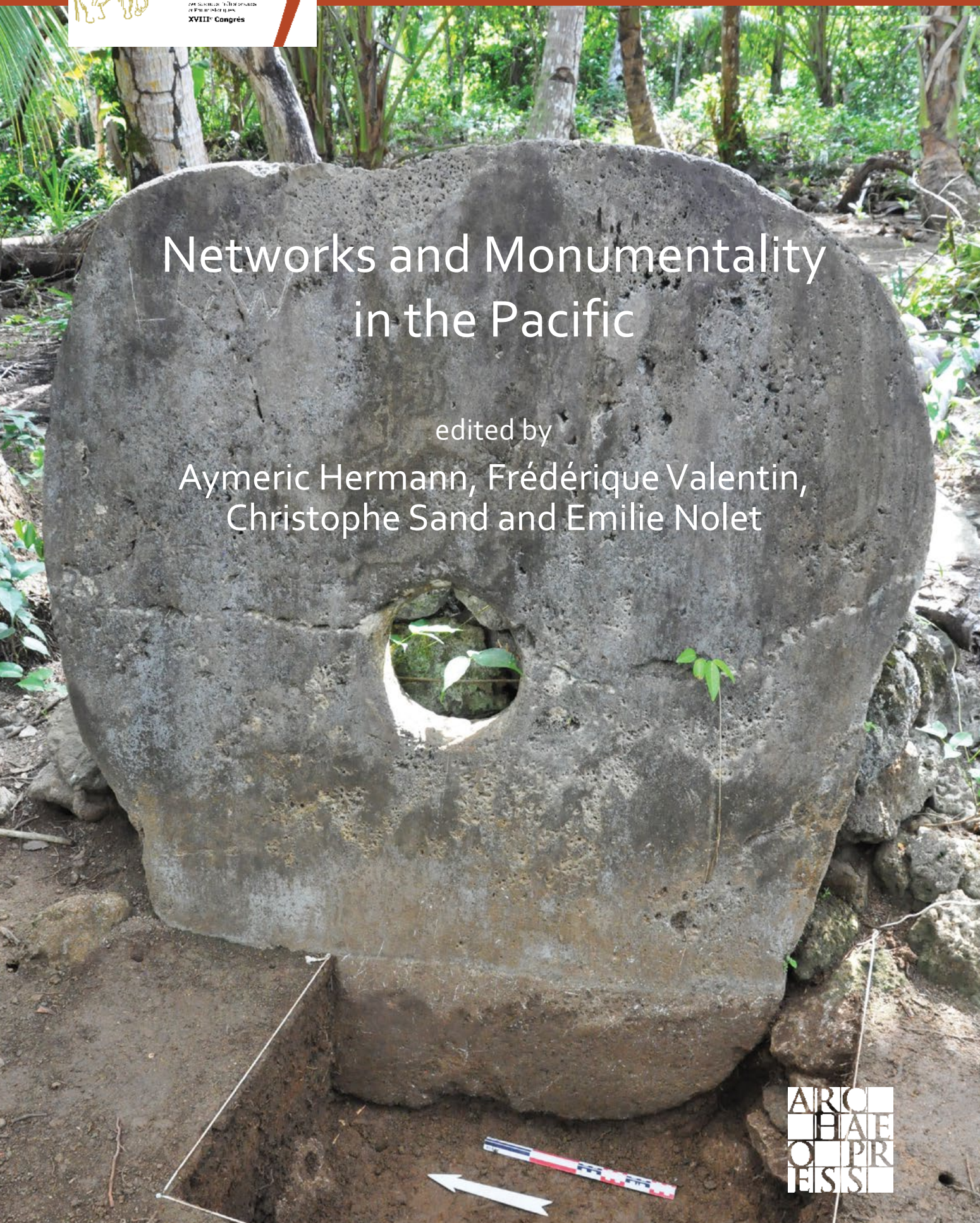
Networks and Monumentality in the Pacific. Proceedings of the XVIII UISPP World Congress

Aymeric Hermann, Frédérique Valentin, Christophe Sand, Emilie Nolet



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edited by
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Proceedings of the XVIII UISPP World Congress
(4-9 June 2018, Paris, France)
Volume 7

Session XXXVIII

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Cover: Stone money (Rai or Fai) at the village of Gachpar on Yap, Carolines Islands. (Copyright: C. Sand)

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Aymeric Hermann, Frédérique Valentin, Christophe Sand, and Emilie Nolet

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Foreword to the XVIII UISPP Congress Proceedings

UISPP has a long history, originating in 1865 in the International Congress of Prehistoric Anthropology and Archaeology (CIAAP). This organisation ran until 1931 when UISPP was founded in Bern. In 1955, UISPP became a member of the International Council of Philosophy and Human Sciences, a non-governmental organisation within UNESCO.

UISPP has a structure of more than thirty scientific commissions which form a very representative network of worldwide specialists in prehistory and protohistory. The commissions cover all archaeological specialisms: historiography; archaeological methods and theory; material culture by period (Palaeolithic, Neolithic, Bronze Age, Iron Age) and by continents (Europe, Asia, Africa, Pacific, America); palaeoenvironment and palaeoclimatology; archaeology in specific environments (mountain, desert, steppe, tropical); archaeometry; art and culture; technology and economy; biological anthropology; funerary archaeology; archaeology and society.

The UISPP XVIII World Congress of 2018 was hosted in Paris by the University Paris 1 Panthéon-Sorbonne with the strong support of all French institutions related to archaeology. It featured 122 sessions, and over 1800 papers were delivered by scientists from almost 60 countries and from all continents.

The proceedings published in this series, but also in issues of specialised scientific journals, will remain as the most important legacy of the congress.

L'UISPP a une longue histoire, à partir de 1865, avec le Congrès International d'Anthropologie et d'Archéologie Préhistorique (C.I.A.A.P.), jusqu'en 1931, date de la Fondation à Berne de l'UISPP. En 1955, l'UISPP est devenu membre du Conseil International de philosophie et de Sciences humaines, associée à l'UNESCO. L'UISPP repose sur plus de trente commissions scientifiques qui représentent un réseau représentatif des spécialistes mondiaux de la préhistoire et de la protohistoire, couvrant toutes les spécialités de l'archéologie : historiographie, théorie et méthodes de l'archéologie ; Culture matérielle par période (Paléolithique, néolithique, âge du bronze, âge du fer) et par continents (Europe, Asie, Afrique, Pacifique, Amérique), paléoenvironnement et paléoclimatologie ; Archéologie dans des environnements spécifiques (montagne, désert, steppes, zone tropicale), archéométrie ; Art et culture ; Technologie et économie ; anthropologie biologique ; archéologie funéraire ; archéologie et sociétés.

Le XVIII° Congrès mondial de l'UISPP en 2018, accueilli à Paris en France par l'université Paris 1 Panthéon-Sorbonne et avec le soutien de toutes les institutions françaises liées à l'archéologie, comportait 122 sessions, plus de 1800 communications de scientifiques venus de près de 60 pays et de tous les continents.

Les actes du congrès, édités par l'UISPP comme dans des numéros spéciaux de revues scientifiques spécialisées, constitueront un des résultats les plus importants du Congrès.

Marta Azarello

Secretary-General /
Secrétaire général UISPP

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Author's list

Baills, Henry
Muséum national d'Histoire naturelle
UMR 7194 CNRS-MNHN-UPVD,
Sorbonne Université,
1 rue Panhard
75013 Paris, France.
& Centre Européen de Recherches Préhistoriques, Tautavel, France
E-Mail: baills@orange.fr

Bedford, Stuart
School of Culture, History & Language, College of Asia and the Pacific,
Australian National University, Canberra, Australia
Max-Planck-Institute for the Science of Human History,
DLCE, Jena, Germany
Email: stuart.bedford@anu.edu.au

Beni, Teppsy
Archaeology, School of Humanities & Social Sciences
University of Papua New Guinea,
Port Moresby, Papua New Guinea

Chave-Dartoen, Sophie
PASSAGES – UMR CNRS 5319
Université de Bordeaux
Maison des Suds
12 Esplanade des Antilles,
33607 Pessac Cedex, France
E-Mail: sophie.chave-dartoen@u-bordeaux.fr

Clark, Geoffrey
Archaeology and Natural History College of Asia and the Pacific
The Australian National University
Canberra, ACT 2601, Australia
E-mail: geoffrey.clark@anu.edu.au

Détroit, Florent
UMR 7194 (HNHP), MNHN/CNRS/UPVD, Sorbonne Université,
Musée de l'Homme, Paris, France
Email: florent.detroit@mnhn.fr

Flexner, James
School of Philosophical and Historical Inquiry,
University of Sydney, Sydney, Australia
Email: james.flexner@sydney.edu.au

Forestier, Hubert
Muséum national d'Histoire naturelle
UMR 7194 CNRS-MNHN-UPVD, Sorbonne Université,
Institut de Paléontologie Humaine, Paris, France

E-mail: hubforestier@gmail.com
Grimaud-Hervé, Dominique
UMR 7194 (HNHP), MNHN/CNRS/UPVD, Sorbonne Université,
Musée de l'Homme, Paris, France
Email: dominique.grimaud-herve@mnhn.fr

Hermann, Aymeric
Max-Planck-Institute for the Science of Human History,
DLCE, Jena, Germany.
UMR 7041-ArScAn-Ethnologie préhistorique,
MSH Mondes, Nanterre, France
E-mail: hermann@shh.mpg.de

Leavesley, Matthew G.
Archaeology, School of Humanities & Social Sciences, University of Papua New Guinea
CABAH at the College of Arts, Society & Education
James Cook University
Cairns, Queensland 4811, Australia
Email: matthew.leavesley@jcu.edu.au

Monnerie, Denis
DynamE CNRS/UNISTRA (UMR 7367)
22 rue René Descartes
67084 Strasbourg Cedex, France
E-Mail: monnerie@unistra.fr

Parton Phillip
Archaeology and Natural History College of Asia and the Pacific
The Australian National University
Canberra, ACT 2601, Australia
E-mail: phillip.parton@anu.edu.au

Ricaut, Francois-Xavier
Laboratoire Évolution & Diversité Biologique (EDB UMR 5174)
Université Paul Sabatier
Bâtiment 4R1, 118, route de Narbonne
31062 Toulouse cedex 9, France
E-Mail: francois-xavier.ricaut@univ-tlse3.fr

Sand, Christophe
UMR 220 GRED, Gouvernance, Risque, Environnement, Développement.
Centre IRD de Nouméa
BP: A5, 98848 Nouméa Cedex, Nouvelle-Calédonie
Email: christophe.sand@ird.fr

Sheppard, Peter
Department of Anthropology
University of Auckland, Auckland, New Zealand
E-Mail: p.sheppard@auckland.ac.nz

Valentin, Frédérique
UMR 7041-ArScAn-Ethnologie préhistorique,
MSH Mondes, Nanterre, France

Email: frederique.valentin@cnrs.fr
Zinger, Wanda
UMR 7194 (HNHP), MNHN/CNRS/UPVD, Sorbonne Université,
Musée de l'Homme, Paris, France
Email: wanda.zin@gmail.com

Introduction

Aymeric Hermann[1,2] and Christophe Sand[2,3]
[1] Max-Planck-Institute for the Science of Human History, DLCE, Jena, Germany
[2] UMR 7041, ArScAn, Ethnologie préhistorique, MSH Mondes, Nanterre, France
[3] UMR 220 GRED, Centre IRD, Nouméa, Nouvelle-Calédonie

Compared to other regions, the Pacific islands have seen a late development of archaeological research, with the first half of the twentieth century dominated by ethnographic work led by various academics from anthropology departments and museums. The prevailing view at the time was that most of the Pacific islands had been settled only a few centuries before the arrival of European explorers, which was supported by the ethnocentric belief in the technical superiority of Western civilizations. The first radiocarbon dates in the Pacific obtained in 1952 from the Kuli'ou'ou rockshelter on O'ahu (Hawai'i), the Lapita site on the Foué Peninsula of Grande Terre (New Caledonia), and Chalan Piao on Saipan (Mariana Islands), provoked a paradigm shift. The unsuspected depth of the history of island societies located in the three corners of the Pacific revealed for the first time the antiquity of the sailing technology used by the first settlers of Oceania, during what must have been amongst the earliest open sea voyages worldwide. This discovery led to a perspective shift toward understanding the deep history of the diversity of ethnic groups, cultural practices, and languages found in the Pacific islands.

Many islands of the Pacific remain to be explored archaeologically. Nevertheless, the tremendous progress in archaeological sciences made in the last 60 years has considerably advanced our knowledge of early Pacific island societies, the rise of traditional cultural systems, and their later historical developments while in contact with European explorers, beachcombers, and missionaries. The wealth of oral traditions, seminal ethnographic descriptions, and foundational anthropological theories presented in the work of scholars such as Bronislaw Malinowski, Raymond Firth, Peter Buck (Te Rangi Hiroa), Margaret Mead, Alfred Métraux, Edmund Leach, and Marshall Sahlins can now be put in perspective with the reconstructed archaeological sequences that highlight the complexity of cultural systems in constant evolution.

This volume shows that archaeological studies provide a unique perspective grounded in materiality and diachrony. However, archaeological research in the Pacific cannot ignore the wealth of ethnographic and ethnohistorical descriptions, oral traditions (chants, mythological narratives, genealogies, toponyms, etc.), and the linguistic descriptions and reconstructions of Oceanic languages. These multiple lines of evidence make it possible to open a wider holistic window onto the past of Pacific island societies, as this unique situation represents a formidable opportunity to develop interdisciplinary perspectives, through the French tradition of 'ethnoarchéologie' and the American tradition of historical anthropology. The papers presented in this volume confirm that these integrated approaches mark a strength and trademark of archaeology in the Pacific region.

Monumental constructions and complex exchange networks are two aspects of Pacific island societies that were extensively described and commented by scholars over the 19th and 20th centuries. Yet, these are not necessarily what comes to the mind of the general public when hearing about Pacific islands, which are more commonly associated with picturesque golden beaches and blue lagoons. Thinking further, the reader might remember that the impressive *moai* of Easter Island (Rapa Nui), the massive stone and wooden *tiki* statues, and the recently named UNESCO World Heritage Site *marae* Taputapuātea are all located in Polynesia. Next to these iconic and famous landmarks, a number of monumental burials, ceremonial constructions,

extensive stone-built fortifications and irrigation systems, and massive anthropomorphic sculptures were built in nearly every archipelago of the Pacific. A number of cultural and agricultural landscapes were often created as well, which also signals the massive efforts put into the intensification of staple production systems, the differentiation of social and political elites, and the rise of powerful religious and political institutions in the societies of Oceania. Unlike the synchronic studies provided by cultural anthropologists, which were often used as 'ethnographic examples' to interpret past non-literate societies across the world, the archaeological analysis of the megalithic and monumental traditions in the Pacific has received little attention by the global scientific community – aside from iconic cases like the 'collapse' or 'ecocide' hypothesis popularized by Jared Diamond about Easter Island (Rapa Nui), which is not supported by the archaeological evidence.

