ARCHAEOLOGICAL RESEARCH AT CAUTION BAY, PAPUA NEW GUINEA

CULTURAL, LINGUISTIC AND ENVIRONMENTAL SETTING

Edited by

Thomas Richards, Bruno David, Ken Aplin and Ian J. McNiven
Cover: Tanamu 2 excavations in progress, 27 November 2009. The site is located 110 metres inland of the mangrove-fringed coastline, on the western margin of Caution Bay's alluvial plain as it extends into the littoral zone. Occupation at the site peaked around 2500 cal BP (photograph by Ian J. McNiven).
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Chapter 1.
Introduction to the Caution Bay Archaeology Project

Thomas Richards, Bruno David, Ken Aplin, Ian J. McNiven and Matthew Leavesley

Introduction

In 2008 we began intensive archaeological surveys at Caution Bay, located 20km to the northwest of Port Moresby, Papua New Guinea (Figure 1.1). We followed this with the excavation of 122 stratified sites in 2009-2010, and detailed analysis of the well preserved and abundant faunal, ceramic and lithic finds has been continuing ever since.

The Caution Bay Archaeology Project is providing new and exciting contributions to western Pacific prehistory. It has radically expanded the known geographic distribution of the Lapita Cultural Complex to include, for the first time, the southern coast of Papua New Guinea; it has established the relationship of Lapita to later cultural expressions in this area; it has pinpointed the time of arrival of domesticated animals along the southern coast of Papua New Guinea and, by inference, on the larger island of New Guinea; it has provided new insights into the impact of resident populations on local terrestrial and marine environments over a 5000 year time period; and perhaps of greatest significance, it has provided a unique opportunity to document, using multiple strands of archaeological evidence, interactions between resident and colonizing populations at a time of cultural transformation c. 2900 years ago.

Over seven hundred indigenous archaeological sites were identified in survey areas comprising coastal and inland landscapes drained by the Vaihua River and Ruisasi Creek (see Chapter 8). The archaeological excavation of 122 stratified sites within the core study area, measuring 3.1km east-west by 2.8km north-south, comprises the largest excavation program ever undertaken in the western Pacific (Figure 1.2). Detailed analyses by experts of the finds from the excavations is fully supported by a dating program consisting of more than 1300 AMS...
radiocarbon dates, a number unprecedented for any single archaeology project in the southern hemisphere.

The Caution Bay Archaeology Project was only possible on such an unprecedented scale because it formed part of cultural heritage impact studies in advance of construction of a liquefied natural gas plant near Port Moresby. The client, along with the main proponent, maintained control of the cultural heritage management aspects of the development from the outset, with our responsibility largely focused on research-oriented salvage excavations.

Intensive pedestrian field surveys were undertaken across the entire study area in late 2008 and early 2009, following burning of the grass to provide a high degree of ground visibility. Site survey and the subsequent salvage excavations were supervised by staff of Monash University; the main salvage excavations took place in a narrow window of time from September 2009 through to March 2010, and were immediately followed by large-scale infrastructure construction activities. Following the main salvage period, a small team of archaeologists was permitted to return to excavate a single human burial in April 2010. Wet sieving of excavated sediments and the preliminary sorting of finds in the field laboratory continued until June 2010.

The salvage excavation program relied extensively on the collaboration and participation of University of Papua New Guinea staff and students. Local community representatives of Boera, Papa, Lea Lea and Porebada villages also made substantial contributions, especially to the fieldwork. These village representatives, employed by the developers, worked with professionally trained Monash University personnel on all aspects of the fieldwork, both at the sites and in the field laboratory.

Following completion of the salvage work and reporting to the clients in mid-2011, Phase 2 research set in with the excavated materials, now housed at Monash University, becoming available for more detailed analyses and
Occupation phases than the off-dune clay and clayey to have deeper stratified cultural deposits with more and clayey loam slopes and hilltops of the highland coastal sand dune, riverine lowland sub-coastal plains. Excavations were undertaken in three main landforms: other materials. Human skeletal remains, human and animal aDNA, and artefacts, sediments, pollen, obsidian, pottery fabrics, warranted on special classes of finds including shell materials such as obsidian and ceramics. Features such as infilled postholes, hearths and earth ovens are rare and only two sites have human burials, although isolated human remains are fairly common. Typically, detailed laboratory investigations were undertaken by specialists on the faunal remains, ceramics and lithics from each site, but additional specialist analyses were frequently warranted on special classes of finds including shell artefacts, sediments, pollen, obsidian, pottery fabrics, human skeletal remains, human and animal aDNA, and other materials.

