC A4 (>10 mm)	PPSMC A5 (>10 mm)
A. atra		5	4		3	
B. cincta	4					
B. cincta		148			30	
B. obliquata	6	61	7	12	26	5
Burnupena spp.	223	121	24	4	3	1
C. granatina		1		1		1
C. meridionalis	1					
C. miniata				2		
C. oculus		132		79	22	8
Glycymeris spp.		3				
Crassostrea spp.		12				
D. gigas					1	
D. serra	697	749	30	46	111	75
H. midae					5	
H. pectunculus					1	
H. spadicea	176	396	18	12	32	15
Haliotis spp.	1				1	
Land snail	105	105				
N. squamosa	3			1	4	3

Nucella spp.	3		5	5		
O. sinensis	8			3	5	
O. tigrina	1			15	2	
Oxystele spp.	66	30	25		20	2
P. perna	5544	1606	354	2751	2013	186
S. argenvillei	3	14		16	4	
S. barbara	18	54		44	8	2
S. cochlear	314	276		38	28	3
S. granularis	4	72		133	39	1
S. longicosta	167	381		145	56	2
S. tabularis	1	19		28	1	
Siphonaria spp.	16	22		5	1	1
T. capensis	2	2				
T. sarmaticus	499	1446	58	167	123	26
Unidentifiable limpet	10	42		28	1	
Unidentifiable oyster	1				3	

Shell Report Appendix F

Water worn specimens weights (kg) identified from PPSMCA1, PPSMCA2, PPSMCA3 and PPSMCA4



Report on the ceramic assemblage from the PPPSMC

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Introduction

The Pinnacle Point Shell Midden Complex (PPSMC) consists of four spatially separate excavation areas (Areas 1-4) each containing one or more shell-rich, anthropological lens. Out of the four excavated areas, only two shell lenses contained pottery, both of which are located in Area 3. A total of 333 pieces of pottery were plotted in three dimensions by total station during the excavation and another 575 sherds were recovered from sieved material. The vast majority of the plotted pottery occurs within the lower, main anthropogenic layer (SMC3E) of Area 3 with an additional 3 plotted pieces located in the smaller, upper anthropogenic layer (SMC3V).

The sherds in Area 3 group spatially in three locations (Figure 47). Two groupings, one just to the south of the hearth, and the second, in the western portion of the site are extremely concentrated. Roughly 75% of the total ceramic assemblage and 63% (N=12) of the plotted rim sherds come from these groupings. The third group, located in the lower center and southeast portion of Area 3, possesses a more horizontally dispersed distribution. This grouping contains a lower overall portion of the plotted pottery (25%) while at the same time containing 37% (N=7) of the plotted rim sherds. A similar spatial pattern of a relatively high density of pottery located within two meters of cooking hearths is present at the Dunefield Midden site (Parkington et al., 2009). Parkington et al. contrasts hearths circumscribed with dense concentrations of pottery to those associated with lithics as a way to differentiate cooking hearths from areas of other specialized activities. Area 3's one major hearth structure

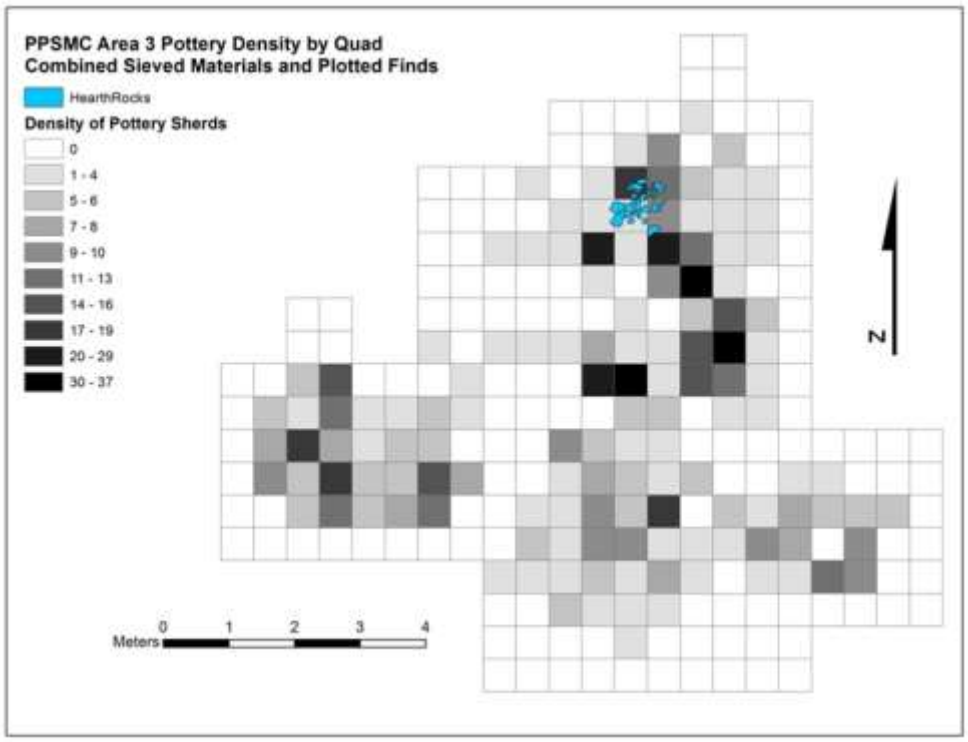

Figure 47. Map of the density of the combined plotted and sieved pottery in Area 3. Stone-lined hearth is highlighted in blue. Dashed red circles demarcate sherd groupings discussed in text.

does not conform to this pattern. Instead there is a high frequency of lithics associated with the hearth and when combined with the surrounding pottery suggests that Area 3's hearth may have been used for both cooking and a tool production area.