The UISPP session dedicated to Pacific monumentality brought together experts of these monuments, who highlighted the wealth and diversity of the phenomenon. A number of case studies illustrate the latest outcomes of archaeological research on this pan-Oceanic topic : ritual architectures on Malekula Island (Vanuatu), monumental stonework associated with food production and land management in West Futuna (Vanuatu), funerary monuments on Pohnpei and monumental earthwork landscape of Palau (West Micronesia), chiefly mound building on 'Upolu, Savai'i and Manono (Samoa), monumental landscapes including pigeon snaring mounds and royal tombs on Ha'apai and Tongatapu (Tonga), sacred trees associated within ritual architectures on Nuku Hiva (Marquesas Islands, French Polynesia), a fertility sanctuary and a main stone quarry reinterpreted as a ceremonial site on Easter Island / Rapa Nui (Chile).

Exchange systems in Oceania have been extensively described and studied based on ethnographic data. A number of case-studies have famously contributed to theoretical advances regarding the embeddedness of social, political and religious dimensions in exchange practices. More generally, the study of exchange systems in Oceania has also enhanced our understanding of socially valued goods and 'proto-money' in non-market economies, and the role they played in social and political spheres. Most interaction networks described by ethnographers involve the transfer of goods from one island to the other, as well as long-distance mobility and seafaring that is well known from the ethnographic period onwards. Despite this wealth of ethnographic and ethnohistorical descriptions, an archaeological approach is necessary to assess the antiquity and the evolution of such patterns of interaction on the long run. Pacific archaeologists have been inferring patterns of mobility and interactions based on typological similarities in material culture, but have better succeeded when using hard evidence, and particularly when emphasizing exotic provenances in the archaeological record. Archaeological evidence for ancient wide-scale interactions has further emerged with the development of provenance analyses of specific material culture items – namely pottery sherds and stone artefacts – and the increasing use of biological data – namely morphometry, and more recently aDNA sequencing and stable isotope studies. The multiple reconstructions of past interactions using archaeological data show that interisland voyaging has been a major component of history in the Pacific, and that different patterns of mobility have developed over the past 40,000 years. As a consequence, Pacific island societies can no longer be considered as closed systems evolving in complete isolation. To the contrary, understanding interisland exchange patterns and intercommunity linkages is actually central to the description of most aspects of cultural systems in the Pacific.

The papers presented during the Paris UISPP Congress in the interdisciplinary session dedicated to mobility and networks in Oceania addressed a diversity of questions based on a wide range of methods and approaches from archaeological sciences, historical linguistics, as well as ethnography and ethnohistory. The presentations tackled different topics, which included the reconstruction of interaction patterns based on material and immaterial evidence, as well as the relationships between exchange networks and settlement strategies in Sahul and the Western Pacific, during the Lapita period and later on in the Polynesian settlement of islands located on the fringe of Melanesia

and Micronesia collectively known as the Polynesian Outliers. Other papers presented the symbolic and social content of exchange, the functional aspect and integration of intercommunity exchange in specific social organisations, as well as case studies of 'proto-currencies' in the western Pacific, such as the stone money banks on Yap, the shell valuables in the Solomon Islands and the pig tusks in Vanuatu.

This volume presents a combination of papers based on the two sessions, with papers drawing on archaeological, ethnohistorical, and ethnological material:

Christophe Sand proposes a reconstruction of the vegetal landscape at the monumental site of Nan Madol on Pohnpei Island (Federated States of Micronesia) at different periods based on a compilation of early historical accounts and photographs dating from the last two centuries. Sand also discusses the traditional use and maintenance of specific taxa around or on the monuments of the famous megalithic site, as well as the changes associated with the modern impact of archaeological programs and tourism.

Geoffrey Clark and Phillip Parton provide an inventory and a classification of monumental stone-faced burial mound sites and sitting platforms or house mounds on the island of Tongatapu (Kingdom of Tonga). The authors particularly highlight the correlation between the distribution of stone architecture and the places of the political elite, therefore demonstrating that monumentality was an important aspect of manifesting political authority in Tonga, one of the most politically complex 'proto-state' societies at the time of European contact.

Hubert Forestier and colleagues present a techno-morphotypological analysis of lithic drill points from Motupore (Papua New Guinea). The authors argue that these were standardized products made by craft specialists from the Motu community, and that they were used in rotating pump drills to transform items used and exchanged as part of the '*hiri* trade circle', a large network of exchange that might have started 800 years ago between Motupore and the Gulf of Papua.

Peter Sheppard reviews the archaeological evidence of exchange networks in the Solomon Islands, and especially the phenomenon of shell money in the western part of the archipelago over the last millennium, therefore providing insights on the antiquity and the evolution of the regional exchange systems described by ethnographers during the 19th and 20th centuries. Sheppard's discussion of 'proto-money' or 'proto-currency' also breaches the divide between what anthropologist Douglas Oliver called 'good-focused' and 'relationship-focused' exchanges in Pacific island societies.

Wanda Zinger and colleagues revisit the archaeological evidence of migration and interisland mobility in the Polynesian Outliers. By stressing the importance of human biological data (skeletal, genetic, genomic), which have been often overlooked in previous archaeological assessments on this complex topic, the authors highlight different mixing situations between Polynesians newcomers and local populations in the northern and southern Outliers. Zinger and colleagues also propose that external exchanges have been a major driver of the ethnogenesis in these regions, through multi-scale interactions between Polynesian Outlier communities, related 'source populations' in the Polynesian triangle, and the surrounding Melanesian and Micronesian populations.

Sophie Chave-Dartoen and Denis Monnerie elaborate an 'anthropological grammar' to understand ceremonial components among Pacific societies. Beyond the diversity of cultural practices related to the institutions of exchange in Oceania, the authors identify common ceremonial components in Arama (New Caledonia) and 'Uvea/Wallis Island (Western Polynesia), which articulate a dyadic and asymmetrical relationship formalised between a welcoming and an arriving party. This seems to function as an underlying rationale for more general ceremonial

activities and relationships. This structural commonality highlighted by Chave-Dartoen and Monnerie, based on two ethnographical cases from Southern Melanesia and Western Polynesia, also suggests a deep historical origin of the dyadic relationship as a foundational element of intercommunity relationships in the Pacific.

Vegetation cover of the megalithic site of Nan Madol (Pohnpei, Federated States of Micronesia): an assessment of its history

Christophe Sand[1, 2]

[1] UMR 220 GRED, Centre IRD, Nouméa, Nouvelle-Calédonie
[2] UMR 7041, ArScAn, Ethnologie préhistorique, MSH Mondes, Nanterre, France

Abstract

This paper presents an assessment of the published information facilitating the study of fluctuations in vegetation cover on the megalithic site of Nan Madol. The 'Venice of the Pacific' is characterized by large built platforms on the reef surface on the east coast of the Island of Pohnpei (Western Micronesia), linked by navigable canals. Its unique architectural setting is characterized by the piling of massive polygonal columnar basalt boulders to raise the retaining walls of the platforms as well as the protective outer walls of some compounds. Nan Madol was occupied between the 10th and the early 17th centuries, before being first described by Europeans in the first half of the 19th century. The use of photography dating from the 1870s onwards helps to precisely follow changes in vegetation cover on the site during the colonial period, and to highlight the important impact of different archaeological research programs carried out from the 1960s to the 1990s for the long-term preservation of the megalithic structures.

Keywords: Micronesia, Pohnpei, Nan Madol, photography, vegetation cover

Résumé

Cet article présente une synthèse des données publiées permettant l'étude des évolutions du couvert végétal sur le site mégalithique de Nan Madol. Cette « Venise du Pacifique » se caractérise par la présence de grandes plates-formes construites sur le récif de la côte orientale de l'île de Pohnpei (Etats fédérés de Micronésie), connectées par des canaux navigables. Sa spécificité architecturale consiste en l'empilement de colonnes basaltiques polygonales massives afin de construire les murs de retenue des plates-formes ainsi que les murs protecteurs extérieurs de certains ensembles. Nan Madol a été occupé entre le Xe et le début du XVIIe siècle, avant d'être décrit pour la première fois par des européens durant la première moitié du XIXe siècle. L'utilisation de la photographie à partir des années 1870 permet de suivre en détail les changements dans le couvert végétal durant la période coloniale et de souligner l'impact important qu'ont eu différents programmes de recherches archéologiques menés entre les années 1960 et 1990, sur la préservation à long terme du site mégalithique.

Mots-clés : Micronésie, Pohnpei, Nan Madol, photographie, couverture végétale

Introduction

The World Heritage Property of Nan Madol on the east coast of the Island of Pohnpei (Federated States of Micronesia), is an abandoned megalithic complex located on the edge of the lagoon of Temwen Island (Figure 1). Although the seashore location was occupied from the beginning of the first millennium AD, the artificial platforms that compose the site were mainly raised between the 10th and the 14th century (Ayres 2002). These quadrangular platforms were erected on the lagoon floor by systematically piling polygonal columnar basalt boulders to create retaining walls. The nearly 130 individual platforms of variable sizes were interconnected through a complex network of navigable water channels, allowing the site to expand to a total size of over 1300m south-west/north-east and about 500 m from the edge of Temwen Island to the limit of the massive walls that protect the site on its ocean sides (Figure 2).

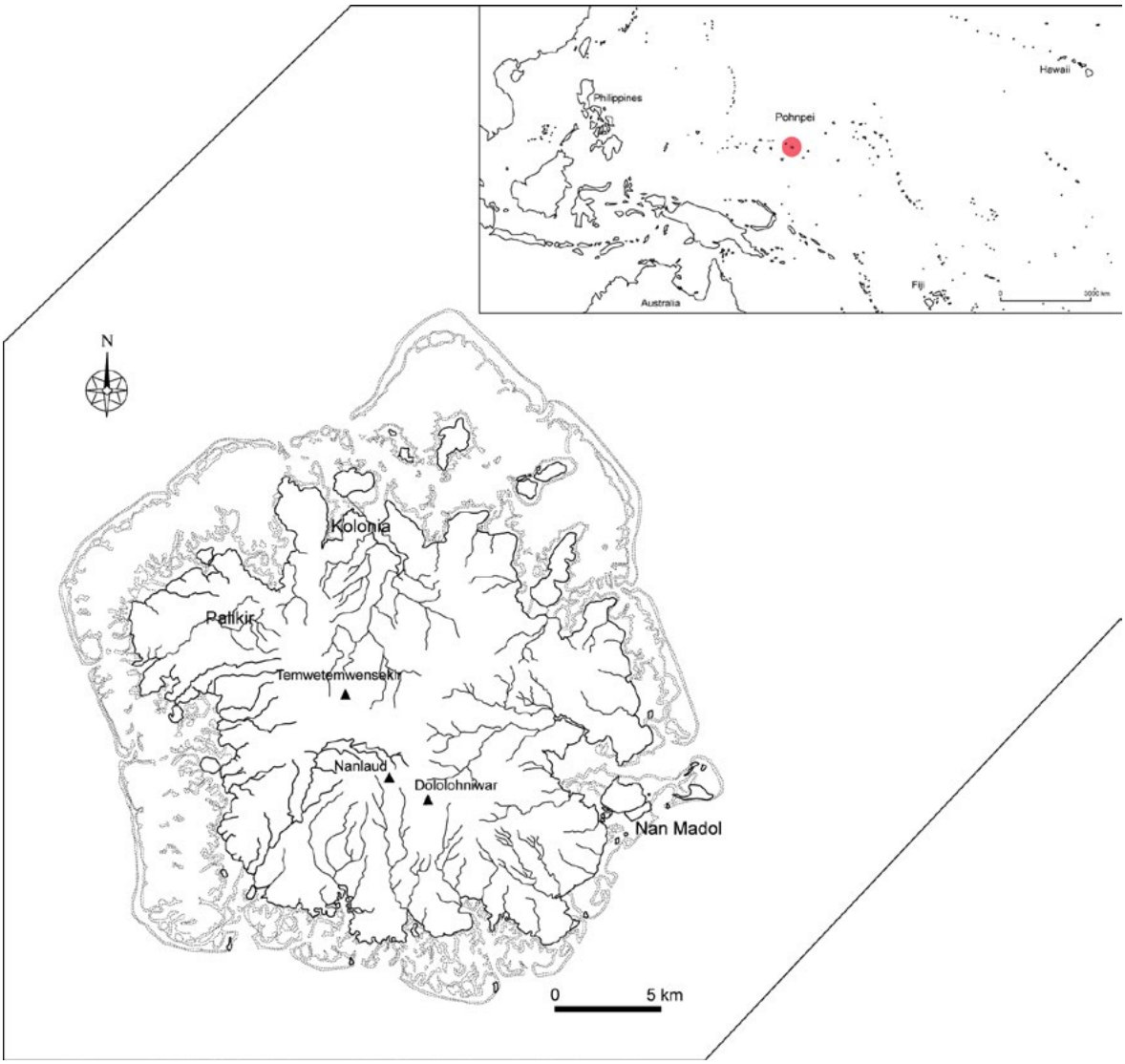

Figure 1. Location of Nan Madol on the east coast of Pohnpei Island (Federated States of Micronesia).

