

CAUTION BAY STUDIES IN ARCHAEOLOGY 1

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**

ARCHAEOPRESS ARCHAEOLOGY

ARCHAEOPRESS PUBLISHING LTD

Gordon House  
276 Banbury Road  
Oxford OX2 7ED

[www.archaeopress.com](http://www.archaeopress.com)

CAUTION BAY STUDIES IN ARCHAEOLOGY 1

ISBN 978 1 78491 504 9  
ISBN 978 1 78491 505 6 (e-Pdf)

© Archaeopress, Monash University and authors 2016

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).

All rights reserved. No part of this book may be reproduced, in any form or by any means, electronic, mechanical, photocopying or otherwise, without the prior written permission of the copyright owners.

Printed in England by Oxuniprint, Oxford  
This book is available direct from Archaeopress or from our website [www.archaeopress.com](http://www.archaeopress.com)

# Contents

Contents.....	i
List of Figures.....	v
Editors' and Authors' Affiliations and Contacts.....	viii
Acknowledgements.....	ix
<b>Chapter 1.</b>	
<b>Introduction to the Caution Bay Archaeology Project.....</b>	<b>1</b>
Thomas Richards, Bruno David, Ken Aplin, Ian J. McNiven and Matthew Leavesley	
Introduction.....	1
Research Goals and Themes.....	3
<i>Lapita Colonization</i> .....	3
<i>Ceramic Transformations</i> .....	4
<i>Long Distance Ceramic Trade</i> .....	4
<i>Historicizing the Ethnographic Koita and Motu</i> .....	4
<i>Spatial and Temporal Faunal Resource Utilization Patterns</i> .....	5
<i>Caution Bay Landscape Use</i> .....	5
<i>Raw Material Sources</i> .....	6
<i>Technological Transformations</i> .....	6
Scope and Organization of the Caution Bay Monographs.....	6
Organization of the Present Volume.....	7
<b>Chapter 2.</b>	
<b>Archaeology in Port Moresby and the Southern Lowlands of Papua New Guinea: Intellectual and Historical Contexts for Caution Bay.....</b>	<b>9</b>
Bruno David, Thomas Richards, Robert Skelly, Ian J. McNiven and Matthew Leavesley	
Introduction.....	9
Port Moresby Region.....	11
<i>Graeme Pretty</i> .....	11
<i>Susan Bulmer</i> .....	11
<i>Jim Allen</i> .....	13
<i>Pamela Swadling</i> .....	16
Yule Island-Hall Sound.....	19
<i>Ron Vanderwal</i> .....	19
Gulf of Papua Region.....	21
<i>Jim Rhoads, David Frankel and Bruno David</i> .....	21
<i>Bruno David and Robert Skelly</i> .....	22
Amazon Bay-Mailu.....	23
<i>Geoff Irwin</i> .....	23
Summary and Conclusions.....	24
<b>Chapter 3.</b>	
<b>The Motu-Koita: A Cultural and Social History.....</b>	<b>27</b>
Michael Goddard	
Introduction.....	27
A Provisional Prehistory.....	27
Social Organization.....	29
Lifeworld.....	31
Effects of European Contact and the Colonial Period.....	32
Independence and Afterwards.....	34

<b>Chapter 4.</b>	
<b>Motu-Koita Contact in the Caution Bay Area of Central and Southeast Mainland Papua New Guinea:</b>	
<b>Some Linguistic Observations</b> .....	39
Tom Dutton	
Introduction .....	39
The Linguistic Scene at First Contact.....	39
<i>Motu</i> .....	39
<i>Koita</i> .....	42
Motu-Koita Contact: The Linguistic Evidence .....	43
<i>The British New Guinea Annual Report for 1889-90 Vocabulary</i> .....	43
<i>The 1994 Study</i> .....	45
Historical Implications of the Linguistic Evidence .....	46
<i>Three Comparative Cases</i> .....	47
Maisin .....	47
Ouma and Related Remnant Languages.....	48
Lau'una .....	50
Motu-Koita Contact in the Caution Bay Area.....	50
Conclusion .....	51
<b>Chapter 5.</b>	
<b>Koita and Motu Landscapes and Seascapes of Caution Bay</b> .....	53
Linus S. digim'Rina, Thomas Richards, Bruno David, Matthew Leavesley, Michael Goddard, Tom Dutton, Robert Skelly, Brad Duncan, Laura Naidi and Julia Hagoria	
Introduction .....	53
Preliminary Place-Name Study .....	53
Detailed Mapping of Caution Bay Place-Names: The Focused Study .....	56
<i>Methods</i> .....	58
<i>Recorded Places</i> .....	58
Named Places in the Study Area .....	58
Named Places Near the Study Area .....	61
Conclusions.....	63
<b>Chapter 6.</b>	
<b>Historicizing Motu Ceramics and the <i>Hiri</i> Trade</b> .....	65
Bruno David, Thomas Richards, Michael Goddard, Tom Dutton, Matthew Leavesley, Ian J. McNiven and Herman Mandui	
Introduction .....	65
The <i>Hiri</i> Trade.....	66
Origin of the <i>Hiri</i> .....	67
The Ceramic Industry.....	70
Conclusion .....	73
<b>Chapter 7.</b>	
<b>The Natural Setting of Caution Bay: Climate, Landforms, Biota, and Environmental Zones</b> .....	75
Ken Aplin, Cassandra Rowe, Helene Peck, Brit Asmussen, Sean Ulm, Patrick Faulkner and Thomas Richards	
Introduction .....	75
<i>Location and General Topography</i> .....	75
<i>Sources of Information</i> .....	77
<i>Terminology of Environmental Zones and Habitats</i> .....	83
Climate.....	83
Environmental Zones and their Resources .....	85
<i>The Littoral Plains Zone</i> .....	85
Littoral Plains Zone Landforms .....	85
Littoral Plains Zone Soils .....	86
Littoral Plains Zone Plant Communities .....	87
Littoral Plains Zone Animal Resources .....	89
<i>The Hinterland Zone</i> .....	90