Out of the 333 total plotted pottery sherds there are a total of 19 rim sherds representing at least 12 vessels of various rim diameters. The PPSMC pottery rim morphologies and mouth diameters are described using published methodology (Sadr and Smith, 1991)(Figure 48) and fall into one of three morphological groupings. The vessels in the first group (N=5) have a rim diameter greater than 90mm and possess flattened rims. The second group (N=6) possess rim diameters in the range of 40mm to 90mm with both flat and rounded rims. The one vessel in the third group possesses a rim diameter of 20mm with a beveled rim. Four rim sherds were too small to measure vessel diameter and possessed either rounded or beveled rims. The

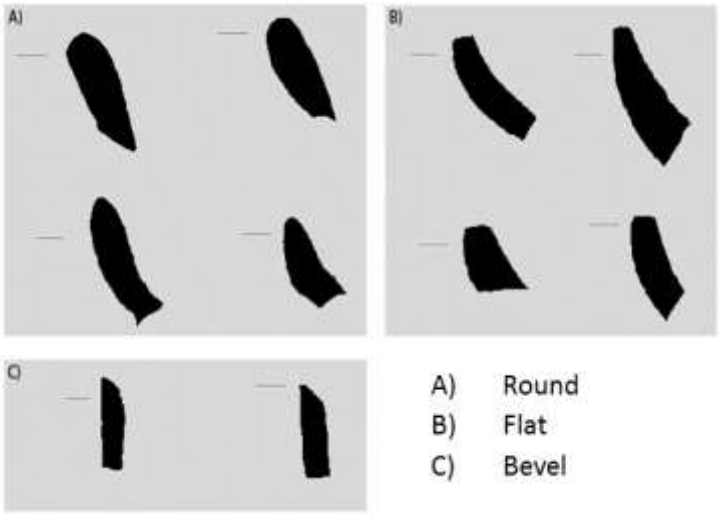

Figure 48. A sample of rim sherds from PPSMC displayed in profile. Rim sherds are organized by rim morphology.

overall average rim diameter is 97mm. All of the plotted rim sherds possess a burnished finish and only three rim sherds display carbon staining.

There were 11 decorated sherds plotted in Area 3. All decorations were incised and most of the decorated sherds (N=9) possessed parallel, horizontal or vertical lines (Figure 49). Of the remaining two sherds, one has repeating vertical lines framed by parallel horizontal lines (PF 01097) and one sherd has repeating dots framed by parallel horizontal lines (PF 01157). PF 01157 is the largest, most complete sherd and is an excellent example of a spouted vessel (Sadr and Smith, 1991). The framed dot motif rings the shoulder just below the neck of the spout and another framed dot rings what appears to be the beginnings of another shoulder leading to another mouth. All decorated sherds appear to be from the shoulder or base of the neck of the vessel.

All 333 plotted sherds appear to be produced out of a red paste with a sandy / quartz temper. The quartz component of the temper was variable in size with one vessel possessed a quartz crystal that was measured to be 3 millimeters long. For all sherds, the temper was extremely

coarse grained and was visible to the naked eye. Black carbon staining is present

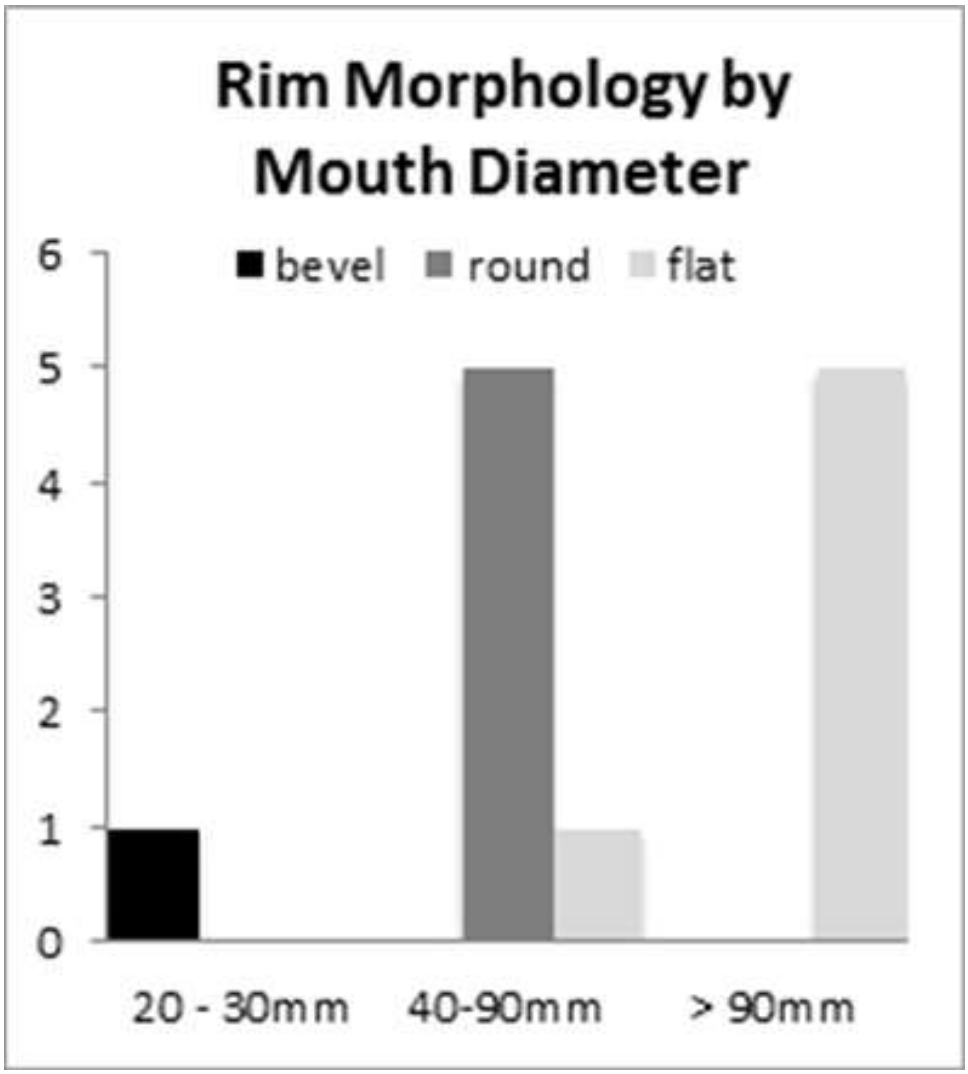

Figure 49. Rim morphology and mouth diameter of plotted PPSMC sherds by rim sherds count.

on 70% of the plotted sherds and 53% of the sherds possess a burnished finished. Overall, the assemblage shows an average wall thickness of 6 millimeters. Figure 51 through 54 provide high resolution photographs of examples of staining and paste.

Excavated materials at PPSMC were sieved through 10mm and 3mm screens. 465 sherds were recovered from the 10mm sieves while an additional 110 sherds were recovered from the 3mm sieves. Of the 10mm sieved materials there were 17 rim sherds and 12 decorated

Figure 50. Examples of plotted decorated sherds from Area 3. All designs elements are demarcated by blue highlight. 1)PF 01157, framed dot motif; 2)PF 01097, framed vertical lines motif; 3)PF 01333, intersecting vertical and horizontal motif; 4)PF 02264, horizontal lines motif; 5)PF 00174, horizontal lines motif; 6)PF 01334, vertical line motif; 7)PF 01907 horizontal line motif.

sherds. The 17 rim sherds are composed of either round or flat rims with one vessel displaying an externally thickened (Sadr and Smith, 1991) rim. Four of the decorated sherds possess decorations that appear to be continuations of the motifs on plotted finds PF 01157, PF 01097, or PF 01333 (Figure 50). It is interesting to note that there is as much as a two meter spacing between these four decorated sherds and their corresponding counterparts. It is unclear as to whether the sherd spacing is due to a deliberate relocation (i.e cleaning) or due to a taphonomic process (modern road cutting through site, hydraulic or aeolian forces, etc.). When the 10mm sieved sherd counts are included with the plotted find sherd counts we find that only 3% of the total sherd assemblage shows decoration. When including both of the 10mm and 3mm sieved materials the overall density of pottery sherds across Area 3 is 20 sherds per square meter.