Rich and detailed oral traditions ascertain the abandonment of the main parts of the site after the reign of the Saudeleur dynasty collapsed, which archaeological studies date approximately to the beginning of the 17th century (Seikel 2016). Nearly all written accounts testify that by the early 19th century, the site had long been devoid of any large population and that the main structures were in ruin. The first European testimonies highlighted the density of the vegetation cover, a characteristic that remains one of the iconic elements of the site today, creating the feeling of a 'lost city'. Evidently this was not the case during Nan Madol's occupation, and a simple statement could synthesize the vegetation history for the site as a complete dichotomy between its period of use and the period of abandonment. The main objective of the present paper is to show, through a detailed synthetic approach using archaeological, traditional, written and photographic data, that the vegetation history of Nan Madol has been far more complex than this. The present study is not only useful from a historical point of view in the overall archaeological analysis of Micronesian megalithic sites. It has also a direct outcome in relation to the expected cultural and touristic conservation projects that will in the near future arise from the 2016 listing of Nan Madol as a UNESCO World Heritage site. Today, the massive vegetation overgrowth is identified as one of the main threats that affect the long-term conservation of Nan Madol, along with sea-level rise. Any restoration of Nan Madol's platforms will have to rely on a defined plan to control vegetation growth, but this can only be fostered with a good knowledge of the history of tree and scrub growth

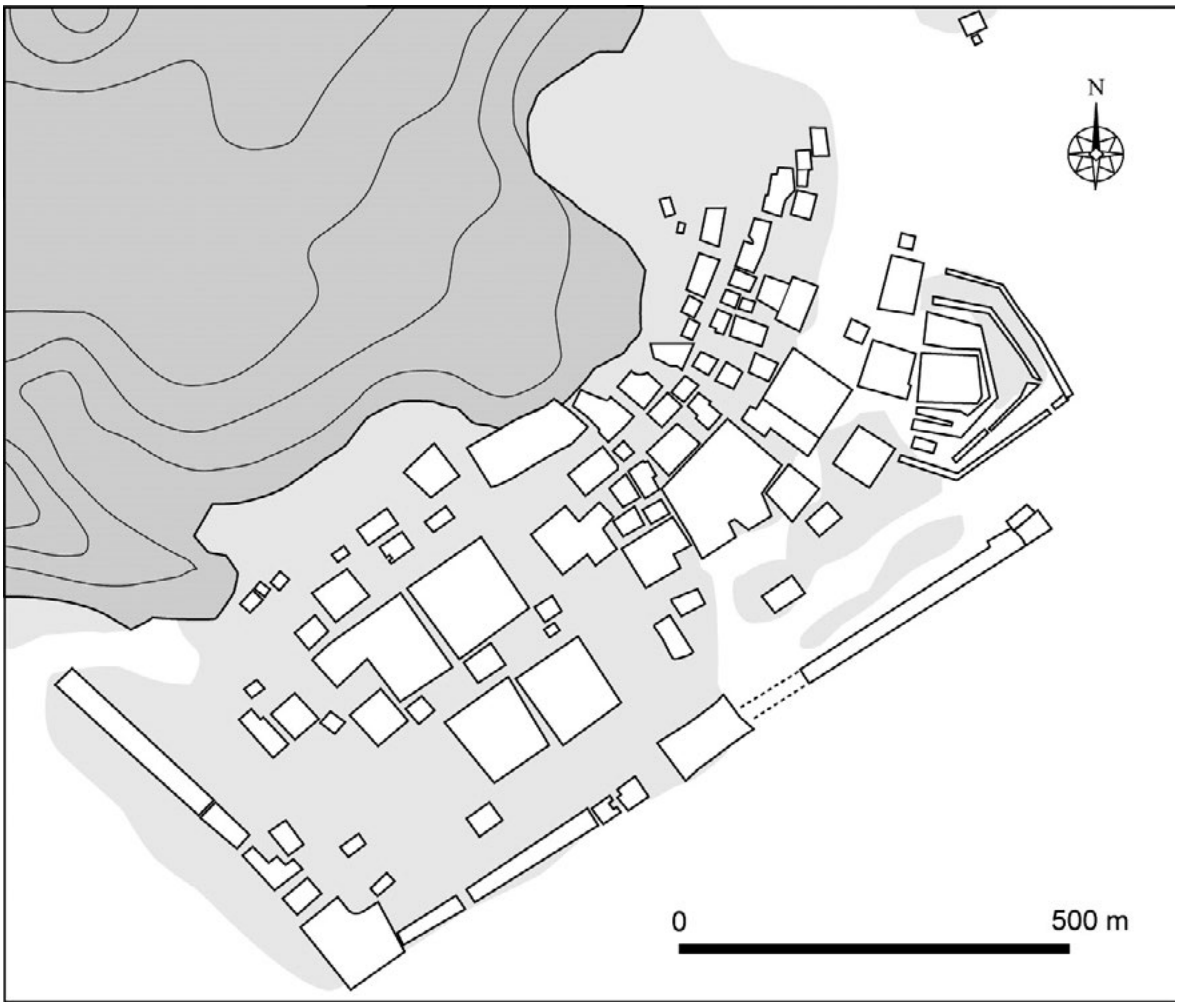

Figure 2. Map of Nan Madol and extent of the present vegetation cover
(from the original map in Kataoka *et al.* 2017, fig. 4).

over last centuries. Accordingly, this paper presents an assessment of the main information that can be retrieved from different sources concerning the history of vegetation cover on this unique megalithic site of the Northern Pacific over a thousand years period. After presenting a summary of the main characteristics of the setting of Nan Madol, the paper will discuss the possible types of vegetation cover that existed on the raised platforms during their time of use. The second part of the paper will analyze in detail the European written and photographic sources about the site in the 19th and 20th centuries, highlighting the profound impact of the archaeological studies started in the 1960s on the evolution of the vegetation.

The megalithic site of Nan Madol: a synopsis

Nan Madol, literally meaning '*between the intervals*' (referring to spaces between the houses on the artificial islets, see Mauricio 1983: 208-209), is formed by a set of over a hundred named artificial islets of different sizes, grouped on the lagoon floor in front of the south-eastern shore of Temwen Island, in south-east Pohnpei, Federated States of Micronesia. The property, included in 2016 on the List of UNESCO's World Heritage, extends over an area of 13,000 square meters (1.5 km by 0.7 km).

Information gathered from Pohnpean oral traditions link the foundation of Nan Madol to two brothers, Olosihpa and Olosohpa (Mauricio 1983: 213-214). Archaeological data identify the appearance of a first set of artificially-filled islets on the reef facing Temwen Island, retained

by large basaltic boulders or prismatic/columnar monoliths, around AD 900-1000 (Ayres 1990; McCoy *et al.* 2016), on a site that had already been occupied for nearly one millennium (Ayres 1983; Athens 1990). Over the next 500 years, a centralized political system, organized around the Saudeleur polity, commanded collective labor from around Pohnpei to progressively expand the number of artificial islets seawards, reaching the edge of the reef-flat before the sharp drop into the deep ocean. Recent geological studies (McCoy and Athens 2012; McCoy *et al.* 2016) have shown that a significant proportion of the monumental stones was transported to Nan Madol from long distances, reaching over 20 km for the quarries of Sokehs Island in north-western Pohnpei. Although blocks of 'post-Shield' geological times (7-less than 1 million years ago) were easily accessible close to Temwen, it is mainly blocks of 'Main Shield Stage' basalts dated to 8-7 million years ago that were used in the construction (Keating *et al.* 1984). Being built over water, the different parts of Nan Madol were mainly accessed and connected through a web of navigable channels. In order to secure long-term occupation and prevent natural erosion from the tides and waves, the sides of the islets were maintained by artificial retaining walls laid on the floor of the natural reef, their cores being filled mainly with coral boulders rather than basalt. The main building technique used for wall raising was the header-and-stretcher architectural method, which is to place a row of parallel blocks over another row of parallel block stretched in opposite direction at 90°. To prevent destruction by massive wave action during natural events such as typhoons, the whole compound of the site was enclosed and protected on the ocean side by a set of long islets with high walls, through which passages had been deliberately left open to allow access to the inner islets. Most of the islets supported mainly thatched wooden buildings that served different purposes: housing, ceremonial and ritual events, cooking and so on. Oral traditions clearly state the specific function of most of the islets, for housing, meeting places or religious ceremonies, as well as sacred eel ponds, chiefly burials and the like. Nan Madol was divided between an essentially profane zone (Madol Pah, 'Lower Nan Madol') and a ceremonial/sacred area (Madol Powe, 'Upper Nan Madol'). Some of the important islets were readily identifiable by the presence of high walls standing on the platforms, constructed mainly with long prismatic/columnar basaltic monoliths. The iconic example today is islet n°113, Nandowas (World Heritage dossier spelling). The main visitor-focus of Nan Madol, it has walls up to 8.1 meters high, built with stones commonly reaching 5 tons, but some probably exceeding 60 tons.

The abrupt end of the rule of the Saudeleur dynasty after about 500-600 years is explained in the oral traditions by the progressively more tyrannical nature of the polity over time, leading to a conflict with the demi-god Isokelekel, who finally overthrew the acting ruler. The fate of the Saudeleur led to the rise of a new polity, symbolizing the beginning of the Nahnmwarki period, during which Pohnpei was subdivided into five chiefdoms, a customary organization that has been maintained up until today. Archaeological information is in general accordance with oral traditions in identifying a fairly abrupt end to the main occupation of Nan Madol, possibly at the very beginning of the 17th century (Seikel 2016).

Extrapolating the vegetation cover of the Nan Madol platforms when the site was occupied

Nan Madol was built on the south-eastern edge of Temwen Island, on what was mostly a flat marshy and sandy seashore lagoon fringed by mangroves. At that time, Temwen and the south-east coast of Pohnpei were used as agroforest, with the planting of breadfruit and coconut trees, bananas, yams and taro as well as kava for ceremonial purposes. The megalithic site was abandoned as a central political locus of Pohnpei Island probably two centuries before the earliest European texts describing its existence were written. No conclusive coring results have been published to date for this part of Pohnpei (see Athens and Stevenson 2012 for a summary), precluding any conclusions about the long-term transformation of the seashore zone around Temwen. Moreover, no specific studies related to food production and preparation have been completed to date on Nan Madol, and the data recovered for nearby Temwen Island (see Levin 2015, 2018) can only be used in general terms. Consequently, we do not have any direct data of the vegetation setting of the different

platforms during their occupation. The information presented in the oral traditions explains in detail the use of the different parts of the site but appears to contain no detailed indication on the vegetation growing at that time on the different platforms.

Although engravings like those made by Europeans for the megalithic city of Lelu on Kosrae Island in the 1820s (see for example Dumont d'Urville 1835, plate LVIII) do not exist for Nan Madol, one can nonetheless attempt cautious extrapolation on the type of vegetation(s) that might have been planted on the site. Pacific Islanders have always surrounded their everyday habitats, their socio-political centers, their burial grounds and their sacred sites with symbolic and/or useful trees and plants (see Balick 2009 for Pohnpei). Furthermore, experiences of archaeologists who completely cleaned some of Nan Madol's platforms of the large vegetation that provides shelter from the sun, demonstrate that work is barely tenable during sunny days because of the reflection of the sun's heat on the shiny coral fill (W. Ayres, pers. com. 2018). It is thus safe to assume that any long-term occupation of the platforms would have necessitated the planting of trees creating shadow. It can be anticipated that some of the trees chosen for this purpose would have allowed for direct gains in edible products, such as breadfruit trees (*Artocarpus altilis*), coconut trees (*Cocos nucifera*) and Tahitian chestnut trees (*Inocarpus fagiferus*). While the vast majority of the edible products prepared for the elite living in Nan Madol must have come from the different districts on the main island of Pohnpei, it can also be expected that some platforms carried small patches of cultivated plants such as yam (*Dioscorea alata*) and taro (*Colocasia esculenta*), alongside bananas (*Musa* spp.) and sugarcane (*Saccharum officinarum*).

Relying on simple human needs for shelter in a tropical climate, pan-Pacific cultural habits and early European observations, it can be concluded that during their time of use, the different platforms of Nan Madol were most probably planted with a diverse array of large trees for sun protection and food production, as well as other usable plants of smaller size for different purposes, such as *Sakau* (Kava, *Piper methysticum*), hibiscus trees (*Hibiscus tiliaceous*), banyan trees (*Ficus* spp.), symbolic/magic plants such as cordyline (*Cordyline fruticosum*), ornamental flowers/leaves, medicinal plants and so on. The only area where it can be anticipated that there were no large trees, was on the massive ocean-facing protective walls, as their growth would have represented a destructive hazard during strong winds, the roots of falling trees being able to dislodge the upper fill of the structures.

Early descriptions by Europeans

The first texts on Nan Madol

The first mention of Nan Madol in a written text that has been found to date (cf. Athens 1981), appears to be by John Lhotsky (1835), relying on an information given by Mr. Ong, resident on Pohnpei for several months: 'there are at the northeast end of the island, at a place called Tamen [Temwen], ruins of a town, now only accessible by boats, the waves reaching to the steps of the houses. The walls are overgrown with bread, coconut, and other ancient trees, and the ruins occupy a space of two miles and a half' (in Ward 1967: 121).

One of the very first Europeans to visit Nan Madol appears to be James F. O'Connell, who was in Pohnpei between the end of the 1820s and 1833. He was the first to coin the term 'Venice of the Pacific' (O'Connell 1836: 208-209). His description of Nan Madol, written from memory, is at times confusing, but highlights the sacred character of the place to the Pohnpeans, who refused to guide him during the days he explored what he describes as 'a large uninhabited island, upon which were stupendous ruins, of a character of architecture differing altogether from the present style of the islanders, and of an extent truly astonishing' (O'Connell 1836: 206). He recalls that '(u)pon some parts of it fruit grows, ripens, and decays unmolested, as the natives can by no persuasion be induced to gather or touch it' (O'Connell 1836: 206). Elsewhere he states that the high walls are 'in

some places dilapidated, and in others in very good preservation. Over the tops of the wall, cocoa-nut trees, and occasionally a bread-fruit spread their branches, making a deep and refreshing shade. It was a deep solitude, not a living thing, except a few birds, being discernible. (...) The walls enclosed circular areas, into one of which we entered, but found nothing upon the inside but trees and shrubs' (O'Connell 1836: 207). O'Connell was probably one of the very first Europeans to enter one of the burial chambers of Nan Madol: 'by the accidental falling of a piece of wood, we discovered a vault, into which I descended. My first supposition was that it was a burial place, but all that appeared to sustain such an opinion was one skeleton, which lay at the bottom, its parts scattered to and fro about the ground. This distribution was probably done by the rats' (O'Connell 1836: 211). That some of the channels were already overgrown by mangroves by that time can be deduced from O'Connell's observation that '(t)he tide happening to be high, our canoe was paddled into a narrow creek; so narrow that in places a canoe could hardly have passed us' (O'Connell 1836: 206-207). Furthermore, the infilling of some of the channels was already evident, as O'Connell states that 'at low tide, one might walk from Kitti (Temwen Island?) to the haunted spot; indeed, it is considered a part of that island' (O'Connell 1836: 209).