Hinterland Zone Landforms .....	91
Hinterland Zone Soils.....	93
Hinterland Zone Animal Resources .....	100
<i>The Inshore Marine Zone</i> .....	103
Inshore Marine Zone Substrates and Habitats .....	103
Inshore Marine Zone Animal Resources.....	104
<i>The Offshore Marine Zone</i> .....	105
Offshore Marine Zone Substrates and Habitats .....	105
Offshore Marine Zone Animal Resources .....	105
Environmental History .....	105
<i>Regional Scale Influences and Events</i> .....	105
<i>Local Influences and Events in Southern New Guinea</i> .....	107
Historical and Contemporary Land Use .....	108
<i>Terrestrial Environments</i> .....	108
Gardening.....	109
Cash Cropping.....	109
Hunting.....	110
Other Terrestrial Resources .....	110
<i>Marine Environment</i> .....	110
Concluding Comments.....	111

## Chapter 8.

<b>Archaeological Surveys at Caution Bay</b> .....	113
Bruno David, Thomas Richards, Robert Skelly, Siobhán Walker, Matthew Leavesley, Jeremy Ash and Herman Mandui	
Introduction.....	113
Archaeological Surveys .....	113
<i>Core Study Area Survey</i> .....	116
Core Study Area Survey Strategy, Methods and Intensity .....	117
Core Study Area Survey Results.....	117
<i>Peripheral Survey</i> .....	132
Peripheral Survey Strategy, Methods and Intensity.....	132
Peripheral Survey Results .....	132
<i>Vaihua River Survey</i> .....	136
<i>Papa Lea Lea Road Survey</i> .....	138
Papa Lea Lea Road Survey Strategy, Methods and Intensity .....	138
Papa Lea Lea Road Survey Results.....	139
<i>Other Sites</i> .....	140
Conclusions.....	143

## Chapter 9.

<b>The Caution Bay Project Field and Laboratory Methods</b> .....	145
Bruno David, Thomas Richards, Ian J. McNiven, Jerome Mialanes, Ken Aplin, Fiona Petchey, Helene Peck, Brit Asmussen, Sean Ulm, Katherine Szabó, Holly Jones-Amin, Patrick Faulkner, Claire Perrette, Cassandra Rowe, Matthew Leavesley and Bryce Barker	
Introduction.....	145
Project Personnel and Research Structure .....	145
Field Methods.....	146
Analytical Methods.....	154
<i>Pottery Analysis</i> .....	156
<i>Pottery Conservation</i> .....	157
Treatment.....	157
Final Comments on Pottery Conservation .....	160
<i>Stone Artefact Analysis</i> .....	160
Raw Materials.....	161
Technological Variables .....	161
Colours and Heat Alteration .....	163
<i>Non-Molluscan Faunal Remains</i> .....	163

Bone from Vertebrate Animals .....	164
Eggshell.....	166
Invertebrate Exoskeleton.....	166
Reporting.....	166
<i>Molluscan Remains</i> .....	167
Taxonomic Identification of Molluscan Remains .....	167
Modes of Quantification.....	167
<i>Worked Shell Analysis</i> .....	169
Determination of the Worked Shell Sample .....	169
Protocols for the Identification of Worked Shell .....	169
Analytical Procedures .....	170
Context of Interpretation.....	170
<i>AMS Radiocarbon Dating and Chronological Model-Building</i> .....	171
Caution Bay Marine Reservoir Corrections.....	171
Chronological Model-Building .....	173
Other Analyses.....	174
Concluding Comments.....	175
<b>Appendix A.</b>	
<b>Comparison of Motu and Koita Vocabulary in the <i>British New Guinea Annual Report for 1889-1890</i> (MacGregor 1890) with that in Dutton (1966) and Dutton (1975) .....</b>	<b>177</b>
<b>Appendix B.</b>	
<b>Other Apparent Borrowings in Motu and Koita in Dutton (1975) not Included in Appendix A.....</b>	<b>179</b>
<b>Appendix C.</b>	
<b>Established Borrowings in Koita with Comparative Evidence from Motu, Sinagoro and Keapara .....</b>	<b>181</b>
<b>Appendix D.</b>	
<b>Caution Bay Project Field Staff, 2009-2010 .....</b>	<b>183</b>
<b>References.....</b>	<b>185</b>