The style of pottery recovered from PPSMC was first described by Sadr and Smith (1991) from the site of Kasteelberg located about 110km north of Cape Town and later described at a variety of sites in the Western Cape (Sealy et al., 2004; Smith et al., 1991; Stewart, 2005). The Kasteelberg ceramic sequence was subgrouped based on both site locale, either Kasteelberg A or Kasteelberg B, and by stratigraphic relation (Sadr and Smith, 1991). Each of the subgroups, named: KBA, lower KBB, and upper KBB, showed variation in overall pottery density and morphological traits as indicated by the 676 reported rim sherds from Kasteelberg (Sadr and Smith, 1991).

Despite the number of reported rim sherds being much greater for the upper KBB (N= 387) (Sadr and Smith, 1991) than that of PPSMC (N=19) we can see a definite similarity between the two assemblages (Table 1). Both PPSMC and upper KBB have predominantly round or flat rims, a low occurrence of beveled rims, and a majority of rim diameters greater than 40mm. While the PPSMC and upper KBB assemblages possess similar vessel morphologies, the main difference between them is the complete lack of decorations on the upper KBB vessels (Sadr and Smith, 1991) and the low frequency of decoration on the PPSMC vessels. The infrequent PPSMC decorations are stylistically similar to the decorations found on KBA style pottery but lack the higher design frequency present in KBA assemblages (Sadr and Smith, 1991). Due to the presence of KBA-style decorated sherds it is possible that a small portion of the ceramic assemblage at PPSMC is comprised of curated KBA style pottery (as discussed by Stewart 2005). Alternatively, PPSMC's pottery assemblage might represent a local Kasteelberg variant or transitory phase in the Kasteelberg ceramic sequence.

In conclusion, while occurring some 500 kilometers from the majority of Kasteelberg sites on the western coast the pottery recovered from the excavations at the Pinnacle Point Shell Midden Complex fits well within the Kasteelberg ceramic sequence (Sadr and Smith, 1991). Radiocarbon dates from stratigraphic layers containing pottery at PPSMC fall well within the

Kasteelberg B ceramic sequence age range of 1000 – 800 BP already established from a variety of other sites (Sealy et al., 2004; Smith et al., 1991; Stewart, 2005).

Figure 51. Example of pottery, Plot 1157.

Figure 52. Example of pottery, Plot 1334 and Lot 292.

Figure 53. Example of pottery, Plot 589 and Lot 144.

Figure 54. Example of pottery, Plot 172 and Lot 63.

Report on the ostrich shell and ostrich shell bead remains from the PPSMC

by

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Ostrich eggshell remains (OES) are rare at the PPSMC, and most of the worked OES is made into beads. No beads were plotted during the excavation – this is to be expected as they are so small. Beads were found during sorting only in the 3 mm and 1.5 mm sieved fractions. Beads were not found in Area 1, but Areas 2 through 4 had beads (Tables 4 and 5). Area 2 has by far the most beads (28) compared to just 6 in Area 3 and 3 in Area 4. Most are complete, and there are only a few in early stages of manufacture.

All beads were measured at the maximum point of their hole or aperture, and at the their maximum external measurement (Jacobson, 1987a, b; Smith et al., 1991). Figure 55 shows a bivariate plot of these two dimensions. The beads in Areas 2 and 4 are similar in size with means of maximum aperture of 1.58 mm and 1.39 mm respectively, while the beads in Area 3 are much larger with a mean of 2.27. It is noteworthy that Area 3 is also the only area with pottery.

Figures 56 through 57 provides photographs of examples of the beads found at the PPSMC.

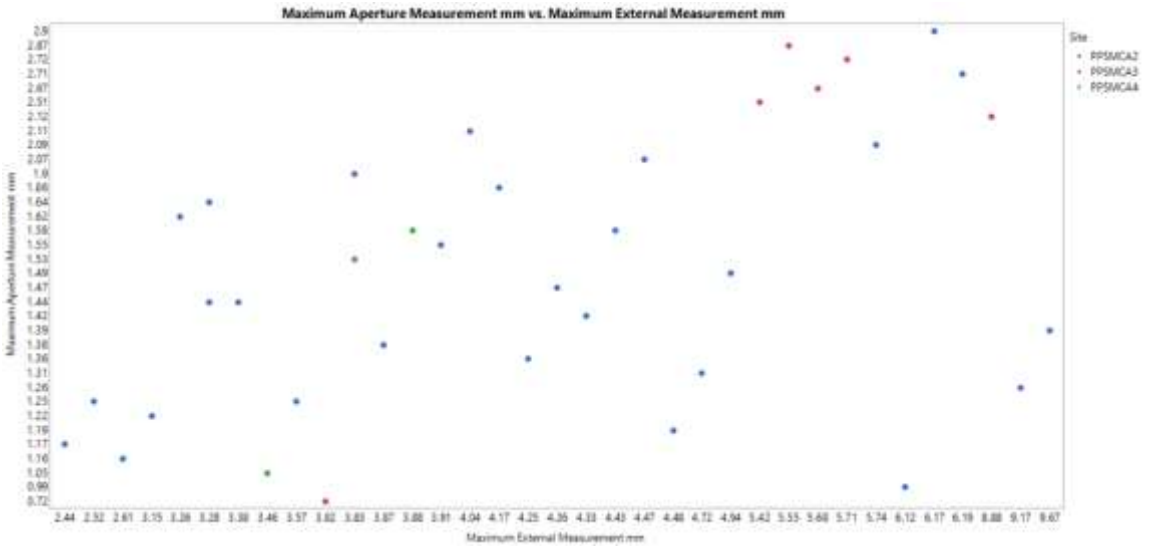

Figure 55. Plot of maximum bead external leangth versus maximum aperture diameter in mm. The beads are color-coded by Area.

Table 4. A list and raw measurements of all OES beads found at the PPSMC.