The description of Nan Madol after the French visit in 1840

A visit by the French vessel *Danaïde* in 1840 provides complementary information. Joseph de Rosamel, the Officer of the ship, left a detailed manuscript of this visit, published in French in 2005. De Rosamel depicts the site as follows, presented here in my translation: 'These islets, being coral blocks, often leave to the channels that separate them a depth of several fathoms, while beside them, only a few inches. Circulation can only be achieved with canoes, in as much as the significant vegetation that grows there covers nearly entirely the access-ways' (de Rosamel 2005: 103). He further ascertains that 'presently, this gigantic construction is invaded by trees and parasitic plants of all kinds whose presence renders any inner circulation very difficult', but goes on to describe that 'nearly all the islets are settled. Between these ruins grow nice coconut trees, impressive breadfruit trees. The light and feeble houses, create a colorful contrast with these heavy and massive walls. When wandering in these canals, charming view-points appear each time the invading mangrove opens to a view. Only the Tabu islets are uninhabited' (de Rosamel 2005: 104). A schematic illustration of the setting of the site was included in a map of Madolenihmw Harbor surveyed by the French team in September 1840, a caption indicating: '(r)uins of ordered canals in the passage are constructed with basalt prisms of very large dimensions' (in de Rosamel 1840, see also de Rosamel 2005: 33).

The first engraving of the site

An anonymous publication of an excavation underway in Nandowas around 1840 gives the first illustration of one of the monumental structures from Nan Madol (Anonymous 1840; Ward 1967: 135). Europeans and one Pohnpean are positioned in front of an idealized rendering of the central tomb, one of them inside the burial chamber giving an item to another person

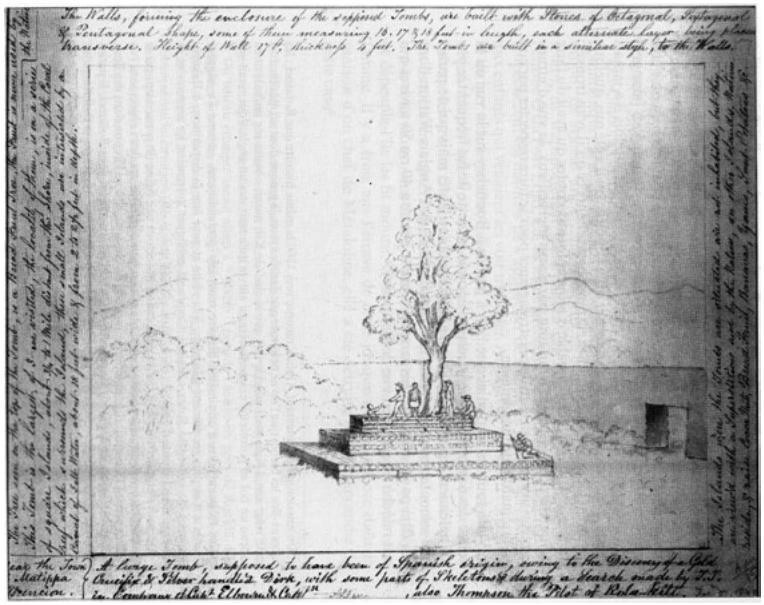

Figure 3. Idealized illustration of a burial vault at Nandowas published in 1840 (figure extracted from de Rosamel 2005, p. 38).

standing on the top of the structure (Figure 3). A side caption reads '(t)he Tree seen on the top of the Tomb, is a Bread Fruit Tree, the Fruit is never used by the Natives'. Vegetation is also depicted at the back of the burial chamber. Another caption of the drawing says '(a) large tomb, supposed to have been of Spanish origin, owing to the discovery of a gold crucifix and silver handled dirk, with some parts of skeletons, during a search made by J.J. in Company of Capt. Elbourne & Capt. Allen, also Thomson the Pilot of Rola-Kiti'. Interestingly, one of the captions of the drawing says that '(o)n other islands natives reside & raise coconuts, breadfruit, bananas, yams, sweet potatoes etc.', indicating that at least some of the platforms of Nan Madol were still occupied during the first half of the 19th century.

Observations of Missionaries and Yacht navigators

The American missionary L. H. Gulick, who sojourned on Pohnpei from 1852 to 1860, describes the megalithic site as follows: '(t)his whole assemblage of islets is now overgrown with vegetation. Some of the larger islets are occupied by bread-fruit and coconut trees; the rest, together with large portions of the canals are enshrouded with the mangrove. Till within the memory of some living, the whole of this locality was densely populated, with the exception of the most sacred spots, and no mangroves were allowed to intrude. A few inhabitants are still to be found there' (Gulick 1859: 131).

That parts of Nan Madol were still used for ceremonies in the mid-19s century is indicated by another extract of Gulick's paper: '(o)n one of the islets, named Pankalera, where most of the most important religious ceremonies of the tribe are several times a year performed, a sort of paved way laid with broad stones, some of them having a peculiar central depression, leads to a spot peculiarly sacred, over which a small shed is erected. Nearby are several low walls forming more or less decided squares, at different points of which religious ceremonies are at stated seasons performed. There are other sacred islets where ceremonies are at times celebrated, and where low walls or pavements can be seen by those who dare venture in' (Gulick 1859: 131-132). In conclusion, '(t)his submerged locality may, even to this day, be considered the head-quarters of the whole island. More important ceremonies are performed here than anywhere else, and many of the performances in the other places have some reference to those here. The chiefs and priests of this tribe are to this day the most bigoted, and are the rallying points of the island's crumbling heathenism' (Gulick 1859: 136).

A final set of information about the vegetation surrounding Nan Madol at the time photography was first beginning can be found in the description by C. F. Wood, of his visit with a yacht party to the site in 1873. Trying to reach the eastern entrance by boat at low tide, his team got stranded. On reaching the site, he noticed that '(t)he land here is very low, and there was a great deal of mangrove swamp' (Wood 1875: 164). The lateral sides of Nandowas are described as running 'back into the dense mangrove swamp', the channel being nearly dry at low tide (Wood 1875: 165). Inside, '(t)he whole of the court was not visible at once, for the dense vegetation entirely concealed what may be called the back part of the ruins, and it was only by clambering about, and pushing our way through vines and creepers, that we ascertained it was nearly square' (Wood 1875: 165-166).

Changing perspective: early photographs of Nan Madol

The photographic collection of Johann Kubary (1870s)

Although some earlier photographs of Nan Madol might exist in museum or archival collections, the earliest set of pictures known to the author is a collection taken by Johann Kubary between 1873 and 1875 (see Kubary 1874). Kubary was sent to Micronesia by the Godeffroy Museum in Hamburg (Germany), to collect ethnographic items and natural specimens (Lawson 2017). Today, part of the photo collection of Kubary is stored at the *Museum Volkenkunde* in the Netherlands and

Figure 4. Central burial chamber of Nandowas, showing a massive vegetation overgrowth around the tomb although the place is visited, as can be deduced from the notch on the coconut tree and the breadfruits trees in the background. It is apparent that the front of the burial was cleared for the photo and Kubary's archaeological 'excavation' (Kubary collection, Photograph A32-57).

is accessible through the museum's web site (http://www.geheugenvannederland.nl) (see Sand 2018a, figures 8-16). A total of 11 photographs (mostly stereograms) presenting parts of Nan Madol can be downloaded. Four photographs (A32-49, A32-50, A32-51 and A32-52) show the presence of mature mangroves along the north-eastern inner walls and on the walls of Nanmwoluhsei (platform 119), as today. The rest of the photographs feature only the burial platform of Nandowas. Amongst these, photographs A32-55 and A32-57 present the central burial chamber, showing a massive vegetation overgrowth around the central tomb, although the place is visited, as can be deduced from notches on the coconut palms and breadfruit trees in the background. The open space in front of the entrance is clearly related to vegetation clearing as part of the preparation for the picture, as the whole back part of the chamber is covered in vegetation. The sediments retrieved from the burial by Kubary during his 'excavation' can be seen in Figure 4, in front of the entrance. The density of vegetation inside the walled compound, as well as the growth of mature mangrove trees in the northern-side channel facing this platform, are clearly apparent in photograph A32-58. Coconut palms at different stages of growth, young and old breadfruit trees, as well as vine development, are all present on these photographs.

From the late 19th century to the German era

The rapid re-growth of the vegetation after the clearing by Kubary's workers can be highlighted by a picture of the lateral base of the entrance-wall of Nandowas published by F.J. Moss a decade later (Moss 1889: 192), with thick foliage cover and recent cutting of branches. Moss describes that during his visit, '(t)he islets were thickly covered with trees' (Moss 1889: 192). The platform of Nandowas was reached by 'wading up one of the smaller channels over a soft mud bottom' (Moss 1889: 193), a rough sketch-map being finalized by passing 'under the towering walls and push(ing) our way among the trees and shrubs as best as we could' (Moss 1889: 194). After having visited Pohnpei in 1896, F. W. Christian published a series of photographs of Nan Madol in his book on the Caroline Islands (1899a). One of these clearly shows a huge overgrowth of banyan trees on top of the north-eastern outer wall of Nandowas, with possibly others visible on the southern wall (Figure 5). The area in front of the corner has evidently been cleaned for the purpose of the photo. The dense vegetation cover observed by Christian at Nandowas can be highlighted through three other photographs, taken from a paper published the same year as the book (Christian 1899b).

F. W. Christian did a sketch map of Nan Madol, indicating the main areas of mangrove growth and highlighting the presence of an open area (shallow lagoon) between the southern and northern

Figure 5. View of the north-east corner of Nandowas taken in 1896, showing the large banyan trees topping the walls (in Christian 1899a, p. 102a).

halves of the site (Christian 1899b: 116). He stresses that most islets 'are deserted, and altogether there are not above twenty people living on the three or four inhabited ones. Some of them are planted with coconuts and bread-fruit, and are visited occasionally by fishing-parties. (...) They say the place is haunted, and on certain of the islets, such as Pan-Katara and Pei-Kap, nothing will induce them to set foot' (Christian 1899b: 117-118). On reaching Nandowas, he notes that '(t)he right side of the gateway is overshadowed and all but hidden from view by a dense leafage of a huge Ikoik tree. This we had not the heart to destroy, a wonder of the deep green heart-shaped leaves, thickly studded with tassels of scarlet trumpet-shaped flowers' (Christian 1899b: 119). '(T)he terrace fronting the waterway is overgrown by a belt of young coco-palms of recent growth' (Christian 1899b, p. 122). 'Standing on the south-west angle, where the wall is nearly 40 feet in height, one looks down upon a green abyss of nodding woodland, with never a glimpse of the network of canals rippling below. The north-east angle is occupied by an enormous banyan tree towering full 50 feet above the masonry in which it stands full-rooted, thrusting its bunches of thread-like root-fibre into every crevice. (...) A tangle of weeds, grasses, India shrubs, and creepers thickly carpets the precinct. Clearing it gave us no end of work' (Christian 1899b: 121). After having had to stop their work on the order of 'King Paul' (Christian 1899b: 122), Christian concludes that '(t)o thoroughly explore and clear the labyrinth of this Micronesian Venice and to make thorough excavations would take several months' hard work' (Christian 1899b: 123).

The period of German colonial rule (1899-1914) was a time marked by new interest in the study of the ruins at Nan Madol. For example, series of excavations was undertaken by Victor Berg, the German vice-governor of Pohnpei between 1905 and 1907, during which he 'systematically searched the graves of the town hall' (Hambruch 1936: 55-56), before his death owing to a sun-stroke after an excavation at Pankitel. It can be assumed that some of this work led to partial vegetation clearing. Nonetheless, pictures taken during the German era highlight the continuous massive overgrowth of vegetation in Nan Madol. A photograph from the H. Hallier collection, dated 1903-1904 (*Museum Volkenkunde,* Netherlands), shows the north-west corner of Nandowas as well as the central burial vault covered with vegetation, and a near-dry channel when close to low tide (Hallier collection, *Museum Volkenkunde*, Netherlands, photographs n°urn-gvn-VKM01-A357-37 and n°urn-gvn-VKM01-A357-38). Nandowas also appears surrounded by dense vegetation (Hallier collection, *Museum Volkenkunde*, Netherlands, photograph). A similar setting is visible on a photo from the *Völkerkunde Museum* collections in Berlin, which highlights the vegetation forbidding easy access to the central tomb (Figure 6). One photograph of what appears to be a corner of Pankedira platform (n°33), apparently cleaned of vegetation, also shows the significant overgrowth of trees and scrub in the background (*Völkerkunde Museum,* Berlin, photograph n°VIIIB 5498). The picture was taken at high tide, suggesting that this was when visitors could access this part of Nan Madol using traditional canoes.

Figure 6. Entrance gate of Nandowas, with recent vegetation cleaning to allow access (Völkerkunde Museum Berlin, photograph n°VIIIB 5497).

The German Südsee Expedition

The photograph shown here in figure 6 suggets that the Berlin collection is part of the German *Südsee Expedition*, as the cleaning of the wall face is identical to one of the photographs published by ethnographer Paul Hambruch in his posthumous 1936 volume on Pohnpei. Hambruch was a member of the German scientific *Südsee Expedition* between 1908 and 1910. He compiled the previous studies about the megalithic site, finalized a new map of Nan Madol and took a number of photographs. The set of photographs published in Hambruch's book, dated to 1910, allow a better understanding of the extent of mangroves in the south-western part (Madol Pah) of Nan Madol at the beginning of the 20th century. The large quantity of rotting trunks visible in some pictures signals the impact of a destructive event, the German expedition having been in Micronesia just after a series of typhoons. Although filled with more mangroves than the main channel, the lateral channels towards the ocean do not appear to be as densely overgrown as they are today. The whole area towards Temwen also appears to be less vegetated. A photograph taken from the south shows the protective wall of platform 110 and in the background the southern wall of Nandowas. The presence of mostly low to medium-sized coconut-trees is noticeable, as is the presence of a large concentration of drift wood in the foreground of the picture, both indicative of the recent destructive weather event (Figure 7). No tall banyan tree can be seen on the top of

Figure 7. View of the southern wall of Nandowas and of Pahndowas, with a massive accumulation of logs deposited by the tides after the typhoons that hit Pohnpei in 1908 (from Hambruch 1936).

the walls, contrary to a decade before. The inside of the first compound of Nandowas is cleared of large vegetation and only young coconut trees are visible in this part of the platform, while large breadfruit trees fill the central compound. This is also significantly different from the vegetation cover visible in earlier pictures.