## List of Figures

Figure 1.1. Location of the Caution Bay study area and sites excavated prior to 2009 (black dots) in the broader Port Moresby region. ....	1
Figure 1.2. Sites (black dots) excavated at Caution Bay, 2009-2010, with Papua New Guinea National Museum and Art Gallery registration codes. ....	2
Figure 2.1. Locations of previous archaeological research areas involving excavation along the southern PNG lowlands, and Mask Cave in Torres Strait. ....	9
Figure 2.2. Cultural and ceramic sequences for southern lowland PNG. ....	13
Figure 2.3. Summary of some characteristics of decorative styles of Port Moresby bowls (from Bulmer 1978: table 5.5). ....	14
Figure 2.4. Representative decorated sherds from Nebira 4 (ACL) (a-d = Style G, e-g = Style H) (after Allen 1972: 106, figure 2). ....	15
Figure 2.5. Shell-impressed bowl sherds with ‘herringbone’ patterns from the ‘early levels’ of Motupore (AAK). ....	17
Figure 2.6. Representative sherds from the Yule Island ‘Type Collection’, PNG National Museum and Art Gallery: a = Type T, b = Type T, c = Type M, d = Type K, e = Type R, f = Type T (Photo: Robert Skelly). ....	19
Figure 2.7. Representative decorated sherds from Oposisi: a = Type A, b = Type A, c = Type B, C, D, E, d = Type B, C, D, E, e = Type B, C, D, E, f = Type A, g = Type B, C, D, E, h = Type G, i = Type G, j = Type K, k = Type B, C, D, E, l = Type B, C, D, E, m = Type B, C, D, E, n = Type K, o = Type F, p = Type S, q = Type W, r = Type W, s = Type T, t = Type T, u = Type W (after Vanderwal 1973: figures VI-6-10). ....	20
Figure 2.8. Representative sherds from Amazon Bay-Mailu excavations (a-d = Early period, e-g = Mayri period, h = Mayri-Mailu transitional) (after Irwin 1985: 248-251, plates 1-3). ....	23
Figure 4.1. Languages of Port Moresby region and central and southeast PNG: (a) Languages of central and southeast Papua New Guinea; (b) Port Moresby region languages and villages. ....	40
Figure 4.2. Central Papuan AN languages (after Ross 1994). ....	41
Figure 4.3. The Koiarian family tree. ....	42
Figure 5.1. Motu and Koita landscape place-names at Caution Bay (excluding creek and river names). ....	54
Figure 5.2. Motu and Koita landscape place-names in the Caution Bay study area (including creek and river names). ....	55
Figure 5.3. Motu and Koita place-names on the Caution Bay seascape, including Edai Siabo First Lagatoi story places. ....	56
Figure 5.4. Motu and Koita places at Caution Bay: a. Location of First Lagatoi Landing/Stone Anchor site (red rectangle), west of Boera village, February 2008 (Photo: Brad Duncan); b. Anchor stone at First Lagatoi Landing/Stone Anchor site, during low tide, west of Boera village, February 2008 (scale in 20 cm increments) (Photo: Brad Duncan); c. Cultural material scatter at Konekaru, March 2009 (Photo: Robert Skelly); d. Outrigger canoes on beach, Papa village, January 2008 (Photo: Brad Duncan). e. Partly buried possible anchor stone at archaeological site ABIV, Square C, Bogi locality, February 2010 (Photo: Simon Cox); f. Julia Hagoria holding a stadia rod in front of a pool on lower Ruisasi Creek where seiri, kwaru and fire-fish are caught, March 2010 (Photo: Robert Skelly). ....	57
Figure 5.5. Konekaru locality, showing open ocean beach bounded by mangrove forest to north and south, and backed by mudflats to the east (Google Earth Pro imagery dated 16 May 2010). ....	59
Figure 5.6. Caution Bay Motu and Koita places: a. Southern edge of Davage beach, looking north, March 2010 (Photo: Robert Skelly); b. Hill directly south of former village of Davage, where women would watch for returning lakatoi rounding Lagava Island at the northern end of Caution Bay, March 2010. Present Boera village in left foreground (Photo: Robert Skelly); c. Stilt house, south side of Lea Lea village, January 2008. Note canoe platform at front (Photo: Brad Duncan); d. Smoke from grass fires set by hunting party from Boera village, October 2009. Archaeological site ABBK Square B excavation in foreground (Photo: Ian McNiven). ....	62
Figure 6.1. ‘Loading the lakatoi, Port Moresby’, 1885 (Lindt 1887, 12, plate V) (photograph by J. W. Lindt). ....	65
Figure 6.2. Heirloom ceramic pot (uro) in the Gulf Province village of Epemeavo in August 2007, previously obtained through hiri trade (photograph: Bruno David). ....	70
Figure 6.3. Traditional categories of Motu pottery (after Bulmer 1971:63, 1978:58; Groves 1960:14). ....	71
Figure 6.4. Motu ceramic pot types from Hanuabada, 1879-1882: a = uro, b = hodu, c = oburo, d= kaiwa, e = itulu (ituru), f = nao (nau) (after Finsch 1914: plate XVII). ....	72
Figure 6.5. Motu pottery manufacture, Hanuabada. Archive image description: ‘clay dug from nearby hillside, made, sundried and burnt; “glaze” from pulp of mangrove applied when hot’, 1921 (photograph by Frank Hurley). Courtesy Australian Museum Archives – AMS320/V4422. ....	73
Figure 7.1. Distribution and extent of offshore barrier reef and the fringing reef at Caution Bay (Sources: Google Earth Pro; PNG 1:100,000 Port Moresby Topographic Map). ....	76
Figure 7.2. Marine and terrestrial habitats of the Caution Bay study area (Source information includes: PNG 1:100,000 Port Moresby Topographic Map; Google Earth Pro; Woxvold 2008: figures 5 and 9). ....	77
Figure 7.3. Molluscan taxa from excavated archaeological sites in the Caution Bay study area, with a summary of their likely occurrence across the various marine to freshwater habitats. Habitat information has been predominantly drawn from Poutiers’ comprehensive chapters on bivalves and gastropods of the Western Central Pacific found in the FAO Species Identification Guide prepared by Carpenter and Niem (1998). Additional supplementary resources were referred to when we encountered species in the archaeological assemblages that were not present in this guide. These include Baron and Clavier (1992), Bellchambers et al. (2011), Coleman (2003), Houbrick (1987), Lamprell and Healy (1998), Malaquias and Reid (2008), Poiner and Catterall (1988) and Tebano and Paulay (2000). The online World Register of Marine Species was also consulted in each instance (WoRMS Editorial Board 2014). ....	78