Excavations were undertaken in three main landforms: coastal sand dune, riverine lowland sub-coastal plains with clayey and clayey loam sediments, and low rocky and clayey loam slopes and hilltops of the highland foothills. Sites located on the coastal sand dune tend to have deeper stratified cultural deposits with more occupation phases than the off-dune clay and clayey loam sites, which tend to be shallower and usually only contain one major occupation phase, although there are some exceptions to this general pattern. The combination of well-dated deeply stratified multi-occupation deposits at a few locations and many single occupation components from throughout the study area allow us to construct a highly detailed culture-historical sequence, and thence, to investigate in considerable detail many research themes, as detailed below.

Research Goals and Themes

Originally, our research goals focused on building a well-dated cultural sequence for Caution Bay, with emphasis on a detailed ceramic sequence, plus attention on the emergence of the historic hiri trade (discussed below and at length in Chapter 6), the timing of the introduction of domesticates including the pig, dog and chicken, and the understanding of land-use patterns through time. At the time of writing we have unambiguous evidence of human occupation dating back to more than 5000 cal BP with cultural horizons covering every century from 4300 cal BP to at least 1500 cal BP. For the more recent period of the past 1500 years, we have not yet begun to study those sites in any detail, but radiocarbon dates already, and possibly entirely, fill this gap. There are yet many sites that are still undergoing analysis and dating, and it is likely that the start of the Caution Bay cultural sequence will be extended further back into the past, while at the other end of the chronological spectrum, the possibly less well represented last 1500 years (or less) of the sequence will likely be fleshed out with more analysis and dating. These results have more than doubled the age of the previously earliest dated archaeological evidence, and have provided the first record of pre-ceramic coastal adaptations, for the broader Port Moresby region. As a historical foundation for understanding the long-term development of the ethnographic cultural landscape, the results from Caution Bay are probably without parallel in the wider Pacific region.

Without doubt the single most startling outcome of the excavations at Caution Bay was the discovery of a Lapita colony dating to c. 2900-2600 cal BP, and our research goals have diversified accordingly; they now include nine major themes, as introduced below. Naturally, these themes are not mutually exclusive but, rather, form an integrated whole with numerous overlapping and interdigitating elements.

Lapita Colonization

The combination of abundant finely-excavated ceramics and other materials, and precise chronological control from numerous sites, allows us to accurately document the time of arrival of Lapita colonists at Caution Bay. Since we also have pre-ceramic occupation sites in a common locality dating from c. 5000 years ago up to
the arrival of Lapita peoples, we are presented with an opportunity unique in the Pacific to characterize the nature of initial interactions between incoming Lapita and pre-existing groups at this critical social and cultural juncture, as well as their subsequent relationships.

Also important to consider are the ties the colonists maintained with other parts of the Lapita world, or at least with their place of origin, after arriving at Caution Bay. We will examine this issue through assessment of the Caution Bay archaeological record against the wider corpus of regional studies.

**Ceramic Transformations**

The emphasis of the Caution Bay ceramic analysis is to produce a local sequence using only the Caution Bay data, rather than attempting to revise problematic existing ceramic sequences or horizons from other parts of the south coast of PNG (see Chapter 2). Pottery is one of the most commonly occurring cultural materials in our excavated sites, ranging from a few nearly whole vessels (e.g., David et al. 2013) to sizable sherd{s}, to tiny comminuted sherds. Although the bulk of the pottery consists of tiny fragments that were recovered in our 2.1mm mesh sieves, there are substantial samples of potsherds in the 3 - 10cm size range in many of the excavated sites. The condition of the pottery is variable, but good enough to identify surface decoration style in every assemblage analysed thus far. In several sites, conjoining of sherds has taken place, greatly facilitating recording of full decoration patterns and identification of vessel shapes.