Site	Lot Number	Specimen number	Complete or Fragment?	Maximum External Measurement mm	Maximum Hole or Aperture Measurement mm
PPSMAC2	297	4542	complete	3.28	1.64
PPSMCA2	15	4023	complete	3.15	1.22
PPSMCA2	33	4016	complete	4.72	1.31
PPSMCA2	94	4008	complete	4.48	1.19
PPSMCA2	137	4004	complete	4.33	1.42
PPSMCA2	189	4029	complete	3.28	1.44
PPSMCA2	191	4018	complete	3.87	1.38
PPSMCA2	265	4020	complete	9.17	1.26
PPSMCA2	265	4021	complete	6.12	0.99
PPSMCA2	266	4025	complete	2.44	1.17
PPSMCA2	266	4026	complete	2.52	1.25
PPSMCA2	270	4027	complete	2.61	1.16
PPSMCA2	279	4028	fragment	3.91	1.55
PPSMCA2	300	4013	complete	4.26	1.47
PPSMCA2	369	4543	complete	3.57	1.25
PPSMCA2	372	4019	complete	9.67	1.39
PPSMCA2	373	4012	complete	4.25	1.36
PPSMCA2	400	4015	complete	4.17	1.86
PPSMCA2	485	4014	complete	4.94	1.49
PPSMCA2	488	4017	complete	4.43	1.58
PPSMCA2	565	4022	complete	4.47	2.07
PPSMCA2	817	4003	complete	6.19	2.71
PPSMCA2	819	4007	complete	6.17	2.9
PPSMCA2	861	4011	complete	3.38	1.44
PPSMCA2	883	4009	complete	4.04	2.11
PPSMCA2	883	4010	complete	3.83	1.9
PPSMCA2	unknown	4005	complete	5.74	2.09
PPSMCA2	unknown	4006	complete	3.26	1.62
PPSMCA3	463	4030	fragment	8.88	2.12
PPSMCA3	479	4024	fragment	3.82	0.72
PPSMCA3	500	4032	complete	5.68	2.67
PPSMCA3	500	4033	complete	5.71	2.72
PPSMCA3	500	4034	complete	5.42	2.51
PPSMCA3	500	4035	complete	5.55	2.87
PPSMCA4	143	4541	complete	3.46	1.05
PPSMCA4	163	4031	complete	3.88	1.58
PPSMCA4	180	4529	complete	3.83	1.53

Table 5. Summary statistics for the beads found at PPSMC. Note that unfinished and thus very large beads have not been included in the external measurement statistics.

Maximum Hole or Aperture Diameter

Area	N	Mean mm	Mininum mm	Maximum mm
PPSMCA2	28	1.58	0.99	2.9
PPSMCA3	6	2.27	0.72	2.87
PPSMCA4	3	1.39	1.05	1.58

Maximum External measurement

Area	N	Mean mm	Mininum mm	Maximum mm
PPSMCA2	26	4.13	2.44	6.19
PPSMCA3	5	5.24	3.82	5.71
PPSMCA4	3	3.72	3.46	3.88

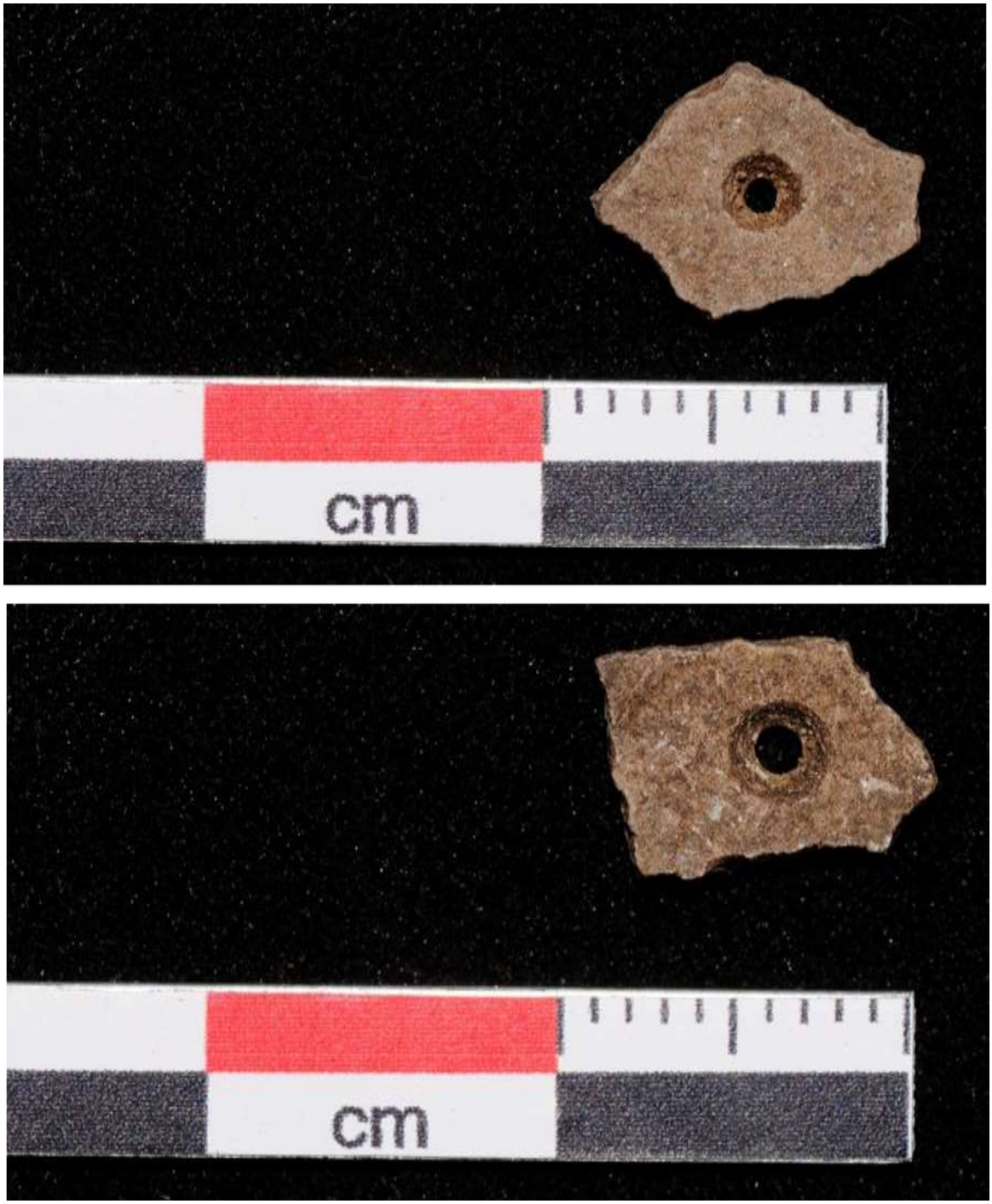

Figure 56. Example of beads in early production, Lots 372 (upper) and 265 (lower).