The Japanese era

During the Japanese era (1914-1945), a number of archaeological projects and excavations were undertaken at Nan Madol, although few final publications were subsequently published (see Intoh 1998; Seikel 2016). Pohnpei was settled during this period by a large foreign population and it appears that aside from archaeological research, Nan Madol saw regular touristic visits. The few pictures found on internet are in low resolution. They nevertheless clearly show that at one time between the two World Wars, Nandowas at least was significantly cleared of its low vegetation, only coconut trees and a few breadfruit trees being visible on some of the photos (see Sand 2018a, figures 34 and 35). Importantly for long-term conservation issues, the Japanese appear to be responsible for the definitive removal of the large banyan trees visible in early photographs from the iconic monumental walls of Nandowas. Without this decision, it is probable that the roots would have at one stage severely dismantled the inner structure of the walls, leading to their final collapse. The Japanese are also credited of being responsible of the creation of new walkways outside and inside Nandowas (Saxe 1980, Plate 42).

The development of archaeological research (1960s-1990s)

The 1963 Smithsonian expedition by B. Meggers and C. Evans

The inclusion of Pohnpei in the UN Micronesian Trust Territory under American control after WWII fostered a few new excavations but no vegetation maintenance until a significant change of clearing scale. This was linked to an expedition by Betty Meggers and Clifford Evans to Nan Madol in 1963, undertaken under the auspices of the Smithsonian Institution in Washington DC. A detailed study of the large collection of photographs taken by Meggers and Evans during their five weeks' work at Nan Madol has been published elsewhere (Sand 2018b) and this part of the present paper will only highlight the main data concerning vegetation cover, platform clearing and channel fill.

In the early 1960s, Nan Madol was evidently under dense vegetation cover, as can be identified throughout the photographs. The American team had a significant financial grant, which allowed a large team of local workers to be paid to remove most of the vegetation on selected platforms. Figure 8 illustrates the extent of vegetation clearing on the platform of Pankedira (n°33), where only a few coconut and papaya trees were left standing. Over the course of the 1963 field season, eight platforms were partly or completely cleared of vegetation (Table 1). As far as is currently known, this was the first program that widely cleared the scrub at Nan Madol, permitting the first unobstructed observation of the major structures and settlement settings of the megalithic site since its abandonment.

The very large number of photographs in the Meggers and Evans collection prohibits the detailed presentation here of all the information for each platform cleared (see Sand 2018b). Yet it appears useful to highlight briefly some information about the canals in 1963, as the photos taken clearly demonstrate their near-total infilling. In a picture taken from atop the west wall of Nandowas and looking towards the channel between Dau (n°111) and Kohnderek (n°115) platforms in the background, for example, one can identify numerous white crab-hole mounds on dry sand covered by patches of dark sea-grass. The picture also shows that the lateral channel between Nandowas and Pohndowas (n°114) is filled by mangroves (Meggers and Evans Collection, Smithsonian Institution, photograph n°7317). Regarding the main channel in the southern half of Nan Madol facing platforms

Figure 8. Complete cleaning of the vegetation of Pankedira platform in 1963 (Meggers and Evans collection, Smithsonian Institution, photograph n°7153).

Platform name	Platform number
Reitik	30
Wasahu	31
Kelepwel	32
Pahnkedira	33
Peikapw	39
Peinmwek	38
Idehd	43
Nan Dawas	113

Table 1. Platforms of Nan Madol cleared of vegetation during the Smithsonian Expedition of 1963 (from Ayres *et al.* 1983, p. 14).

like Pankedira (n°33), photographs taken at low tide of retaining walls show the clear presence of drying mud (Meggers and Evans collection, Smithsonian Institution, photograph n°7150).

Other vegetation cleaning associated to archaeological projects and tourism

Starting in the 1970s, mangroves and tall trees were cleared by the Pohnpei Tourist Office, especially around Nandowas (W. Ayres, personal communication, January 2018). A set of administrative reports of the Trust Territory from that period published photographs of the site, allowing one to follow the path of vegetation maintenance (see for example *Historic Preservation in Micronesia* 1976, p. 90). The Historic Preservation Program of the Trust Territory planned in the late 1970s to create a 'Cultural Park' on the site (Trust Territory 1979: 32). In the same period, a number of archaeological mapping projects were started on Nan Madol, especially under the direction of J. Stephen Athens (cf. Athens 1980). These survey and mapping missions involved the near-total cleaning of surface vegetation, with at least 26 platforms cleared during this process by Athen's team (1985: 12) (Table 2), helped by a severe drought. A team of archaeologists from the University of Oregon, under the direction of William ('Bill') Ayres, in parallel fulfilled a long-term research program at the megalithic site. As part of this effort, a further seven platforms (Table 3) were cleared of vegetation (Ayres 1985: 14). Altogether, these different programs of clearing encompassed about 25% of the total number of platforms and nearly all the significant structures of the site.

Aside from these research programs, Nan Madol is illustrated in a book published in 1988 by W. N. Morgan on prehistoric Micronesian architecture. The luxurious color photographs featured in the book necessitated the cutting of some of the trees of Nandowas, including for example the coconut tree growing in front of the main entrance (Morgan 1988: 61). Two aerial photographs included in the book allows one to get an idea of the extent of vegetation growing around Nandowas (Morgan 1988: 64).

Platform name	Platform number
Idehd	43
Palakapw	49
Peinkitel	55
Imwinmah	67
Pohnmah	68
Sapwengei	69
Sapwolos	70
Sapwenpwe	72
Sapwuhtik	76
Sepedir	77
Nihmokemok	78
Likinpei	88A
Likinpei	88B
Likinpei	88B
Pereilap	90
Usennamw	91
Pahnkatau	94
Paraktuka	95
Peinering	101
Peinioar	102
Sapwuhtohr	105
Pahndauwas	110
Nandauwas	113
Pohndauwas	114
Karian	122
Pahnmwasangap	128
Lemenkou	129
Pei rani	No number

Table 2. Platforms cleared from vegetation and mapped between the late 1970s and early 1980s (from Athens 1985, table 1, p. 12).

Platform name	Platform number
Pahnwi	9
Peinair	47
Kelepwel	32
Peinmwehk	38
Peiniang	No number
Reilap	27
Wasau	31

Table 3. Platforms mapped in the early 1980s by the team from the University of Oregon (from Ayres 1985, p. 14).

Over the past three decades, all the platforms mapped in the 1970s, 1980s and 1990s apart from Nandowas and immediately surrounding platforms have seen a re-growth of the vegetation that was so thoroughly cleared. While some plants can be considered harmless to the integrity of the structures, other clearly impact negatively on the raised masonry. This is for example the case of hibiscus trees, which can become a major hazard for wall integrity when the trunks become too heavy, as can be observed today on some of the platforms where hibiscus overgrowth has completely covered archaeological structures (Figure 9). The creation of a boardwalk leading to Nandowas significantly reduced visits by boat, leading in recent times to the progressive overgrowth of dense mangroves and the cloaking of parts of the main channel crossing the site from south-west to north-east. Mangrove expansion over the last two decades can clearly be seen by comparing aerial photographs of the late 1990s with present-day Google Earth pictures.

Conclusion

This paper analyzed the question of vegetation cover on the megalithic site of Nan Madol through a study of archaeological data and traditional oral-historical knowledge as well as written texts and photographs from the last two centuries, with the objective of identifying changes in vegetation growth at the site over the past 1000 years. The vegetation cover present on the different platforms during their time of use can be assessed by relying on the planting habits of Pohnpeians and Pacific Islanders more widely, who have a long tradition of use of symbolic and productive plants and trees raised on important political and religious sites across Oceania. There is no doubt that in the early 19th century, vegetation cover was significant on most of Nan Madol's platforms, though a set of testimonies indicate that an unknown number of families were still living on the site at that time. The presence of planted banana trees in some photographs reinforces the hypothesis that several fertile platforms of Nan Madol were used on a regular basis by local families for gardening activities, aside from copra collection. Variations in vegetation density and species occurred during the last century and a half. This has been especially the case for the burial islet of Nandowas, which apparently has been cleared regularly since at least the Japanese era, as it was considered to be the main visitors' attraction at the site. Over most of the colonial period, the main channels were navigable at high and medium tide at least. Based on Hambruch's photographs showing the consequences

Figure 9. Tall hibiscus branches leaning on one of the walls of Pankedira platform (n°33) (photo C. Sand).

of the 1908 typhoon, the mangrove cover in the Madol Pah area and along the border of Temwen Island was less developed than today. The main platforms of the site have been cleared for archaeological mapping purposes since the 1960s, which partly changed the vegetation cover and led to the expansion of hibiscus growth in particular. This has accelerated the rate of wall collapse in the recent past, although the study of old photographs clearly shows that the retaining walls of most platforms were already partly ruined when Europeans started to study the site in the 19th Century.

This assessment has highlighted an unexpected complexity in the history of vegetation growth at Nan Madol during the past millennium. Reconstructing what species of plants were growing on the platforms during the first part of the second millennium AD must still rely today mostly on ethnographic data. To go further we would need detailed studies of botanical remains (charcoals, pollen, phytoliths, starch grains etc.) retrieved from archaeological excavations on a sample of the platforms. The development of this field of analysis should demonstrate in the future the presence of specific plant species growing on the platforms, depending on their specific use as habitations, meeting places, burial grounds or sacred religious compounds. The study of the old photographs has highlighted for its part the presence of tree species that are not present now, such as banyan trees at Nandowas. Relying on other examples around the world (Angkor in Cambodia, Mayan sites in Central America), it can be confidently asserted that the decision of the Japanese authorities in the 1920s to definitively remove the banyan roots from the top of the walls of Nandowas, certainly saved them from collapsing. Another significant turning-point was identified by the present study, characterized by the expansion of hibiscus and other scrub cover resulting from the cleaning of platforms during archaeological projects started in the 1960s. This observation highlights the need for archaeologists to cautiously ascertain the impact of any vegetation clearing for scientifically-related purposes of ancient sites in Oceania, as these can have dramatic consequences for the subsequent conservation of the monumental remains. Consequently, any program of vegetation removal and management, as part of archaeological studies as well as long-term conservation projects, to be developed on the World Heritage Property of Nan Madol, should take into account the complex history of plant, tree and scrub grows of the site over the ‘longue durée’.

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Stone architecture of the ancient Tongan state on Tongatapu Island, Kingdom of Tonga

Geoffrey Clark[1], Phillip Parton[1]

[1] Archaeology and Natural History, College of Asia and the Pacific, The Australian National University, Canberra, Australia

Abstract

On Tongatapu Island stone structures were used by senior chiefly lines to manifest title and lineage status. Stone slabs were used to demarcate house and sitting platforms, to face the royal tombs of the paramount, set upright as standing stones, and at Heketā used to make a unique monumental gateway. Slabs were also used to make stone burial vaults and the material was quarried from coastal locations around Tongatapu and other islands in Tonga. Recent work has increased the number of stone structures recorded in previous archaeological survey. This shows that their distribution is strongly focused on the east of the island where traditional history has the first monumental stonework constructed by the 11th Tu'i Tonga around AD 1250. In addition to describing and classifying stone structures that incorporate quarried slabs of carbonate stone, we show that the distribution of stone architecture is primarily associated with the central places of the Tu'i Tonga and high-ranking leadership demonstrating that stone architecture held an important role in manifesting political authority in the Tongan state.

Keywords: Tonga, Tu'i Tonga, stone architecture, monumental sites, political development

Résumé

Sur l'île de Tongatapu, les structures lithiques monumentales étaient utilisées par les chefs les plus puissants pour marquer leur titre et leur lignage. Des dalles de pierres étaient utilisées dans le marquage des plateformes de maison ou de réunion, et étaient dressées pour former la façade des tombes des chefs les plus importants. Elles étaient également utilisées pour la construction de caveaux funéraires et dans la construction d'un portail monumental unique sur le site de Heketā. Ces dalles, extraites dans plusieurs carrières de Tongatapu et d'autres îles des Tonga, étaient également utilisées dans la construction de la voute des tombes. Le nombre de structures lithiques sur l'île a récemment été réévalué à la hausse grâce à de nouveaux travaux de terrain. L'ensemble des prospections effectuées montrent que la répartition de ces structures est fortement concentrée sur la partie Est de l'île, dans une région connue par les traditions orales comme le lieu des premières constructions monumentales érigées par le chef portant le titre de 11ème Tu'i Tonga autour de 1250 AD. En plus de décrire et de proposer une classification des structures intégrant des dalles de roche carbonatée, nous montrons que la répartition de l'architecture en pierre est principalement associée aux lieux centraux du pouvoir des Tu'i Tonga et des dirigeants de haut rang, et qu'elle jouait ainsi un rôle important dans la manifestation de l'autorité politique dans l'empire tongien.

Mots-clés : Tonga, Tu'i Tonga, architecture en pierre, sites monumentaux, développement politique

Introduction

In prehistoric Tonga a chiefly dynasty of semi-divine origin established religious and political control over the scattered islands of the archipelago by at least AD 1100-1200 and expanded its influence to neighbouring islands with a maritime network based on large voyaging canoes. The development of the Tongan State under the paramount Tu'i Tonga ('Lord of Tonga') is associated with major changes to land ownership, religion and methods of food production. As in other parts of the world such changes were accompanied by a degree of urbanization, the emergence of a religio-political centre, and a dramatic increase in ritual practice (e.g. Heckenberger *et al.* 2008; Smith 1995: 47, 63). Centralization in Tonga was materialised by elite structures to show the status of the paramount and to create spaces for secular and ritual activities involved in the complex intertwining of power

and ideology found in archaic states (Trigger 2003). The architectural innovations that displayed the new political and social formations were not static and were responsive to a range of factors including (among others) the level of centralised power and state cohesion, population size and density, success in warfare and, the emphasis leaders and communities put on exhibiting religious authority and manifesting the political hierarchy (Smith 2019).