With the abundant ceramics from numerous stratified sites – we estimate that there are many hundreds of thousands of sherds in the excavated assemblages, although most are very small – we are able to construct a detailed ceramic sequence starting at c. 2900 cal BP with the appearance of Lapita pottery, and continuing largely uninterrupted to the ethnographic period. Key decorative traditions and transformations in stylistic conventions are being identified and finely dated (e.g., David et al. 2012). We have, for example, several stratified sites dating from the Lapita to post-Lapita periods on the coast and inland at Caution Bay, with good samples of well-dated, decorated ceramics, allowing this key transformation to be examined in detail (in the second monograph of this series). We also have well-dated excavated ceramic assemblages from throughout the study area pertaining to each subsequent ceramic transformation or phase up to ethnographic times, which will allow these to also be characterized as the analysis progresses.

**Long Distance Ceramic Trade**

Of widespread interest is understanding the emergence of the ethnographically documented Motu *hiri* trade, a large scale, long-distance maritime enterprise that involved the transport of locally manufactured clay pots westward in fleets of *lagatoi* sailing ships to be exchanged for sago starch with trading partners hundreds of kilometres distant in the swamplands of the Gulf of Papua (see Chapter 6, this volume). Genealogical reckoning using oral histories suggests a maximum 300-400 years antiquity for this trade. The Caution Bay area features prominently in the ethnographic and oral historic accounts of the *hiri* trade, including origin myths and first *lagatoi* stories, so it is an excellent location from which to investigate the emergence of the *hiri* trade using archaeological data (see Chapters 3, 5 and 6). The abundant, well-dated Caution Bay ceramic assemblages will also enable us to identify indicators of long distance ceramic trade in the region from the Lapita period onwards, including shared ceramic decorative conventions with pottery found elsewhere (e.g., Skelly et al. 2014), evidence for the mass production of pottery, or standardization of pot forms akin to *hiri* trade wares.

**Historicizing the Ethnographic Koita and Motu**

The study area is located in an area occupied today by two originally linguistically unrelated and culturally distinct groups: the Motu, Austronesian language speakers who mostly occupied coastal villages, had a maritime resource focus, and specialized in the manufacture of pottery that they traded far and wide, especially via the *hiri*; and the Koita, non-Austronesian language speakers who mainly occupied inland villages, hunted wallabies and tended gardens, manufactured no pottery until the arrival of Austronesian-speaking peoples, and who participated in the *hiri* through the Motu. The present day and historical relationships between these two ethnographic groups are examined ethnographically and linguistically in Chapters 3 and 4 respectively. We have to consider that we can now archaeologically document the arrival of pottery-making Lapita colonists c. 2900 cal BP in a Caution Bay cultural landscape where existing populations did not make pottery. This leads us to ask the following questions: are the maritime-focused, Austronesian language speaking, long-distance travelling, pottery specialist Lapita founding population(s) the direct ancestors of the maritime-focused, Austronesian language speaking, pottery making and long-distance trading, ethnographic Motu of Caution Bay? And are the Koita direct descendants of the existing aceramic Caution Bay populations at the time of arrival of the Lapita people? Or rather is the picture more complex, involving intermarriages and multiple kinds of cross-cultural exchanges and influences, with two, initially distinctive populations literally coming together and perhaps even largely merging at Caution Bay over a period covering nearly three millennia? If so, what is the basis for a more or less distinctive Koita versus Motu cultural identity that we see today? This latter question is one that both the archaeology and social anthropology
can contribute to significantly, and in doing so cross-fertilize our separate disciplinary skills and approaches.

Spatial and Temporal Faunal Resource Utilization Patterns

Faunal assemblages of marine and terrestrial origin are preserved in virtually every excavated site and throughout the stratigraphic profiles, and in many cases the preservation of bone and shell is good to excellent. To date, only a very few sites have been reported in a preliminary fashion (e.g., McNiven et al. 2011, 2012a); however, studies are underway on both the molluscan and non-molluscan faunal remains from numerous coastal and inland sites. The results will allow for progressively more detailed analyses across numerous assemblages, both synchronously across the landscape and through time. In sheer quantity but also in the quality and diversity of remains, the faunal assemblages are without parallel in a New Guinean context. Critically, animals represented in the deposits are derived from every one of the locally represented environments including the off-shore and near-shore marine, the strandline, mangrove and inter-tidal mudflat habitats of the littoral zone, the woodland, grassland and scrub of the inland plains and hills, and the freshwater aquatic habitats and fringing bands of riparian forest of the inland streams.