Figure 57. Examples of beads, Lots 191 (top) and 861 (bottom).

Report on the faunal remains from the PPSMC

by

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Faunal remains are well preserved at the PPSMC. The sample includes both plotted and sieved material, and we studied and included in this report all the plotted and 10 mm sieved faunal remains. We also sorted the 3 mm sieved faunal remains and cataloged those, and fish remains are abundant in that 3 mm sample. Since we do not have a fish specialist in our group, we did not study the very small and fragmented fish material, but we are endeavoring to find a scientist interested in studying them.

The faunal remains were examined and when needed compared to our extensive comparative collection at the MAPCRM facility in the Munro House, Dias Museum. Marean and Cleghorn are both very experienced zooarchaeologists, and have analyzed and studied African material for many years. The specimens were entered to computer database directly.

We present the number of specimens at two levels of categorization. At the level of "General Category", we group the specimens by bird, fish, mammal, reptile, and unidentified. At a more specific level, we group them by species or near-species level to try to detect more specific taxonomic patterns. For all presentations of data, we use the Number of identifiable Specimens (NISP). Since the collections are quite small we do not calculate MNIs. While

we present some broad comparative numbers on the birds, a more detailed report is provided separately on the bird remains.

Results

Area 3 has the largest sample of faunal remains, while Area 1 has the smallest (Tables 6 and 7). If we examine the general categories of animals represented, Area 1 is dominated by fish (56%) and mammals (31%) and when examined by species of the mammals, seals are the most abundant (13%). Area 2 differs in that mammals are more abundant than fish, making up 54% of the assemblage. Of the mammals, seals are the most abundant. Within the reptile category, tortoise is dominant, and in fact when calculated by this grouping tortoise is the most abundant taxon. Area 3 is dominated by mammals (48%) and birds (37%), and of those remains more specifically identifiable, the vast majority of seals. Area 4 is dominated by tortoise.

Table 6. The number of identifiable specimens (NISP) classified into general categories and grouped by area (above), and expressed as percentages (below).

	PPSMCA1	PPSMCA2	PPSMCA3	PPSMCA4
Birds	11	112	745	22
Fish	147	174	48	435
Mammals	82	625	988	61
Reptiles	6	240	39	74
Unidentified	18	56	220	43
Total	**264**	**1207**	**2040**	**635**

	PPSMCA1	PPSMCA2	PPSMCA3	PPSMCA4
Birds	4	9	37	3
Fish	56	14	2	69
Mammals	31	52	48	10
Reptiles	2	20	2	12
Unidentified	7	5	11	7

None of the areas preserved clear examples of the remains of domesticated animals, though one astragalus fragment from Area 3 was likely a caprine.

Table 7. The number of identifiable specimens (NISP) classified into specific categories and grouped by area (above), and expressed as percentages (below).

	PPSMCA1	PPSMCA2	PPSMCA3	PPSMCA4
Artocephalus pusillus	21	70	321	5
Bathyergus suillus	6	0	0	0
Bos/Syncerus	0	1	2	0
Raphicerus sp.	1	0	2	0
Tortoise	4	213	23	53
Fish	134	171	17	353
Total	**166**	**455**	**365**	**411**

	PPSMCA1	PPSMCA2	PPSMCA3	PPSMCA4
Artocephalus pusillus	13	15	88	1
Bathyergus suillus	4	0	0	0
Bos/Syncerus	0	0	1	0
Raphicerus sp.	1	0	1	0
Tortoise	2	47	6	13
Fish	81	38	5	86

Summary and Conclusions

Overall, the faunal remains in the PPSMC are dominated by fish and seals, with varying numbers of tortoises. However, this pattern can be deceptive – virtually all seal faunal fragments are identifiable to seal, while smaller mammal bones get grouped in a much more general category. This can make seals and fish look numerically more abundant than they are, and that is likely the case here. However, even so, the assemblages have strong components of marine animals while terrestrial animals are rather poorly represented.

Report on the bird remains from the PPSMC

by

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Among the archaeological assemblage a total amount 615 pieces of plotted bird bones were excavated. Along with the plotted pieces of bird bone remains there were also a total of 359 pieces of un-plotted, 10mm sieved, bird bone remains found. The 3mm and 1.5 sieved materials was not used in this study as the bird bone pieces are too small and fragmented to classify various bird taxa.

Most of the bird remains came from Area 3, but it must be taken into account that excavations in Area 3 were conducted on a much larger scale than Areas 1, 2 and 4.

Methodology

Marine bird remains excavated at the PPSMC were analysed using standard zooarchaeological techniques. All plotted and 10mm bird remains were counted and separated into groups based on the area (Area 1-4) in which they were excavated.

The bones were then gently brushed clean in water to remove all dirt and assist in better analysing the bird remains. The first step of analyses was to distinguish between identifiable and unidentifiable bird bone fragments. Identifiable fragments were then classified according to their skeletal element as well as their bird taxa by using comparative specimens from the Munro House at the Diaz Museum, Mossel Bay and the Iziko Museum, Cape Town. Dr. Graham Avery assisted with the identifications.

The bird remains were also studied under microscope to look for any signs of surface modification. Most of the bird remains' surfaces were badly damaged by root growth (Figure 58 and 59) making surface analyses very difficult.

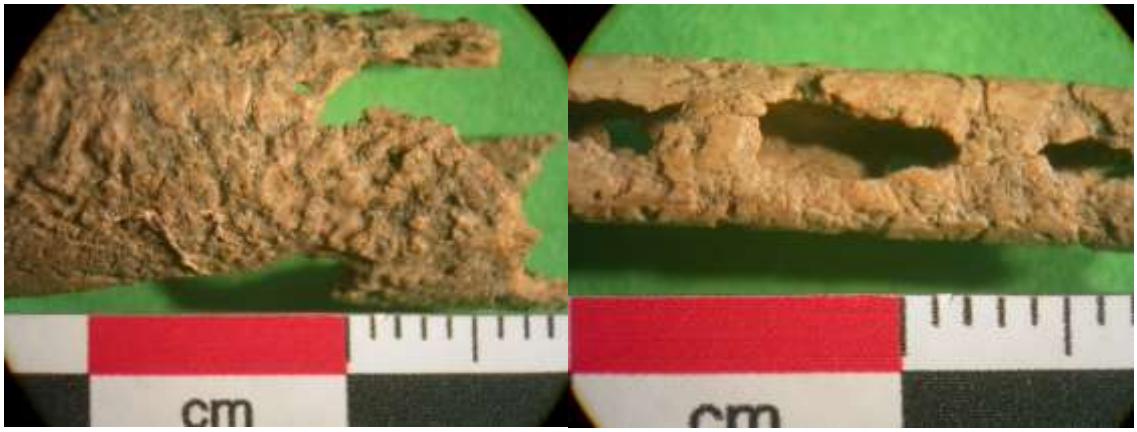

Figure 58. Microscopic photos showing the extent of root growth damage to the bird bones.