In this paper we provide an updated inventory of stone structures on Tongatapu Island which builds on McKern's (1929) pioneering study of Tongan architecture, sites reported by Swanson (1968) and Spennemann (1989a), in addition to previously unreported stonework identified in our fieldwork. We report structures made with quarried slabs of carbonate beach rock or in rare cases the harder reef limestone which excludes prehistoric constructions made with unmodified stone. Beach rock (*makapapa*) is formed in the intertidal zone by cementation of coral/limestone sediments and the lithified sediments can fracture to produce natural slabs that were taken to face or outline a structure or space. Similarly, unmodified coral heads and coral/limestone cobbles were also used to build impressive constructions such as chiefly pigeon snaring mounds and to face canoe wharfs (Burley 1996; Clark *et al.* 2008; McKern 1929). The use of quarried carbonate stone required significant labour and transport costs (Burley 1998) and unsurprisingly many of the worked stone structures are associated with locations of Tonga's senior chiefs. The largest stone structures on Tongatapu contain more than 250 stone slabs and while individual slab size and weight is highly variable the largest are 5-6 m in length and weigh 10-20 tons. Dressed stone architecture accompanied the paramount Tu'i Tonga system of government and the distribution highlights the spatial development of the polity as it spread from eastern Tongatapu (Heketā and 'Āfa) to Lapaha beside the Fanga 'Uta Lagoon where the polity reached its greatest extent. In addition, the updated structure list demonstrates significant variability within functional categories such as stone-faced tombs that overlap in size with other stone architecture such as house and sitting platforms.

Tongatapu Stone Structures

The best-known structures made with quarried slabs/blocks on Tongatapu are the royal tombs of the Tu'i Tonga known as *langi* (Tongan 'sky') along with house platforms (*paepae*) and sitting platforms (*'esi*). Included in our review is a monumental trilithon at Heketā that is a discreet structure (Clark and Reepmeyer 2014). Quarried stone was also used to make architectural elements such as stone vaults (*fonualoto*) that were placed inside an earth/sand mound or stone-faced tomb, to outline chiefly bathing wells, used as chiefly backrests or as framing for a funerary house (*fale tōli'a*) built over a royal tomb at Heketā (McKern 1929: 38-39). We do not include these elements in our review nor other stone items such as isolated stone slabs or a limestone monument reputed to be a finger-sacrifice stone at Lapaha known as Levulevukefu/Tokomatupa (McKern 1929: 93).

Many of the structures made with quarried stone were initially recorded by McKern (1929) who identified 35 on Tongatapu. The majority were chiefly tombs located at the central place of the Tongan state at Lapaha (n=27) with one near Makaunga, three each at 'Āfa and Heketā and one at Longoteme. McKern's publication organised structures by their traditional function with tombs identified as *langi* if they were remembered as burial places of the Tu'i Tonga or his immediate family. However, some tombs with stone walls were identified as *langi* when there was no indication of who was buried in the tomb while burial sites of derived chiefly lines such as the Tu'i Ha'atakalaua and Fale Fisi were also grouped with the 'royal' Tu'i Tonga tombs. A synthesis of Tongatapu sites surveyed by Green and Terrell in 1965 recorded additional stone-faced tombs at Kanokupolu, Neiafu and Hamula and added another five structures to the Heketā group (Swanson 1968). Finally, Spennemann (1986, 1989a) identified two new stone structures at Lapaha-Talasiu during site mapping for a total of 45. Our fieldwork on Tongatapu has expanded the number to 63 stone structures with another seven at Lapaha-Talasiu, nine in 'Āfa adjacent to the Heketā complex, one at 'Ahau and one at Makaunga (Figure 1, Table 1). The new stone structures reported here were recorded after discussions with Town Officers and informants from several parts of Tongatapu, as

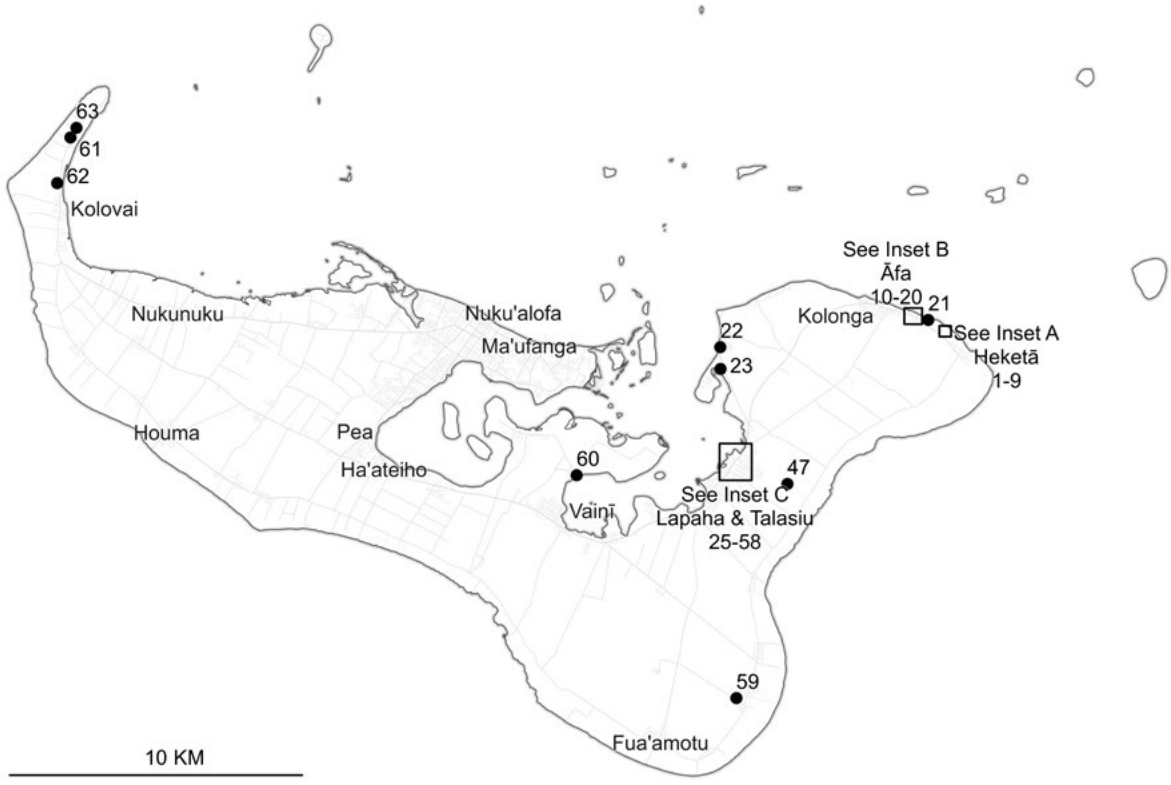

Figure 1. Location of stone structures on Tongatapu.

Number	Location	Name	Identification	Area	Number of Levels	Typology	Length-Width Ratio	Code
1	Heketa	Ha'amonga-a-maui	gateway	na	na	na	na	TO-Nt-1
2	Heketa	Makafakinanga	sitting	56	1	1b	1.8	TO-Nt-2
3	Heketa	Heketa langi	tomb	374	3	2	1.5	TO-Nt-3
4	Heketa	Heketa Unnamed	house	598	1	1a	1.7	TO-Nt-4
5	Heketa	Heketa Unnamed	house	664	1	1a	1.7	TO-Nt-5
6	Heketa	Heketa Unnamed	?	126	1	1b	1.6	TO-Nt-6
7	Heketa	Heketa Unnamed	house	664	1	1b	1.7	TO-Nt-7
8	Heketa	Heketa Unnamed	?	219	1	1b	1.4	TO-Nt-8
9	Heketa	Heketa Unnamed	?	100	1	1b	1.1	TO-Nt-9
10	Āfa	Mo'ungalafa a	tomb	679	1	4a	1.1	
11	Āfa	Mo'ungalafa b	tomb	180	1	1a	1.1	
12	Āfa	Mo'ungalafa c	tomb	340	1	1a	1.1	
13*	Āfa	Utukakai	tomb	315	1	1a	1.4	
14*	Āfa	Fokai 1	sitting	28	1	1b	1.3	
15*	Āfa	Fokai 2	sitting	27	1	1b	1.6	
16*	Āfa	Fokai 3	sitting	61	1	1b	1.3	
17*	Āfa	Fokai 4	?	164	1	1b	1.4	
18*	Āfa	Toa 5	?	171	1	1b	1.2	
19*	Āfa	Unnamed 6	?	206	1	1b	1.6	
20*	Āfa	Unnamed 7	?	244	1	1b	1.4	
21*	Āfa	Unnamed 8	?	450	1	1b	na	

Table 1. Tongatapu stone structures (see Figure 1 and Figure 4 for locations).
Numbers marked with an asterisk are new structures recorded by the authors.

Number	Location	Name	Identification	Area	Number of Levels	Typology	Length-Width Ratio	Code
22*	Makaunga	Utuangiangi	?	729	3	2	1.0	
23	Makaunga	Tamatou	tomb	621	2	2	1.2	
24*	Talasiu	Faletoonga/Tu'itonga	tomb	825	2	2	1.3	J33
25	Talasiu	Langalangafehi/Malomaloa'a	tomb	273	1	1a	1.4	J19
26	Talasiu	Nakulikilangi	tomb	465	2	2	1.1	J18
27*	Talasiu	Unnamed	?	na	1	1b	na	
28*	Talasiu	Falekitangata	burial	260	1	1b	1.3	
29	Lapaha	Malomaloa'a/Olomaloaa	?	281	2	2	1.3	J23
30	Lapaha	Namoala	tomb	860	3	2	1.5	J21
31	Lapaha	Paepaeotelea	tomb	1170	3	2	1.6	J20
32	Lapaha	Leka/Puipui	tomb	1850	4	2	1.2	J17
33	Lapaha	Pau and Ngau/Maluatonga	tomb	640	1	1a	1.1	J16
34*	Lapaha	Unnamed	tomb	120	1	1b	na	J30
35	Lapaha	Fa'apite	tomb	1570	3	2	1.3	J15
36	Lapaha	Fo'ou	tomb	117	1	1a	1.4	J14
37	Lapaha	Tofaua	tomb	170	1	1a	1.5	J13
38	Lapaha	Nukulau'uluaki/Nukulau b	tomb	260	1	1a	1.1	J12
39	Lapaha	Nukulau'ua/Nukulau a	tomb	260	1	1a	1.2	J11
40	Lapaha	Tauhala	tomb	2730	1	1a	1.0	J10
41	Lapaha	Tauatonga/Leka	tomb	2130	4	2	1.3	J09
42	Lapaha	Tafaua	tomb	350	1	3	1.6	J08
43	Lapaha	Maluatonga	tomb	220	1	1b	1.4	J07
44	Lapaha	Taetaea	tomb	580	1	1a	1.3	J06
45	Lapaha	Sinae	tomb	270	1	1a	1.1	J05
46	Lapaha	Kofe	tomb	270	1	1a	1.2	J27
47*	Lapaha	Ha'atufunga	tomb	117	1	4b	1.4	
48*	Lapaha	Aponima	tomb	76	1	4a	1.4	J28
49*	Lapaha	Lili	tomb	na	1	1a	na	
50	Lapaha	Tuofefafa	tomb	1300	2	3	1.0	J04
51	Lapaha	Katoa	tomb	1580	5	2	1.2	J03
52	Lapaha	Fanakavakilangi/Tauatonga	tomb	440	1	1a	1.4	J02
53	Lapaha	Tuoteau	tomb	650	1	3	1.1	J01
54	Lapaha	Loamanu a Falepulemaalo	tomb	434	1	1a	1.5	a
55	Lapaha	Loamanu b Loamanu/Luani	tomb	633	1	1a	1.3	b
56	Lapaha	Loamanu c Faletuipapai	tomb	183	1	1b	1.3	c
57	Lapaha	Loamanu d Loamanu IV	tomb	357	1	1a	1.2	d
58	Lapaha	Loamanu 1 (beside 54)	tomb	476	1	1a	1.2	1
59	Hamula	Unnamed	tomb	178	1	1b	1.1	
60	Longoteme	Loamanu I	tomb	141	1	1a	1.2	
61	Kanokupolu	Malae Kanokupolu	tomb	420	1	3	1.1	TO-Ka-9
62*	Ahau	Volokamanu	tomb	170	1	3	1.2	
63	Neiafu	Mataeleha'amea	tomb	360	1	4b	1.6	TO-Ka-12

Table 1. Continued.

well as from site discovery after clearing and excavation at locations at Lapaha-Talasiu and Āfa, in addition to two sites recorded with the Culture Division (Ministry of Tourism) after Cyclone Gita in February 2018.

It is clear that additional structures remain to be found while several have had slabs removed, others have been damaged/destroyed by development as local informants have identified locations where stone has been removed by road building, sports field levelling and house construction. Identification of structures as tombs (*langi*), house platforms (*paepae*) or chiefly sitting platforms (*'esi*) is difficult as use can change over time when house or sitting platforms mounds were used for chiefly burials (or vice versa). We include identifications of structure function based on traditional history and evidence for burial such as exposed stone vaults/human bone, deposits of volcanic funerary stones (*kilikili*) and observation of stratigraphy, but acknowledge that the complicated use-life of some prehistoric structures may have obscured their original function. Different labelling systems have been used to record stone structures and names also vary significantly among accounts and informants. For example, McKern (1929: 37) records Faletoonga as an earth mound while informants from Talasiu and Lapaha identify a structure in Talasiu with two stone tiers (24) as Faletoonga. To avoid confusion, we have sequentially numbered structures from the east to the west of Tongatapu and include previous site codes used by previous researchers (Clark *et al.* 2008; McKern 1929; Spennemann 1989a).

The sites made or outlined with quarried stone slabs in Table 1 provide an estimate of site area and shape, number of stone levels or tiers, and a structure typology (Figure 2) that builds on McKern's (1929: 35, Figure 17) and Kirch's (1988: 45, Figure 23) classification of stone and earth structures. The length of the longest wall divided by the length of the shortest wall is a ratio that indicates whether the basal stone wall is square or rectangular.