Figure 7.4. Averaged monthly trends for important climate parameters, based on measurements taken over the past 40 years at Jackson Airport, Port Moresby (based on data from BoM 2015a).	83
Figure 8.1. Location of Caution Bay Study Area surveys.	114
Figure 8.2. Caution Bay survey areas.	115
Figure 8.3. Caution Bay surveys in progress: a. Site survey across open grassland in the vicinity of site AAPH, located in the south of the Core Survey Area, 24 February 2009 (Photo: Robert Skelly); b. UXO encountered during survey at Caution Bay, February 2009 (Photo: Jeremy Ash); c. Survey of patchy grassland in the northwest of the Core Survey Area, 6 May 2008 (Photo: Matthew Leavesley); d. Survey and recording of site ABAV, located in savannah in the southeast of the Core Survey Area, 6 November 2008 (Photo: Robert Skelly).	116
Figure 8.4. Caution Bay Core Study Area Survey (red outline) sites (red dots).	117
Figure 8.5. Core Study Area Survey site descriptions.	118
Figure 8.6. Caution Bay survey landscapes and site recording in progress: a. Survey team determining extent and recording site AAUY, in the northeast part of the Core Survey Area, 20 March 2009 (Photo: Jeremy Ash); b. Survey of edge of intertidal salt flat, Vaihua River Survey Area, 10 April 2009 (Photo: Jeremy Ash); c. Mangrove forest, Vaihua River Survey Area, 2 April 2009 (Photo: Jeremy Ash); d. Recording site ABIL eroding from bank on edge of salt flat, Vaihua River Survey Area, 10 April 2009 (Photo: Robert Skelly).	131
Figure 8.7. Core Study Area Survey site surface artefact density (maximum number of items/m <sup>2</sup> ) by site size (m <sup>2</sup> ).	132
Figure 8.8. Caution Bay Peripheral Survey area (blue outline) sites (blue dots), plus other recorded sites (orange dots), with Papua New Guinea National Museum and Art Gallery registration codes.	133
Figure 8.9. Peripheral Survey site descriptions.	134
Figure 8.10. Peripheral Survey site surface artefact density (maximum number of items/m <sup>2</sup> ) by site size (m <sup>2</sup> ).	136
Figure 8.11. Caution Bay Vaihua River Survey area (yellow outline) sites (yellow dots) with Papua New Guinea National Museum and Art Gallery registration codes.	137
Figure 8.12. Vaihua River Survey site descriptions.	137
Figure 8.13. Vaihua River Survey site surface artefact density (maximum number of items/m <sup>2</sup> ) by site size (m <sup>2</sup> ).	139
Figure 8.14. Caution Bay Papa Lea Lea Road Survey sites (black dots) with Papua New Guinea National Museum and Art Gallery registration codes.	140
Figure 8.15. Papa Lea Lea Road Survey site descriptions.	141
Figure 8.16. Papa Lea Lea Road Survey site surface artefact density (maximum number of items/m <sup>2</sup> ) by site size (m <sup>2</sup> ).	142
Figure 8.17. Descriptions of other sites recorded at Caution Bay.	142
Figure 9.1. Pot sherds on the surface (red rectangles) and embedded in the ground (blue rectangle), site AAJB, west-central core study area, 12 February 2009 (Photo: Jeremy Ash).	146
Figure 9.2. Sites excavated in the Caution Bay study area, with numbers of excavation squares and stepping out squares. (PNG NMAG = Papua New Guinea National Museum and Art Gallery).	147
Figure 9.3. Excavations in progress at Caution Bay: (a) View from site ABIW east to excavations at site Tanamu 3 (ABHD) (left and centre) and AAJM (far right, in mid-distance), in the west of the study area, with the Dirora Gotera Range in the background, 7 December 2009 (Photo: Nic Dolby); (b) View of excavations at site Nese 1 (AAWA) on the northern slope of Moiapu Hill, in the east of the study area, 10 November 2009 (Photo: Ceri Shipton).	150
Figure 9.4. Excavation at site Edubu 1 (ABAO), 26 September 2009 (Photos: Thomas Richards): a. Excavation in progress at (left to right) Squares A, B and C; b. Square B, strung out with offset metal survey arrows, prior to commencement of excavation; c. Start of excavation in Square B; d. Excavation of Square C; e. Elevation reading being taken with automatic level; f. Excavated soil being transferred to plastic bag for transport to field laboratory for wet sieving.	151
Figure 9.5. Stepping out operations at Caution Bay: a. Phase 1 of stepping out completed at site Bogi 1 (ABEN) with excavation Squares C and D protected by a wooden cover in the centre of the stepping out area, 5 January 2010 (Photo: Ian McNiven). Note the star picket and plywood shoring around the periphery of the stepping out pit, as well as other protective and safety measures being installed prior to the next stage of excavation; b. Hand excavation of stepping out squares in progress around excavation Squares D and E (with plywood on bottom in centre of photo) at site (ABIV), 9 March 2010 (Photo: Ben Shaw).	152
Figure 9.6. Wet sieving and sorting operations in the Caution Bay field laboratory, September 2009 – May 2010 (Photos: Cassandra Rowe): a. Wet sieving team at work; b. Close-up of wet sieving through 2.1mm mesh sieve; c. Wet sieve residue on trays drying on shelves prior to sorting; d. Sorted sieve residue on trays; e. Sorting team at work on sieve residue.	153
Figure 9.7. Excavated sediment temporarily stored inside container prior to wet sieving, Caution Bay field laboratory, 19 March 2010 (Photo: Cassandra Rowe).	154
Figure 9.8. Excavated sediment temporarily stored outside container prior to wet sieving, Caution Bay field laboratory, 19 March 2010 (Photo: Cassandra Rowe).	155
Figure 9.9. Key terms used for ceramics.	157
Figure 9.10. Excavated pottery conservation: (a) Site Ruisasi 1 (ABKO) pottery conjoining in progress showing 3M Micropore™ tape labels on sherds, conjoined sherds (green rectangle), a conjoin map (red rectangle) and structural fills on a partially reconstructed pot (blue rectangles) (Photo: Holly Jones-Amin); (b) Shoulder-carinated Lapita pot with a collar and globular base from site Bogi 1 (ABEN), Square F, XU14, reconstructed from 23 conjoining sherds, which has undergone mechanical reduction of carbonates, desalination and infilling using Paraloid (Photo: Steven Morton).	158
Figure 9.11. Stone artefact analysis variables.	162
Figure 9.12. Colours (Munsell Color 2011) recorded on flaked stone artefacts from Caution Bay.	164
Figure 9.13. Valve determination in chiton (Class Polyplacophora) used for MNE and MNI calculations (after Dell 1951: 9).	168
Figure 9.14. Specific landmarks identified for MNE and MNI calculations of bivalves (after Carpenter and Niem 1998: 124, 192, 198).	168