Out of the few bird bones that were better preserved some signs of surface modification was apparent. One of *Morus capensis* humeri did show signs of cut marks (figure 59) on the proximal shaft (Site: PPSMC3, Lot: 478, Specimen: 2156). Parallel cut marks was observed under microscope. The series of cut marks was about 1cm wide separated by 0.5 mm intervals.

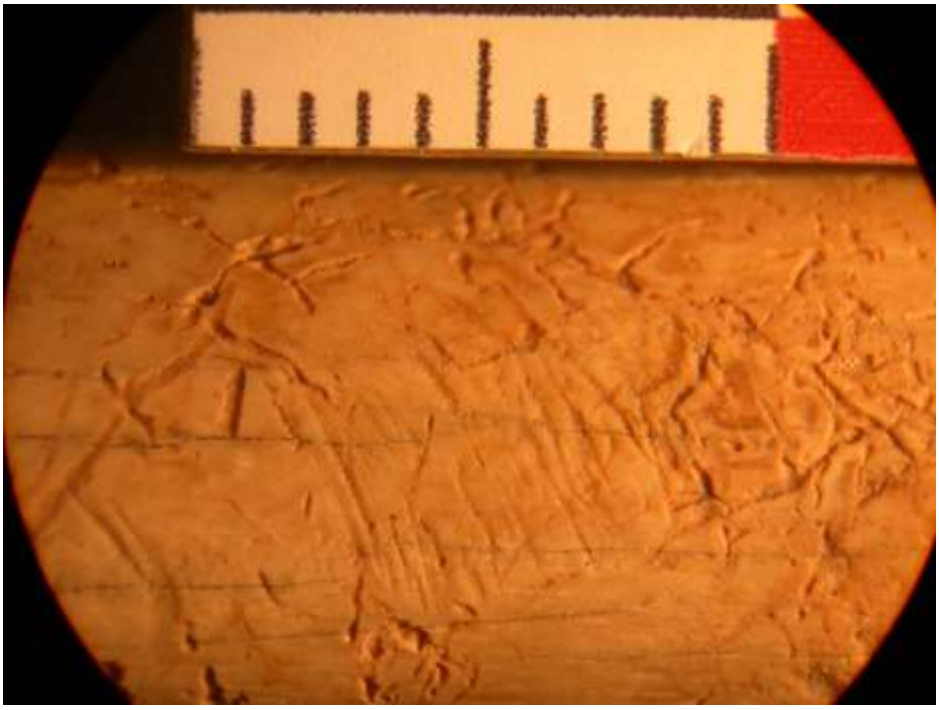

Figure 59. Parallel striations on the humerus of a Morus capensis bird.

The proximal shaft of a *Morus capensis'* humerus (Site: PPSMC3, Lot: 259, Specimen: 946) as well as the proximal shaft of a *Phalacrocorax lucidus'* radius (Site: PPSMC3, Lot: 413, Specimen: 1892) showed signs of gnaw marks by a small rodent (Figure 60).

Figure 60. Bite mark of a rodent present on the humerus of a Morus capensus bird.

Microscopic study of the inside cavity of a *Morus capensis* femur (Site: PPSMC3, Lot: 293, Specimen: 1255) showed the presence of microfauna remains within the cavity (Figure 61).

Figure 61. Microfauna bones present within the distal end of a Morus capensis femur.

A midshaft bone fragment of a *Morus capensis* also shows clear signs of being used as bone tool (Figure 62). The bone tool is about 3cm long and is broken (snapped) on the one end

while ending in a worn sharp point on the other. The surface is visibly polished and shows angled, parallel striation marks.

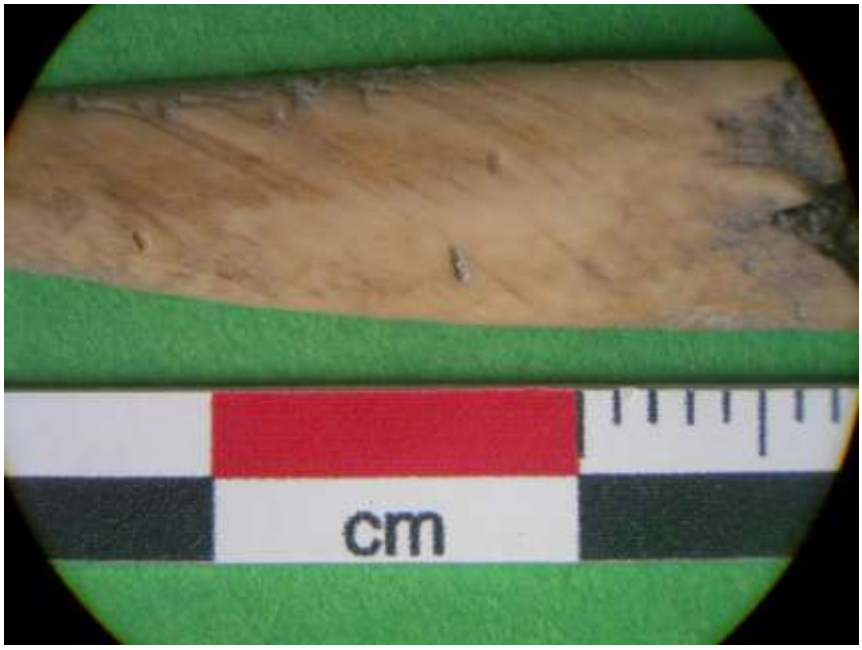

Figure 62. A bone tool made from a midshaft fragment of a Morus capensis longbone.

Overall results of PPSMC's bone analysis

Table 9 shows a summary of the results of the PPSMC bird bone analyses. Almost all of the birds identified in the plotted find and 10mm collection belonged to the order Ciconiiformes (marine birds)(Hockey et al., 2005). The only exception was one bone belonging to the order Strigiformes (owls). The most prominent families present in the record were that of the family Sulidae (Gannets) and the family Phalacrocoracidae (Cormorants).

Under the family Phalacrocoracidae the following species were found; *Phalacrocorax capensis* (Cape cormorant), *Phalacrocorax lucidus* (White-breasted cormorant) and the *Phalacrocorax neglectus* (Bank cormorant).