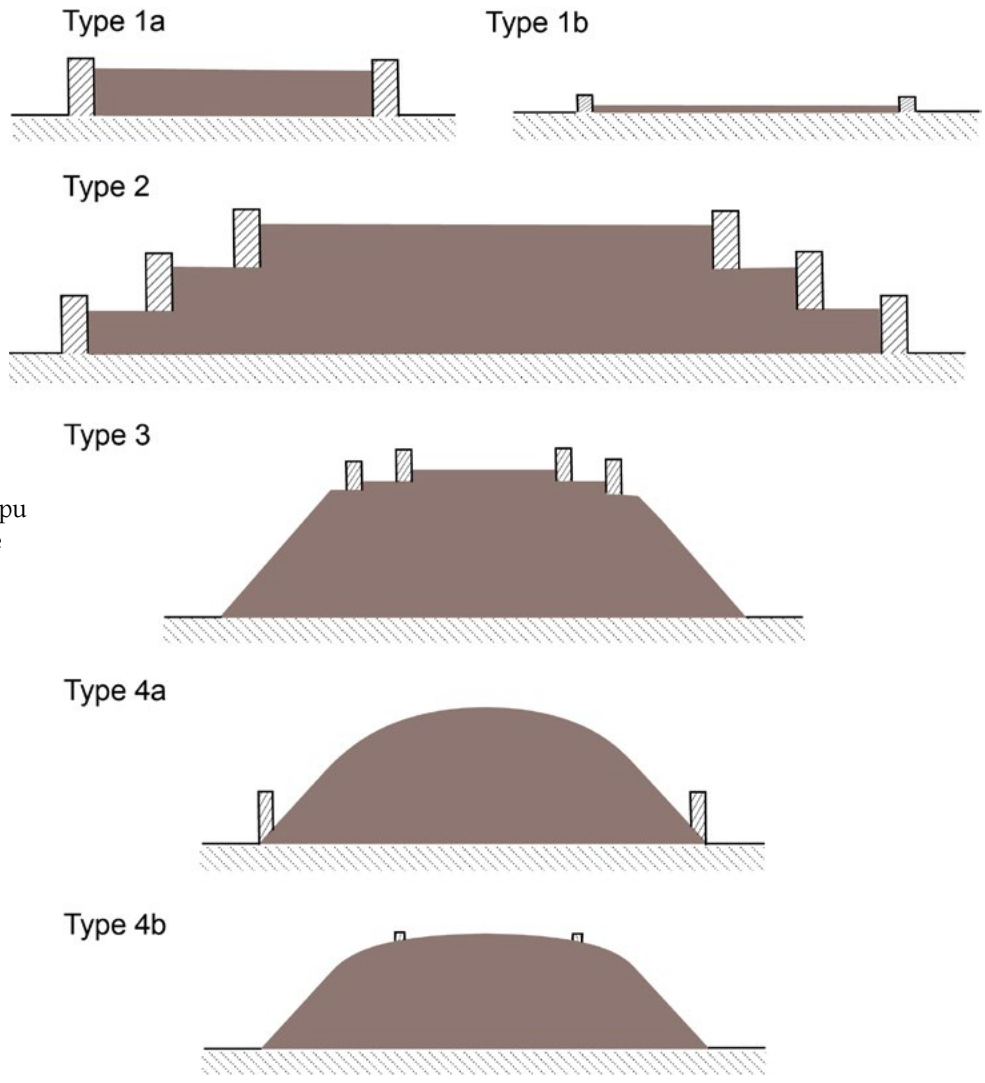

Figure 2. Tongatapu stone structure typology.

Type 1a

These have a single level of stone facing with a marked step from the exterior ground level to the interior platform surface (n=24). There is significant variation in structure area with the smallest, Fo'ou (36, 117 m^2) and the largest, Tauhala (40) at Lapaha (2730 m^2), which is clearly an outlier with all other Type 1a structures under 670 m^2. Excluding Tauhala (40) the average area of Type 1a constructions is 353 m^2 with a group of five structures with similar areas of 260-273 m^2. Most are located in the central place of the Tongan state encompassing Lapaha-Talasiu (n=18) and are subsidiary tombs associated with the larger 'royal tombs' of the Tu'i Tonga as well as tombs of the Tu'i Ha'atakalaua (54, 55, 57, 58 at Loamanu) and Fale Fisi (25, Langalangafehi) lineages that were derived from the Tu'i Tonga family (Bott 1982; Gifford 1929). Most Type 1a structures were used for burial but there are two structures (4, 5) at Heketā that are likely to be house platforms. Both are identified in Tongan traditions as house sites, particularly structure 4, which is reputed to be the residence of the 11th Tu'i Tonga Tu'itātui (Clark and Reepmeyer 2014). Excavation to recover material to radiocarbon date structure 4 did not record any evidence for burial and the centre of the platform contained a large posthole surrounded by thin oval shaped layer of coral gravel consistent with a house floor. In tombs with burial vaults, a thick deposit of coral gravel was placed around and over the stone vault, but neither feature was observed in excavation of structures 4 and 5 at Heketā. The association of Type 1a burial structures with locations where larger royal tombs (*langi*) were built indicates they may have made for lower ranked chiefs and family members of the Tu'i Tonga, and that tomb use developed from stone house and sitting platforms found at Heketā and 'Āfa.

Type 1b

The structure type (n=17) is similar to Type 1a in having a single level of dressed slabs, but differs in having a low wall height and reduced volume of earth fill over the ground surface. Damage to slabs can reduce their height and in such cases excavation of the platform fill is needed to estimate the original wall height. Testing of the platforms at 'Āfa has not been undertaken due to the proximity of domestic buildings and their status as Type 1b structures is therefore tentative. Several Type 1b platforms appear to have had a low curbing of carbonate stone rather than a 'wall' potentially consistent with the use of left over quarried stone. Some support for this might be that several Type 1b structures appear to be incomplete including two platforms at Heketā (7, 8) and one at Talasiu (27). Type 1b structures are generally the smallest with 14 of the 16 structures with a measurable area under 265 m^2 including Heketā structure 2 that traditions identify as a chiefly sitting platform (*'esi*). As most Type 1b structures do not appear to have been used for burial they might also have been used as chiefly activity areas. At Talasiu, the presence of a modern cemetery has obscured the original function of the Falekitangata (28) site which has an area of 450 m^2 marked with low slab walls and at least two 'pillar' stones. Local traditions indicate the site was a cemetery that might be of late prehistoric-early historic age. The largest Type 1b site at Heketā (7) has an area of 664 m^2 is unlikely to be a burial site and is similar in size and shape to two nearby house platforms (4, 5). The length-width ratio indicates most Type 1b structures are rectangular (average 1.4) and only an isolated burial platform (59) reported by Swanson (1968: 12) at Hamula has a square form.

Type 2

The distinguishing mark of Type 2 structures (n=12) is two or more tiers of stonework extending upward from the ground surface. The largest of structures are identified as royal tombs (*langi*) of the Tu'i Tonga and immediate family members. Exceptions include a small tomb with an area of 281 m^2 known as Malomaloa'a (29) at Lapaha which has no burial information. Malomaloa'a was built on reclaimed land as were the large tombs of Namoala (30) and Paepaeotelea (31), but was placed in a low-lying area close to the water table. The second potential exception is the two-

tiered tomb of Nakulukilangi (26) at Talasiu located on the edge of the old shoreline. This tomb is relatively small (465 m^2) and is the burial place of the Tu'i Lakepa family of the Fale Fisi lineage that began around AD 1700 (Bott 1982), although the tomb may date older (see below).

The remaining Tu'i Tonga tombs include the smallest and probably oldest Type 2 royal tomb at Heketā (3) with three levels of stonework (374 m^2) and the three tombs at Makaunga (22, 23) and Talasiu (24). Both Utuangiangi (22) and Faletoonga (24) are currently used as burial grounds and only a few slabs can be used to estimate structure area and the number of stone tiers. In contrast, Tamatou (23) has two tiers and is in relatively good condition on private land. This tomb is associated with the 12th Tu'i Tonga who installed a wooden 'king' which is said to have been buried in Tamatou (23). Excavation of the tomb by McKern (1929: 55) supported this as he did not find a stone vault nor human remains, but one Lapaha tradition suggests instead that the wooden 'king' was buried at Faletoonga (24) at Talasiu and that Tamatou is a more recent construction (Clark, unpublished field notes).

The area of Type 2 structures shows a clear division with seven in the range 280-860 m^2 separated from five over 1000 m^2 in area (1170-2130 m^2). The five largest tombs (31, 32, 35, 41, 51) are all in Lapaha and have between three and five levels of stonework. There is a reasonable correlation between tomb area and the number of stone levels (r^2=0.59) indicating that structures were probably planned to have a set number of levels and a larger base was needed to accommodate the loss of area to the upper platform caused by the addition of 'internal' stone tiers. The smallest of the tombs with an area over 1000 m^2 is Paepaeotelea (31) dated to AD 1300-1400 (Clark *et al.* 2016) while the youngest tombs may be Tauatonga (41) and Katoa (51) which have display stones in the southwest corner of the top tier, which is an architectural addition that appears to postdate the construction of tombs at Heketā and of Paepaeotelea at Lapaha (Clark 2014). As Tauatonga (41) is the largest Type 2 tomb (2130 m^2) and Katoa (51) has the most levels of stonework (five tiers) it is apparent that there was sustained investment in this form of mortuary architecture at Lapaha compared with the smaller Type 2 tombs at Heketā (3) and Makaunga-Talasiu (22-24). A rectangular walled structure is common for Type 2 tombs apart from Utuangiangi (22) that is poorly preserved and Nakulukilangi (26). At Lapaha other large 'royal' tombs tend to have square stone walls (see below).

Type 3

These are all chiefly tombs (n=5) that have one or two levels of stone slabs placed on top of an earth mound. This is a labour efficient means of increasing structure height without using multiple levels of stonework that require hundreds of quarried slabs as used in Type 2 structures. McKern (1929: 35) described his similar Type C tombs as having a rectangular earth base with rectangular stone walls intermediate between the base and top of the mound. While some mounds are rectangular (42, 62), the three largest at Lapaha (42, 50) and Kanokupolu (61) are relatively square and this is reflected in the shape of the stone walls and their length-width ratios (1.0-1.1). On these mounds the stone walls were placed on the top of the mound to demarcate an inner platform holding a central vault/burial. The earth mounds may have been purpose built to hold stone walls or were used as burial sites and the stone walls added later. The square form is also found in the large Type 1a tomb at Lapaha (40, Tauhala) likely to be of late prehistoric age suggesting that a change from rectangular to square walled tombs occurred in late prehistory. This is indicated by the Tuoteau tomb (53) at Lapaha that was built before AD 1777 for the 35th Tu'i Tonga and two tombs of the Tu'i Kanokupolu lineage (61, 62) that likely began around AD 1600. Although only a small number of Type 3 tombs have been identified the type may be under-represented as erosion has been observed to result in the collapse of low stone walls placed on the upper part of a mound. The status of Taufaua (42) at Lapaha as a Type 3 mound is uncertain as McKern (1929: 57) has it as a low rectangular mound with slabs half-way up the mound unlike other Type 3 structures.

Type 4a

There are two Type 4a structures that consist of an earth mound with a perimeter wall of stone around the mound base that is either square or rectangular. The larger structure at Āfa (10) has an area of 679 m^2 and along with two smaller structures (11, 12) forms the Mo'ungalafa tomb complex. The main tomb (10), which is traditionally dated to the time of the 11th Tu'i Tonga, consists of a square-shaped earth mound with a convex upper surface 2.6 m high. Due to mound erosion it is unclear whether the wall slabs held a large amount of tomb fill or the slabs always outlined the mound base. The form of the tomb suggests that the earth mound was built first and the slabs added later. The tomb has several monumental slabs 4-5 m in length and the stone wall originally stood ~1.5 m above the ground surface. With the exception of Heketā where three massive blocks were used to build a trilithon (1), the Mo'ungalafa tomb has the largest individual wall slabs from any part of Tongatapu apart from Lapaha where blocks 4.0 m or greater in length are relatively common. The Aponima tomb (48) is similar in form to the Mo'ungalafa tomb (10) although is much smaller (76 m^2). Aponima is a rectangular earth mound with the base outlined with small stone slabs. Excavation of the mound revealed that a low vault had been built into an existing mound that had been a burial site for one or two centuries before the vault was added suggesting that the basal wall slabs were added at the same time as the stone burial chamber. Type 4a structures are rare and likely represent the addition of stonework to existing earth mounds.

Type 4b

Both of the two Type 4b structures are rectangular earth mounds with a low stone wall or curbing on the mound top. The larger structure of Mataeleha'amea (63) at Neiafu is identified as the tomb of the 4th Tu'i Kanokupolu while the other example from inland Lapaha is said to be the tomb of the Ha'atufunga (47) undertaker clan that was responsible for organising the funeral of the Tu'i Tonga and other senior chiefs (Gifford 1929: 67). Mataeleha'amea (63) is in poor condition and might have been a Type 4a structure that has experienced extensive damage to its wall slabs, but this does not appear to be the case for the Ha'atufunga tomb which has small stone slabs projecting ~10-20 cm above the ground and has reportedly never been ploughed. As with Type 4a structures the addition of relatively small amounts of stonework to an earth mound suggest that Type 4b structures are modified burial mounds or tombs of junior lineages/clans who could access only small quantities of quarried stone. Lidar data was used to calculate mound volumes of the Type 4b structures with Mataeleha'amea ~745 m^3 and Ha'atufunga ~700 m^3. On Motutapu Island, McKern (1929: 104-106) recorded a possible variant of the Type 4b structure which was a circular burial mound with a single layer of slabs arranged in a circle around the upper mound perimeter and a central walled 'vault' lacking floor or covering slabs. The Motutapu burial structure was: 'not known elsewhere in Tonga' (McKern 1929: 109), and the wall slabs were roughly dressed unlike the carefully smoothed wall slabs at Heketā, Āfa and Lapaha-Talasiu.