How these habitats were exploited through time will reveal previously unavailable information about the extractive strategies of both the pre-Lapita residents of Caution Bay and of the earliest Lapita colonists, and of the subsequent pattern of exploitation, over-use and adaptive shifts that occurred across space and through time. The impacts of this utilization on the local environment can also be assayed from the faunal remains, including evidence for depletion and extinction of local populations. Comparison of these results with the findings of pollen analyses within the study area (Rowe et al. 2013) will lead to a detailed narrative of regional resource use and its impacts over the past 5000 years. It is anticipated that this record will yield numerous insights into the sustainability or otherwise of traditional resource extraction practices, and that these insights will be of great practical value for the ongoing management of both marine and terrestrial resources in south central New Guinea where many people continue to follow customary practices, often using similar methods as their forebears to obtain the same resources at Caution Bay.

Wallaby hunting is a topic of some interest in the Port Moresby area (e.g., Allen 1977a). This was a notable activity across the region in ethnographic times, and the potential role of fire to modify and maintain landscapes in favour of wallaby-preferred grassland savannah is a topic of great interest. The Caution Bay deposits contain remains of at least three wallaby species and, at times, these were clearly the focus of hunting activity. By document the variable presence and composition of wallaby remains through time and across space, and comparing this pattern to the wider faunal and palynological records, we hope to establish the nature of the relationship(s) between wallaby hunting and landscape firing and modification, and also that between the intensity of wallaby hunting and the status of trade activities.

In a recent paper, O’Connor et al. (2011) reviewed the evidence for the introduction of the pig (Sus scrofa) into mainland New Guinea (not including evidence from Caution Bay, which were not available at the time). They argued convincingly that the evidence for the mid-Holocene presence of pig is unreliable, being derived from mixed middle and late Holocene deposits, and that the oldest directly dated pig bone in all of New Guinea is from Kria Cave in West Papua, dating to 1876-1638 cal BP. We will be addressing the appearance of pigs in the archaeological record at Caution Bay through a combination of careful assessment of the chronosтратigraphic context of each occurrence and by direct AMS dating of key specimens. Analysis of ancient DNA of pig remains is being undertaken where DNA is preserved, to determine genetic relationships with existing regional pig populations and with other archaeologically recovered genetic profiles for pigs (Larson et al. 2007), and thus we seek to gain further insights regarding the routes of introduction of the pig into New Guinea.

Similarly, we will be addressing the appearance of the domesticated dog in the archaeological record of Caution Bay. Ethnographically and continuing today in many areas, dogs are of central importance in diverse aspects of New Guinean life, including hunting, security and various ceremonial contexts. Their introduction is anticipated to have had a marked impact on lifestyles throughout the region (Koler-Matznick et al. 2007).

Caution Bay Landscape Use

This theme involves consideration of the chrono-spatial distribution of occupation deposits across the study area, both synchronically and diachronically. Aspects of relevance include coastal vs. inland land use, the distribution of hamlets, villages, other occupation sites, burials and specialized activity areas, in comparison with the distribution of food resources and habitats and arable land. Spatial comparisons should facilitate the understanding of relationships between ceramic (Lapita and descendant) and non-ceramic (pre-Lapita and descendant) populations through time (see Historicizing the Ethnographic Motu and Koita above).

The environmental history of the study area is also directly pertinent to documenting and understanding human landscape use through time, as well as
understanding human impacts on the landscape. There is a likely recursive human-natural environment effect from the time of extensive land-clearance relating to gardens upstream of the study area and increased erosion and fluvial sediment deposition in the study area, or increased human burning activities and the creation, expansion or maintenance of the grassland savannah characteristic of the present day study area. These effects would have influenced wild food resource availability, the amount of land suitable for gardening, and the location of suitable long-term occupation locations (i.e., villages). We have started to address this issue through the study of coastal pollen cores (e.g., Rowe et al. 2013) and we are continuing with ongoing analyses of sediments and pollen from inland archaeological sites across the study area, and with the detailed studies of faunal assemblages that document the conversion of lowland rainforests to savannah woodlands and grasslands.

Detailed studies of the molluscan and marine vertebrate faunal remains also promise significant insights into the impact of fishing and other extractive activities on the coastal and off-shore environments of Caution Bay. From work already undertaken, it is clear that our studies will document major changes in this milieu, including local depletions and even extinctions of particular resources, and that we will document a series of corresponding shifts in the extractive focus of local human populations.