Under the family Procellariidae family the *Morus capensis* (Cape gannet) was the most dominant bird species present in the bone assemblage. The *Morus capensis* made up 43% of the plotted find assemblage and 17% of the 10mm assemblage.

The Phalacrocorax species (Cormorants) was the second most prominent species making up 6.5% of the plotted find assemblage and 4% of the 10mm assemblage.

Other species that also appeared in the plotted find and 10mm assemblage were the *Spheniscus demersus* (Jackass penguin), the *Procellaria aequinoctialis* (White-chinned Petrel) and *Bubo africanus* (Spotted Eagle-Owl).

Table 9. A summary of the results of the PPSMC bird bone analysis. The bird bones were classified according to family, species, the amount of plotted and 10mm bones belonging to that certain species, and the percentage of bones in relation with the total amount of bird bones discovered at PPSMC.

Plotted Bird				
Family	**Species**	**Number of plotted finds belonging to family/species**	**Total amount of plotted finds**	**Percentage**
Phalacrocoracidae	Phalacrocorax capensis	30	615	4.88%
Phalacrocoracidae	Phalacrocorax lucidus	9	615	1.46%
Phalacrocoracidae	Phalacrocorax neglectus	1	615	0.16%
Procellariidae	Unidentified	5	615	0.81%
Spheniscidae	Spheniscus demersus	17	615	2.76%
Strigidae	Bubo africanus	1	615	0.16%
Sulidae	Morus Capensis	265	615	43.09%
Unidentified	Unidentified	287	615	46.67%
10mm Bird				
Family	**Species**	**Number of specimens belonging to family/species**	**Total amount of specimens**	**Percentage**
Phalacrocoracidae	Phalacrocorax lucidus	7	359	1.95%
Phalacrocoracidae	Phalacrocorax neglectus	8	359	2.23%
Phalacrocoracidae	Unidentified	4	359	1.11%
Procellaria	Procellaria aequinoctialis	1	359	0.28%
Spheniscidae	Spheniscus demersus	7	359	1.95%
Spheniscidae	Unidentified	3	359	0.84%
Sulidae	Morus Capensis	61	359	16.99%
Unidentified	Unidentified	268	359	74.65%

Results of Area 1 bone analyses

Results from Area 1 were not very insightful (Table 2). A total amount of 11 bird bones were identified in the plotted find and 10mm record. Identifiable species in Area 1 was *Phalacrocorax lucidus* (White-breated cormorant) and *Spheniscus demersus* (Jackass penguin).

Table 10. Results of Area 1 bone analysis.

Area 1				
Plotted bird				
Family	**Species**	**Number of plotted finds belonging to family/species**	**Total amount of plotted finds/specimens**	**Percentage**
Unidentified	Unidentified	2	2	100%
10mm				
Phalacrocoracidae	Phalacrocorax lucidus	1	9	11.11%
Spheniscidae	Spheniscus demersus	3	9	33.33%
Unidentified	Unidentified	5	9	55.56%

Results of Area 2 bone analyses

Area 2 delivered a diverse amount of bird species (Table 3). Six different species could be identified in the plotted find and 10mm bird bone assemblage (112 bones). The following species were present in Area 2: *Phalacrocorax capensis* (Cape cormorant), *Phalacrocorax neglectus* (Bank cormorant), *Spheniscus demersus* (Jackass penguin), *Bubo africanus* (Spotted Eagle-Owl), *Morus capensis* (Cape gannet), Procellaria aequinoctialis (White-chinned Petrel).

The Cape cormorant was the most prominent species found in Area 2 making out 32.89% of the plotted find and 11.11% of the 10mm assemblage. The second most prominent species was the Cape gannet. It made out 14.47% of the plotted find and 16.67% of the 10mm bird bone assemblage.

Table 11. Results of Area 2 bone analysis.

Area 2				
Plotted bird				
Family	**Species**	**Number of plotted finds belonging to family/species**	**Total amount of plotted finds/specimens**	**Percentage**
Phalacrocoracidae	Phalacrocorax capensis	25	76	32.89%
Phalacrocoracidae	Phalacrocorax neglectus	1	76	1.32%
Procellariidae	Unidentified	5	76	6.58%
Spheniscidae	Spheniscus demersus	9	76	11.84%
Strigidae	Bubo africanus	1	76	1.32%
Sulidae	Morus capensis	11	76	14.47%
Unidentified	Unidentified	24	76	31.58%
10mm				
Phalacrocoracidae	Phalacrocorax neglectus	4	36	11.11%
Phalacrocoracidae	Unidentified	1	36	2.78%
Procellaria	Procellaria aequinoctialis	1	36	2.78%
Spheniscidae	Spheniscus demersus	1	36	2.78%
Sulidae	Morus capensis	6	36	16.67%
Unidentified	Unidentified	23	36	63.89%

Results of Area 3 bone analysis

Area 3 delivered the largest amount of bird bone remains totaling at 751 bones (Table 4). Five different species were identified in Area 3: *Phalacrocorax capensis* (Cape cormorant), *Phalacrocorax lucidus* (White-breated cormorant), *Phalacrocorax neglectus* (Bank cormorant), *Spheniscus demersus* (Jackass penguin) and *Morus capensis* (Cape gannet).

The Cape gannet was the most prominent species present in Area 3 making out 48.38% of the plotted bird and 21.24% of the 10mm bird remains.

All signs of surface modification only came from Area 3. Almost all of the surface modifications were done on Cape gannet bird bones.

Table 12. Results of Area 3 bone analyses.

Area 3				
Plotted bird				
Family	**Species**	**Number of plotted finds belonging to family/species**	**Total amount of plotted finds/specimens**	**Percentage**
Phalacrocoracidae	Phalacrocorax capensis	1	525	0.19%
Phalacrocoracidae	Phalacrocorax lucidus	9	525	1.71%
Spheniscidae	Spheniscus demersus	5	525	0.95%
Sulidae	Morus capensis	254	525	48.38%
Unidentified	Unidentified	256	525	48.76%
10mm				
Phalacrocoracidae	Phalacrocorax lucidus	5	226	2.21%
Phalacrocoracidae	Phalacrocorax neglectus	1	226	0.44%
Phalacrocoracidae	Unidentified	2	226	0.88%
Spheniscidae	Unidentified	1	226	0.44%
Sulidae	Morus capensis	48	226	21.24%
Unidentified	Unidentified	169	226	74.78%

Results of Area 4 bone analyses

Area 4 delivered only 23 bird remains (Table 5). The only species that could be identified *was Phalacrocorax capensis* (Cape cormorant), *Spheniscus demersus* (Jackass penguin), *Phalacrocorax neglectus* (Bank cormorant).

Table 13. Results of Area 4 bone analyses.