Figure 9.15. Specific landmarks identified for MNE and MNI calculations of gastropods (after Carpenter and Niem 1998: 364, 370, 394, 486 and Harris et al. 2015: 170). .....	169
Figure 9.16. Cut <i>Conus</i> sp. body with fragment surfaces heavily eroded through acid dissolution (at x30 magnification). From site ABHD, Square C, XU 13b (Photo: Katherine Szabó). .....	169
Figure 9.17. Freshwater mussel ( <i>Alathyria jacksoni</i> ) nacre delaminating and crumbling due to organic loss and microbiological taphonomic action which has produced numerous tiny holes. SEM micrograph at x1100 magnification (Micrograph: Erica Weston).....	170
Figure 9.18. Recommended species-specific $\Delta R$ for Caution Bay marine shells (adapted from Petchey et al. 2012, 2013). .....	172
Figure 9.19. Example from site Ataga 1 (AAVM) of an OxCal multi-plot showing the 68.2% and 95.4% probability age ranges as outlined in the text. ....	173
Figure 9.20. OxCal model schematic showing the overlapping phase model for site Nese 1 (AAWA). .....	174

## Editors' and Authors' Affiliations and Contacts

- Dr Ken Aplin. (1) Division of Mammals, National Museum of Natural History, Smithsonian Institution, Washington D.C., 20013-7012, U.S.A. [aplink@si.edu](mailto:aplink@si.edu) (2) Department of Archaeology and Natural History, College of Asia and The Pacific, Australian National University, Canberra, A.C.T., 0200, Australia. [ken.aplin@anu.edu.au](mailto:ken.aplin@anu.edu.au)
- Dr Jeremy Ash. Monash Indigenous Centre, Monash University, Clayton, Victoria 3800, Australia. [jeremy.ash@monash.edu](mailto:jeremy.ash@monash.edu)
- Dr Brit Asmussen. (1) Cultural Environments Program, Queensland Museum, PO Box 3300, South Brisbane, QLD 4101, Australia. [brit.asmussen@qm.qld.gov.au](mailto:brit.asmussen@qm.qld.gov.au) (2) School of Social Sciences, The University of Queensland, Brisbane, QLD 4072, Australia.
- Professor Bryce Barker. School of Arts and Communication, University of Southern Queensland, Toowoomba, Queensland 4350, Australia. [Bryce.Barker@usq.edu.au](mailto:Bryce.Barker@usq.edu.au)
- Dr Bruno David. Monash Indigenous Centre, Monash University, Clayton, Victoria 3800, Australia. [bruno.david@monash.edu](mailto:bruno.david@monash.edu)
- Dr Linus digm'Rina. Department of Anthropology, University of Papua New Guinea, PO Box 320, University Post Office, National Capital District, Papua New Guinea. [digimrls@yahoo.com.au](mailto:digimrls@yahoo.com.au)
- Dr Brad Duncan. School of Humanities, University of New England, Baulkham Hills, New South Wales, 2153, Australia. [brad.duncan@graduates.jcu.edu.au](mailto:brad.duncan@graduates.jcu.edu.au)
- Dr Tom Dutton. 530 Yass River Road, Yass, New South Wales 2582, Australia. [tomdutton@bigpond.com](mailto:tomdutton@bigpond.com)
- Dr Patrick Faulkner. Department of Archaeology, University of Sydney, New South Wales 2006, Australia. [patrick.faulkner@sydney.edu.au](mailto:patrick.faulkner@sydney.edu.au)
- Dr Michael Goddard. Department of Anthropology, Macquarie University, Sydney, New South Wales 2109, Australia. [michael.goddard@mq.edu.au](mailto:michael.goddard@mq.edu.au)
- Ms Julia Hagonia. PO Box 7534, Boroko, National Capital District, Papua New Guinea. [julia.hagonia@gmail.com](mailto:julia.hagonia@gmail.com)
- Ms Holly Jones-Amin. Monash Indigenous Centre, Monash University, Clayton, Victoria 3800, Australia. [hjjon2@student.monash.edu](mailto:hjjon2@student.monash.edu)
- Dr Matthew Leavesley. (1) Department of Anthropology, University of Papua New Guinea, PO Box 320, University Post Office, National Capital District, Papua New Guinea. [matthew.leavesley@gmail.com](mailto:matthew.leavesley@gmail.com) (2) College of Arts, Society and Education, James Cook University, PO Box 6811, Cairns, Queensland 4870, Australia. [matthew.leavesley@jcu.edu.au](mailto:matthew.leavesley@jcu.edu.au)