**Raw Material Sources**

Identifying the sources of raw materials present in the excavated sites will potentially illuminate both internal and external relationships within the Caution Bay study area and between Caution Bay and external localities. For example, chert is a widely available surface resource at Caution Bay and is also the most common raw material in every flaked lithic assemblage studied thus far. One study underway is using X-ray fluorescence technology to characterize chert sources to investigate patterns of chert usage over time and throughout the study area; the results may help to identify social boundaries as well as patterns of interaction and land use within the study area. In addition, we are interested in comparing the raw material sources of stone axes/adzes from the pre-Lapita, Lapita and subsequent periods at Caution Bay, not only to look at continuities or changes, but also to potentially gain insight into engagement between Lapita peoples and local inland populations for raw materials sourced to the mainland of PNG, or the establishment of offshore trading patterns for materials from island sources. Obsidian, as well as metamorphic and volcanic stone for adze and axe making are presently the subjects of sourcing studies.

Also in progress is the fabric analysis of ceramics from certain excavated sites to shed light on the origin and movement of pottery, potentially allowing further insights into internal and external social relationships at Caution Bay.

**Technological Transformations**

Non-ceramic artefacts from excavated sites at Caution Bay include flaked lithics, ground lithics, drilled lithics, and worked shell, bone and sea urchin. Detailed analysis of the technology of manufacture, maintenance and repair, is being undertaken for all of these materials, with emphasis on identifying transformations through time, but also variability across the study area, and external relationships, including stylistic aspects and raw material selection.

Other than pottery, flaked lithics are the most common worked items by far, being present at nearly all of the excavated sites. Flaked stone was clearly in use on a daily basis. Detailed lithic analyses for each excavated site is providing a profile through time and across space of raw material selection, lithic reduction, and tool use, and will thus provide crucial data for evaluating wider patterns of landscape use. Comparisons of technology and raw material use-profiles from pre-Lapita and initial Lapita should be particularly informative, as should the comparisons of lithic assemblages at the ceramic transformations of Lapita to post-Lapita, etc., through to the ethnographic period.

**Scope and Organization of the Caution Bay Monographs**

While some of the preliminary results, especially in relation to the initial discovery of stratified archaeological deposits establishing the presence of Lapita people on mainland PNG, have been published elsewhere (e.g., McNiven et al. 2011, 2012b; David et al. 2011), from the onset we have worked towards the production of monographs as detailed accounts of our investigations, including analytical methods and primary results, and meta-analyses of trends and processes. This series of monographs reporting the Caution Bay investigations will not only detail the analytical results on a site-by-site basis for numerous sites but will also contain an emergent consideration of each of the research questions in progressive depth. To avoid potential repetition and redundancy, we have carefully structured the monograph series to present the mass of new information in an efficient, informative and interesting way.

The present volume is both an introduction, and a necessary accompaniment, to the succeeding volumes that will consist of a series of detailed reports on the investigations at a number of sites. The write-up of each site is focused on a site report chapter, detailing the investigations and the chronostratigraphy of that particular site, followed by results of specialist studies either in separate chapters if there is much material or otherwise incorporated into the site report chapter. Each
volume will conclude with a chapter or chapters that discuss relevant research goals and themes in light of the contribution of each site, or group of sites in the volume.

Each monograph will focus on both a research theme and one or more of the following sites or groups of sites: (1) a key, well and/or deeply stratified site, rich in cultural content, that is important for establishing a cultural sequence with that monograph’s major theme in mind; (2) contemporaneous sites, to highlight ceramic stylistic conventions and/or transformations, or variable use of the landscape across the study area; or (3) groups of geographically proximate sites that document land use of a portion of the study area. For example, the second Caution Bay monograph has an emphasis on the deeply stratified Lapita age Tanamu 1 (ABHA) site, but also includes four other important sites of late Lapita to immediate post-Lapita age (c. 2700-2400 cal BP) from across the study area, with a thematic focus on Lapita to post-Lapita transformations.

Organization of the Present Volume

The first volume of the Caution Bay monographs is designed to introduce the goals of the Caution Bay project, the nature and scope of the investigations and the cultural and natural setting of the study area. To this end a series of chapters are included on the ethnographic and linguistic setting, the present and past natural environment, archaeological surveys of the study area and investigative and analytical methods. These background chapters will be repeatedly referred to in all the other monographs, as foundational reference materials for the broader study.