Area 4				
Plotted bird				
Family	**Species**	**Number of plotted finds belonging to family/species**	**Total amount of plotted finds/specimens**	**Percentage**
Phalacrocoracidae	Phalacrocorax capensis	4	12	33.33%
Spheniscidae	Spheniscus demersus	3	12	25.00%
Unidentified	Unidentified	5	12	41.67%
10mm				
Phalacrocoracidae	Phalacrocorax neglectus	2	11	18.18%
Unidentified	Unidentified	9	11	81.82%

Discussion and Conclusion

According to Avery (2011) bird remains occur in virtually all coastal archaeological sites in South Africa from Middle Stone Age onwards. Among coastal archaeological sites like

Eland's Bay Cave, Die Kelders Cave 1 and Nelson Bay Cave marine species seem to be the most common. PPSMC seems to have similar results (see page 4) as all the identified species except for one belong to the Ciconiiformes (marine birds) order.

Avery (2011) believes that these birds were acquired for food as well as raw material for tools, ornamentation, containers and symbolic objects. The only evidence of cut marks comes from Area 3. One Cape gannet humerus showed signs of being cut.

The most likely reason for the little evidence of cut marks on bird bones is discussed by Serjeantson(2009). According to Serjeantson birds are rarely skinned because they have a layer of fat below the skin. This fatty layer is very desirable as it provides nutritional value and flavour. Skinning was only used when the skin was removed for clothing or decoration. Serjeantson believes that by stewing birds in cooking pots rather than roasting it over an open fire would leave the flesh tender, making the use of a cutting implement to remove the meat unnecessary.

Avery (2011) believes that the presence of cut marks on bird remains may also be the result of tool and ornament manufacture. In Area 3 (see page 4 and figure 6) a bone tool was discovered made out of a midshaft fragment of a Cape gannet longbone.

The most common marine birds found by Avery (2011) were the Cape gannet, Cape cormorant and the African penguin (Jackass penguin). Similar results were found when looking at the overall results of the PPSMC bone analyses (see page 4-5 and Table1).

Based on 29 years of beached bird surveys Avery (2011) argues that beached birds could serve as a viable resource for coastal foragers if these various taxa have a strong summer-winter and taxon related seasonality in their availability. According to ethnographic accounts snares and throwing sticks could also have been used to catch certain birds(Avery, 2011).

Beach surveys on the South-east Coast of South Africa have shown that beached Cape gannet are very common between January and May. Beached Phalacrocoracidae (Cormorants) seemed to be abundant between July to September. Lastly beached *Spheniscus demersus* (Jackass penguin) seemed to be more abundant between January and May, but the months between July and September also provided a good amount of beached penguin(Avery, 2011).

Comparing these beached bird results with the archaeological record of PPSMC might indicate in which seasons these Areas were exploited. Area1 and Area 4 may have been

exploited during the winter between July and September. Area 2 seems to have been occupied through the whole year as there is a large amount of Cormorants (dominant in July to September) and Cape Gannets (dominant in January to May). Lastly Area 3 seems to have been occupied in between July and September as the site is dominated by Cape Gannet bones.

Looking at the bird remains found at PPSMC it seems that marine birds were used as food resource as well as a source for manufacturing tools. The seasonal availability of beached marine birds also seems to have been optimised by the occupants of Areas 1-4.

Report on the radiocarbon dates from the PPSMC

by

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Radiocarbon dates were run on each of the four excavation areas, and when possible on the major stratigraphic units. Some areas received more intensive dating than others. MAPCRM submitted radiocarbon dates to Beta Analytic Inc., 4985 SW 74th Court, Miami, Florida 33155, USA, Tel: (1) 305-667-5167, Fax: (1) 305-663-0964, E-mail: lab@radiocarbon.com. Dr. Andy Herries submitted samples for radiocarbon dating as part of a separate project, to ANSTO (Australian Nuclear Science and Technology organization, http://www.ansto.gov.au). These sample results are reported below.

Table 8. The radiocarbon dates for the PPSMC.

Mapcrm Ages												
Sample Number	BetaAnalytic Number	General Description	Area	Lot Number	Square	Quadrant	StratUnit Name	Material	d13C	CONVENTIONAL AGE	2 SIGMA CALIBRATION (SHCAL13)	
417630	380658	C14-AMS	PPSMC1	37	N846E956	NW	A	charcoal	-24.7 o/oo	2180 +/- 30 BP	Cal BC 350 to 300 (Cal BP 2300 to 2250)	
417636	380661	C14-AMS	PPSMC1	102	N844E057	SE	C	charcoal	-28.2 o/oo	2920 +/- 30 BP	Cal BC 1125 to 975 (Cal BP 3075 to 2925)	
417629	380657	C14-AMS	PPSMC2	822	N921E083	SE	Z	charcoal	-23.9 o/oo	1680 +/- 30 BP	Cal AD 360 to 475 (Cal BP 1590 to 1475)	
417632	380659	C14-AMS	PPSMC2	168	N922E103	SE	C1	charcoal	-23.7 o/oo	2470 +/- 30 BP	Cal BC 745 to 685 (Cal BP 2695 to 2635)	
417626	380656	C14-AMS	PPSMC3	368	N960E127	NW	E	charcoal	-24.2 o/oo	1160 +/- 30 BP	Cal AD 775 to 970 (Cal BP 1175 to 980)	
417633	380660	C14-AMS	PPSMC4	31	N922E154	SE	H	charcoal	-23.1 o/oo	2430 +/- 30 BP	Cal BC 540 to 395 (Cal BP 2490 to 2345)	
417637	380662	C14-AMS	PPSMC4	147	N928E153	SW16	H	charcoal	-24.8 o/oo	2410 +/- 30 BP	Cal BC 735 to 690 (Cal BP 2685 to 2640)	
Andy Herries Ages - all on hearth in Area 3												
Sample Number	ANSTO Number	General Description	Area	Lot Number	Square	Quadrant	StratUnit Name	Material	d13C	CONVENTIONAL AGE	2 SIGMA CALIBRATION (SHCAL13)	
SMC3KC1	OZM862 Charcoal	C14-AMS	PPSMC3	95	N954E128	SW	K	charcoal	-23.3 +/- 0.1	1125 +/- 30	893-1020 cal AD	
SMC3KC2	OZM863 Charcoal	C14-AMS	PPSMC3	95	N954E128	SW	K	charcoal	-24.2 +/-0.1	1120 +/- 30	893-1023 cal AD	
SMC3KOP	OZM864 Shell Opercula	C14-AMS	PPSMC3	95	N954E128	SW	K	shell - opercula	3.1 +/- 0.1	1490 +/- 30	1150-1268 cal AD	NOT DCF corrected

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