- Mr Herman Mandui. Papua New Guinea National Museum and Art Gallery, Port Moresby, Papua New Guinea. (deceased)
- Professor Ian J. McNiven. Monash Indigenous Centre, Monash University, Clayton, Victoria 3800, Australia. [ian.mcniven@monash.edu](mailto:ian.mcniven@monash.edu)
- Dr Jerome Mialanes. Monash Indigenous Centre, Monash University, Clayton, Victoria 3800, Australia. [jerome.mialanes@monash.edu](mailto:jerome.mialanes@monash.edu)
- Ms Laura Naidi. PO Box 304, Alotau, Milne Bay Province, Papua New Guinea. [chelee.naidi@gmail.com](mailto:chelee.naidi@gmail.com)
- Ms Helene Peck. College of Arts, Society and Education, James Cook University, PO Box 6811, Cairns, Queensland 4870, Australia. [helene.tomkins@jcu.edu.au](mailto:helene.tomkins@jcu.edu.au)
- Ms Claire Perrette. Centre for Archaeological Science, School of Earth and Environmental Sciences, University of Wollongong, Wollongong, New South Wales 2522, Australia. [claireperrette@gmail.com](mailto:claireperrette@gmail.com)
- Dr Fiona Petchey. Radiocarbon Dating Laboratory, University of Waikato, Hamilton 3240, New Zealand. [fpetchey@waikato.ac.nz](mailto:fpetchey@waikato.ac.nz)
- Dr Thomas Richards (Corresponding Editor). Monash Indigenous Centre, Monash University, Clayton, Victoria 3800, Australia. [thomas.richards@monash.edu](mailto:thomas.richards@monash.edu)
- Dr Cassandra Rowe. Monash Indigenous Centre, Monash University, Clayton, Victoria 3800, Australia. [rowe.cassandra@gmail.com](mailto:rowe.cassandra@gmail.com)
- Dr Robert Skelly. Monash Indigenous Centre, Monash University, Clayton, Victoria 3800, Australia. [robert.skelly@monash.edu](mailto:robert.skelly@monash.edu)
- Dr Katherine Szabó. Centre for Archaeological Science, School of Earth and Environmental Sciences, University of Wollongong, Northfields Ave., Wollongong, New South Wales 2522, Australia. [kat@uow.edu.au](mailto:kat@uow.edu.au)
- Dr Sean Ulm. College of Arts, Society and Education, James Cook University, PO Box 6811, Cairns, Queensland 4870, Australia. [sean.ulm@jcu.edu.au](mailto:sean.ulm@jcu.edu.au)
- Ms Siobhán Walker. Community Relations, Rio Tinto Alcan, Weipa, Queensland 4874, Australia. [siobhanski@gmail.com](mailto:siobhanski@gmail.com)

## Acknowledgements

We gratefully dedicate this research to the people of Caution Bay, the villagers from Boera, Kido, Lea Lea, Papa and Porebada, who generously supported this project for its duration. We especially thank all who participated in the surveys, excavations, recording of place names and laboratory work at Caution Bay from 2008 to 2010.

Assistance and support from the University of Papua New Guinea and the Papua New Guinea National Museum and Art Gallery were essential for the successful completion of field operations at Caution Bay.

We thank all of the archaeological and anthropological personnel listed in Appendix D, who worked on the 2009-2010 field investigations at Caution Bay, and the survey team members of 2008-2009: Nick Araho (PNG National Museum and Art Gallery), John Dop (PNG National Museum and Art Gallery), Brad Duncan (Monash University), Alexandra Gartrell (Monash University), Alois Kuaso (PNG National Museum and Art Gallery), and John Muke (Social Research Institute, Port Moresby).

Tom Dutton is indebted to Andrew Pawley, Malcolm Ross and Andrew Taylor for comments on earlier drafts of Chapter 4, and to all three and Alan Jones for providing data on Proto Oceanic and particularly Proto Central Papuan languages. Tom Dutton is also grateful to Kidu Taylor, a native speaker of the eastern dialect of Motu, for comments on Motu forms and usages.

We thank Jim Allen for making the sherds in Figure 2.5 available to us for drawing, and Cathy Carigiet for drawing them.

We thank the Australian Research Council for Discovery grants, QEII and DORA Fellowships DP0877782 and DP130102514 to Bruno David.

The authors are indebted to the many local people named in Chapter 5 who provided information on named places, and also extend thanks to Andrew Taylor and Kidu Taylor who clarified and confirmed Motuan seascape terms for us.

Monash University has provided unceasing support for the fieldwork, administration, lab work, analyses, and reporting associated with the Caution Bay Archaeology Project. We especially thank our management and support team at Monash University in 2009-2010: Phillippa Sutherland, Cathy Alex, Melanie Thiedeman, Dimitria Semertjis, Judith Harvey, Heather Fletcher, Kerry Cake, and Jean Newey. We are also grateful for the painstaking work of the many lab assistants who processed the huge quantity of excavated material from Caution Bay at Monash University from 2009 through 2013, and the several lab supervisors who oversaw this work: Nick Hogg, Simon Coxe, Laura Bates, Kirstie Lewis, Peter Ross, Jerome Mialanes, and Cassandra Rowe. We thank Kara Rasmanis, Monash University, for drafting most of the figures in this volume. The Monash Indigenous Centre, especially Professor Lynette Russell, Executive Officer Vanessa Fleming-Baillie and Administrative Assistant Beverly Thomson, have been generous with support during the production of this monograph.

Lastly yet foremostly, this project owes a big debt of gratitude to the late Herman Mandui, Curator of Archaeology, PNG National Museum and Art Gallery, who was responsible for cultural heritage management for all of PNG. His tragic, premature death in October 2014 means that he will sadly not be able to see this finished product. Herman was a champion of this project from the outset, supporting the scale of the field and laboratory work as proposed by Monash University, and, most importantly, in mediating between the demands of development and scientific research to achieve the best outcome for his nation.



# 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

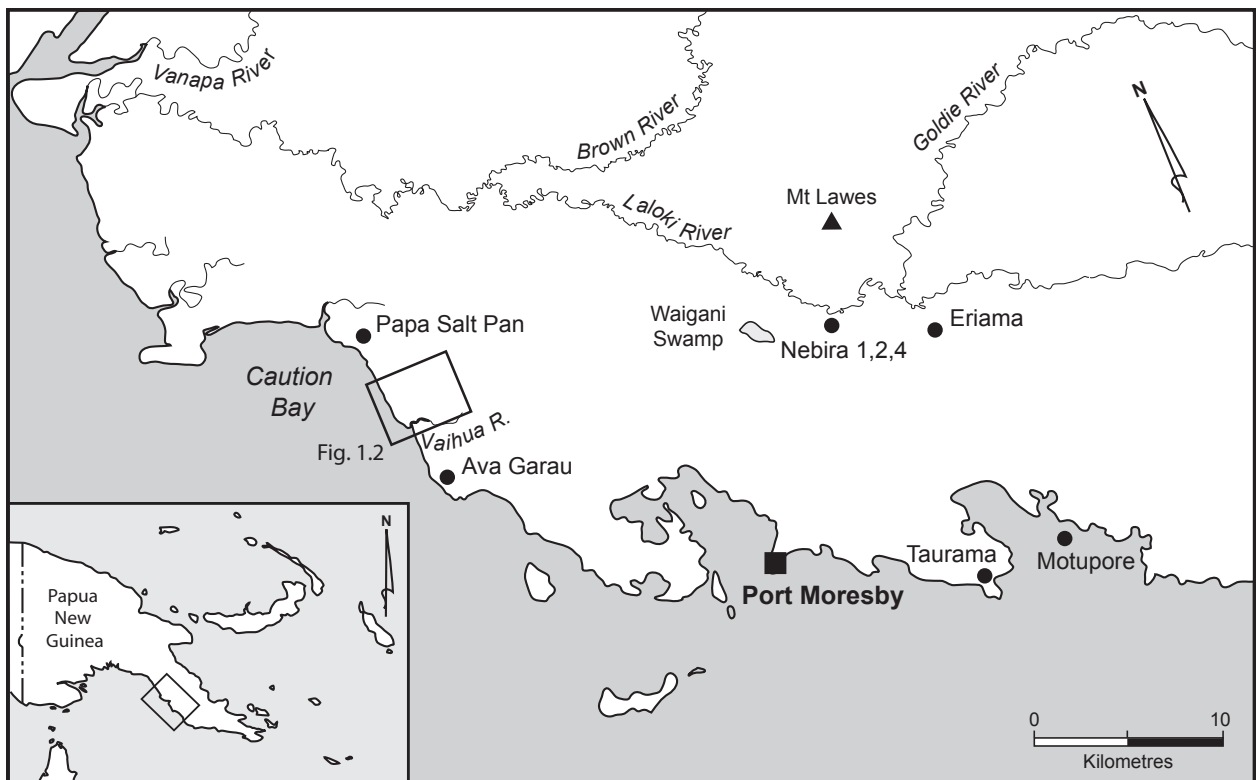


FIGURE 1.1. LOCATION OF THE CAUTION BAY STUDY AREA AND SITES EXCAVATED PRIOR TO 2009 (BLACK DOTS) IN THE BROADER PORT MORESBY REGION.

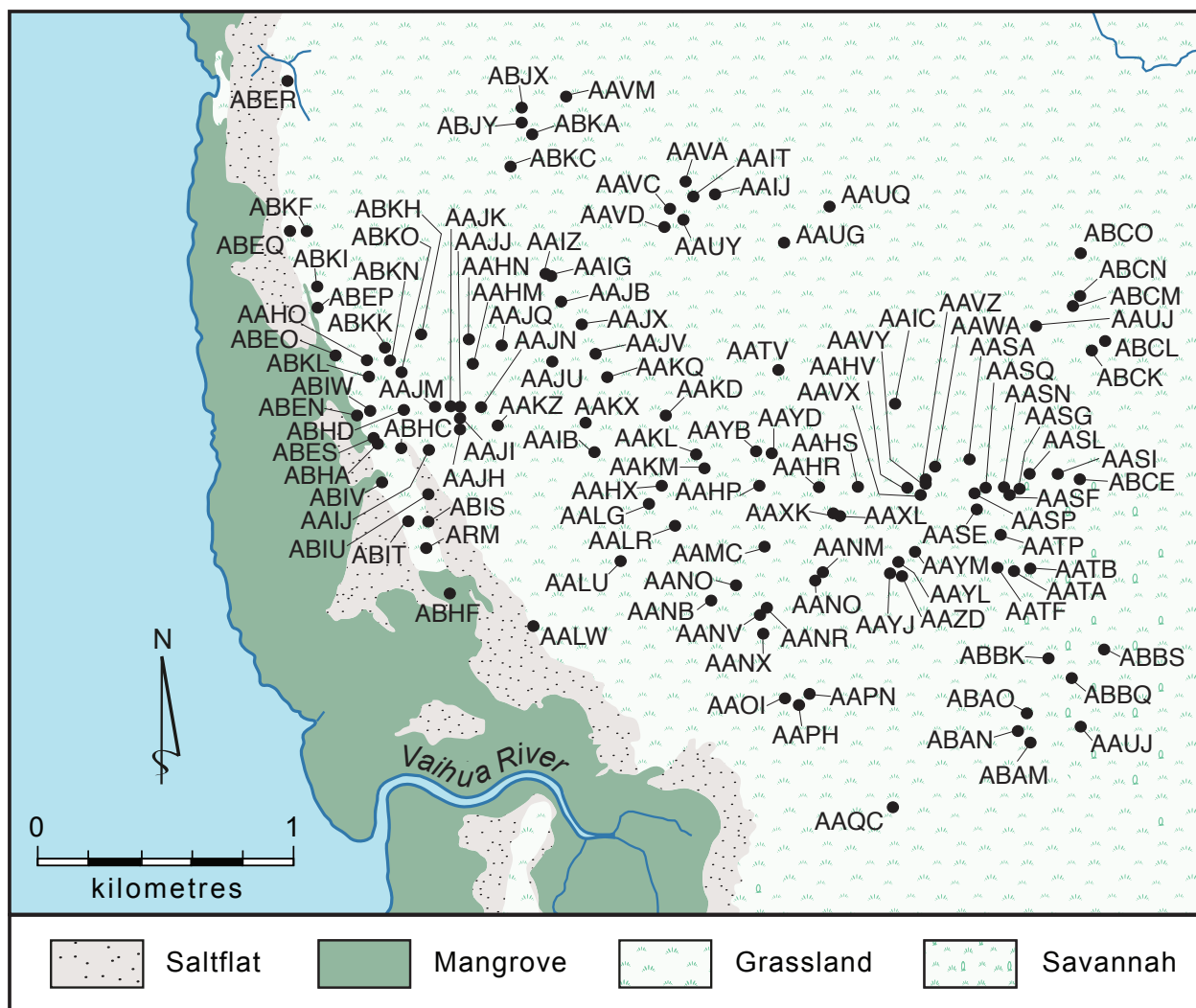


FIGURE 1.2. SITES (BLACK DOTS) EXCAVATED AT CAUTION BAY, 2009-2010, WITH PAPUA NEW GUINEA NATIONAL MUSEUM AND ART GALLERY REGISTRATION CODES.

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

publication. Analyses have been in progress ever since, working towards publication in this monograph series.

From the onset, the guiding assumption of the excavation program was that the majority of archaeological sites in the Caution Bay study area were going to be destroyed or made inaccessible to further study during construction activities. Consequently, one objective of the salvage program was to obtain a meaningful sample of cultural material from this landscape before it was permanently altered. The chosen strategy was to excavate as many sites as possible where surface exposures identified during the project surveys indicated the presence of potentially stratified deposits (see Chapter 9). We explicitly chose to undertake a large number of small excavations within the available time, rather than limit ourselves to a handful of large excavations, so as to sample subsurface deposits in a range of environmental settings and covering a range of potential time frames. By this means we hoped to obtain a diverse sample of the material residues of human activities in the study area, through time and across the landscape. This decision was made in part because we had no idea what lay beneath the surface prior to the excavations – extensive excavations at just a few sites could have led to the sampling of one period of time only, at the expense of other cultural phases elsewhere across the landscape – and partly to historicize landscape engagements across the entire region through time.

Strict adherence to highly controlled excavation methods and broad landscape sampling has resulted in abundant, high integrity excavation data. The excavated sites typically contain an abundance of molluscan remains, a variable quantity of non-molluscan faunal remains including both marine and terrestrial animals, lithics and ceramics, with occasional personal decorative items and other valuables, usually of shell, but also of sea urchin and of stone. A subset of sites produced unusually rich concentrations of particularly informative 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. As 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 sherds, 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

documenting 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 chronostratigraphic 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 descendent) and non-ceramic (pre-Lapita and descendent) 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.