Discussion

Traditions record that the first monumental stone constructions on Tongatapu began with the 11th Tu'i Tonga trilithon (1) at Heketā which is dated to ~AD 1250-1350, but the innovation of quarrying smaller quantities of beach rock and limestone likely began earlier from the use of stone to outline or raise chiefly platforms. In several Polynesian societies unmodified pieces of coral and beach rock were set on end in the ground and used to outline house and burial structures while dressed volcanic and carbonate stones were used in ceremonial and chiefly structures in Rapa Nui, the Marquesas and the Society Islands, but never, or only rarely in Samoa, New Zealand and Hawai'i. In the 'Story of Mailau' the first stone vault in Tonga was made by Finau after the death of her daughter. Members of Finau's family contributed individual stones and their names became the titles of the hereditary undertaker clan of the Ha'atufunga after a Tu'i Tonga saw the tomb and installed the family at Lapaha to make his vaults (Filihia 2001:212-214; see also Gifford

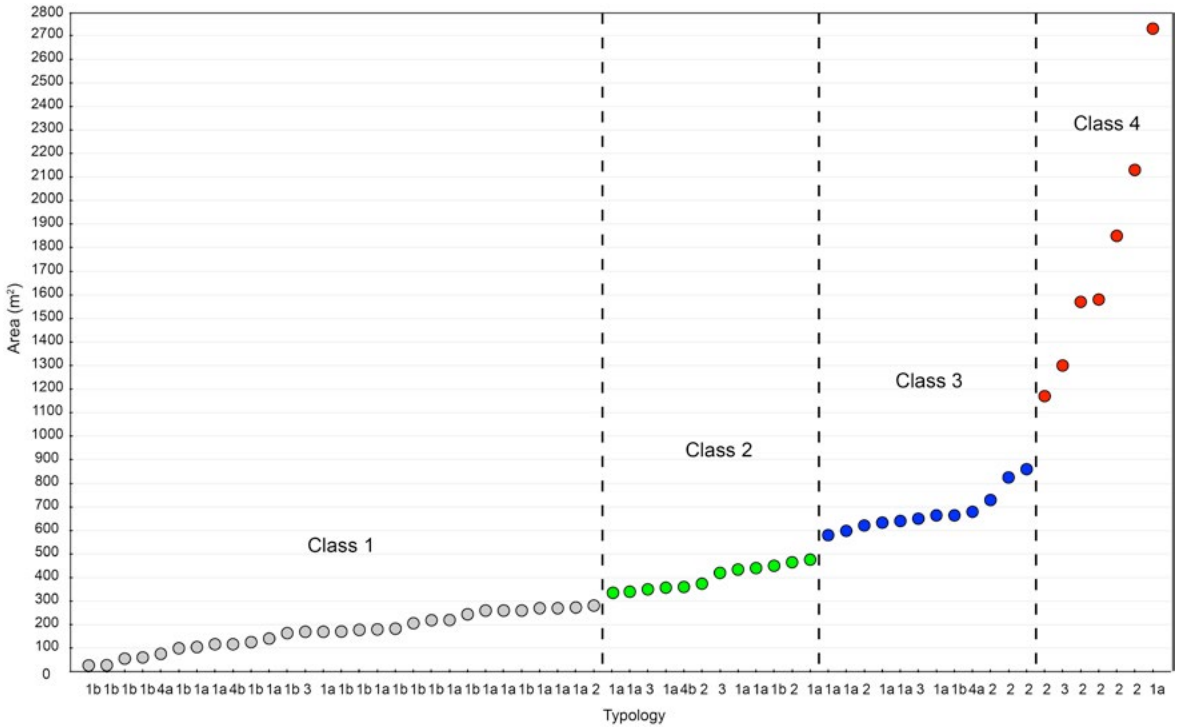

Figure 3. Plot of stone structure area against structure type (see Figure 2) and four potential size classes.

1924:204-205). The sequence implies that stone vaults came after stone facing were being used in architecture at Heketā, ʻĀfa and Lapaha. Geophysical study of the Heketā tomb (3) supports this as ground penetrating radar (GPR) did not record a stone vault in all of the large Lapaha tombs (Clark and Reepmeyer 2014).

The two striking aspects of Tongatapu's stone structures is their spatial distribution and size/shape variation. In Figure 3 the relationship between structure area and typology is plotted for the 60 stone structures with the available data (excluded structures are 1, 27, 49).

Structure Area and Typology

Arranged by structure area the Figure 3 plot shows areas where moderate-to-large jumps in size occur which have been used to distinguish four general size classes. The division between Class 1 and Class 2 is small at 281 and 315 m^2, between Class 2 and Class 3 is 476 and 580 m^2, and Class 3 and Class 4 is between 860 and 1170 m^2. The discovery of additional structures could well bridge some of the 'step' changes among smaller structures, but is less likely for the significant divide between the larger Class 3 and Class 4 structures.

There are two significant trends in the form of stone structures over the fours size classes. First, the proportion of Type 1 structures (1a and 1b) decreases in each size class (Class 1=86%, Class 2=58%, Class 3=50%, Class 4=14%). Second, the abundance of Type 2 structures increases in each class (Class 1=4%, Class 2=17%, Class 3=33%, Class 4=72%). As the structure typology separates Type 1 and Type 2, in part, by height (single level of stonework versus multiple levels), the plot indicates that structures with a large area and multiple tiers of stonework of Type 2 were the apogee of Tongan funerary architecture. These large Class 4 structures were traditionally the prerogative of the Tu'i Tonga line and were only made at Lapaha.

The largest Class 4 tomb is, however, Tauhala (40) with an area of 2730 m^2 which is a Type 1a structure with a single level of large stone slabs. The form and size of this tomb is unusual and

requires discussion as it lies between two large Type 2 tombs (35, 41) which are rectangular (as are all seven of the surrounding Type 2 tombs), and the square walls of Tauhala are more common in tombs made after ~AD 1600. The tomb known as 'Tauhala' was recorded by the missionary Shirley Baker who was posted to the Lapaha area in the 1860s and again by McKern in 1920-1921 showing that the tomb name has not changed. Gifford (1923: 127) recorded the name of this tomb as: 'Langitauhala. Royal tomb of the Tamatauhala, an individual higher in rank than the Tamaha ...'. The Tama Tauhala was a male child with extremely high rank born to the Tu'i Tonga's sister (the Tamahā). The Tama Tauhala in Tongan society was: '... the end and consummation of all things, towards whom all ranks and titles converged ...' (Williamson 1924: 181). As the Tamahā title probably began in the early 18th century (Bott 1982), the Tauhala (40) tomb is likely to have been constructed after the two Type 2 tombs (35, 41).

The unusual scale of the Tauhala tomb, then, was made to express the high rank of the Tama Tauhala while the single level of stonework was usually used for chiefly lines that were closely linked to the Tu'i Tonga dynasty. Chiefly lineages derived from the Tu'i Tonga that were given secular responsibilities were the Tu'i Ha'atakalaua and Tu'i Kanokupolu and both of these have either Type 1a or Type 3 tombs with a single level of stonework. In the early 19th century, Type 1a structures with a single layer of wall slabs were generally associated with: '... more lowly ranked chiefs' (Filihia 2001: 114). The Fale Fisi line is also associated at Talasiu with a Type 1a (25) and Type 2 (26) tomb, but as mentioned previously one or both of these tombs may be older and they might have been taken over by the Fale Fisi in the 18th century. Circumstantial evidence for this is that the condition of both 'Fale Fisi' tombs is very poor with slab delamination and severe fracturing similar to the slabs of older tombs in addition to the presence of early Tu'i Tonga Type 2 tombs to the north (24) and south (southeast 30 and 31, southwest 34 and 35). A final point is that remains of a partial stone platform (27) adjacent to 25 and 26 once extended over the old shoreline, but most of the walls have been lost to slope erosion and the amount of sediment loss could also indicate that the 'Fale Fisi' tombs date older than AD 1700.

Among the smaller size classes in Figure 3, all structures are tombs/burial sites except for a number of house and chiefly sitting platforms of Type 1a and Type 1b at Heketā and 'Āfa. The smallest structures may be sitting platforms with several in the range of 27-61 m^2, but there is also a tomb with an area outlined by stonework of only 76 m^2 (48), although as mentioned above this site may well be an earth mound that had stone slabs added later. Otherwise, all confirmed tombs with stonework are over 100 m^2. Sitting platforms are likely to have greater size variation and extend to at least ~170 m^2. House platforms are also difficult to distinguish on size alone as some could have been used as burial sites after the death of a chief except at Heketā where archaeological excavation of two Type 1a structures supported their traditional use as house platforms (4, 5). Both of these structures (598-664 m^2) are relatively large, and there are Type 1a and 1b structures at 'Heketā and 'Āfa in the range ~200-670 m^2 that do not appear to be burial sites that could also be chiefly house or sitting platforms.

Spatial Distribution

The location of stone structures is focused on eastern Tongatapu with the majority (86%) in three loose groupings (Figure 4) before a significant gap in central Tongatapu west of Lapaha and only three structures in the far west of the island.

Heketā, the easternmost group, has nine stone structures most of which are arranged in a column with the long axis of each structure parallel to the coast (Figure 4A). The monumental trilithon (1) is offset from the structures and points toward an area of modified shoreline that traditions and survey indicate was the likely source of the trilithon uprights each weighing over 20 tons (Clark and Reepmeyer 2014). There is debate over whether the trilithon was used in astrocalendrics – a proposition refuted by Velt (2011) – and Spennemann (2002) interpreted the structure as a gateway

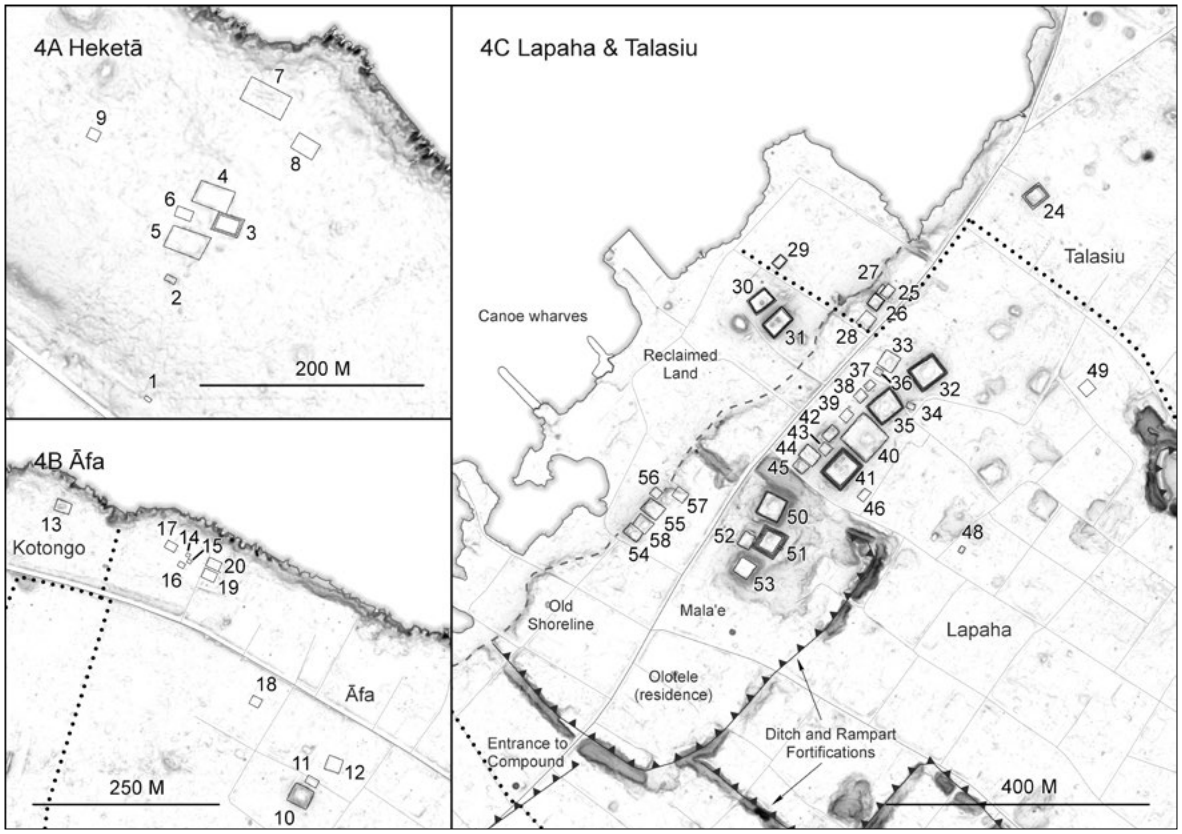

Figure 4. Stone structure groups (see Figure 1 for location and Table 1 for details).
4A. Heketa, 4B. ʻĀfa. 4C Lapaha and Talasiu.

to an elite compound. Traditions mention that Heketā held a ground for the chiefly sport of dart throwing and was also the venue for the First Fruits (*ʻinasi*) ceremony attended by chiefs from Tonga and other islands (Gifford 1924: 49). If the trilithon (1) was a ceremonial gateway then the southwest slope in front of the sitting platform with a stone backrest (2) could have been a natural amphitheatre (*malae*) for ceremonial events.

While the Heketā site is well known the stone structures at ʻĀfa (Figure 4B) are not. In addition to the three tombs collectively known as Mo'ungalafa (10-12) recorded by McKern (1929), there are a further nine structures to the west (13-20) and east (21) of the tombs including Utukakai (13) which is a typical rectangular Type 1a tomb. The function of the other eight structures is unclear and they may be tombs or sitting/house platforms. The west ʻĀfa structures are aligned roughly parallel with the coast rather than in a column formation as at Heketā. As quarried stone likely came from offshore islands such as Motutapu (where a large beachrock quarry is located) the series of small platforms could represent a marine access point for the Heketā precinct as the ʻĀfa sites are located close to a reef entrance.

Apart from two Type 2 tombs in Makaunga area there are no structures recorded until the concentration of stone tombs at Lapaha-Talasiu (Figure 4C). Rectangular tombs at Lapaha-Talasiu are located with their long axis aligned to the Fanga ʻUta lagoon similar to the east ʻĀfa structures, but different from Heketā. Traditionally, the Tu'i Tonga had his residence (Olotele) to the southwest of the main row of tombs with an entrance through a defensive ditch-rampart and a meeting ground (*malae*) beside his residence with stone tombs in a row to the northeast (Figure 4C; see also McKern 1929: 95). Such a configuration with a formal entrance to a ceremonial ground close to a chiefly residence may be similar to Heketā particularly if the Heketā Type 2 tomb (3) was built after the stone house platform (4) as the architectural evidence suggests (Clark and Reepmeyer 2014). An early Lapaha tomb (31) made in reclaimed land away from the Tu'i Tonga's residential area is

consistent with a defensive fortification primarily made to protect the chiefly compound while tombs were located outside the residential area.

The gradual extension of the tombs southward toward the residential zone (Olotele) appears to be a reason for infilling the northern part of the defensive ditch, possibly after the addition of a long linear fortification (Fisi-Tea, Parton *et al.* 2018) made the section of 'internal' earthwork redundant. The Type 3 Tuoteau tomb (53) inside the fortified area was certainly one of the last 'royal' tombs to be made at Lapaha and is the closest tomb to the Tu'i Tonga's traditional residence (Clark *et al.* 2008). Smaller Type 1 tombs lie in a parallel row to the large tombs except for the tombs of the Tu'i Ha'atakalaua line (54-58) that was given the task of secular government and supporting the 24th Tu'i Tonga (Gifford 1929). In return the lineage appears to have been able to make stone-faced tombs for burial ~AD 1450. The association of small tombs with larger stone burial sites is also seen at 'Āfa but not at any of the Type 2 structures at Makaunga and Talasiu (22-24). The row of nine 'companion' tombs west of the four large tombs at Lapaha suggests that several lower-ranked group(s) associated with the Tu'i Tonga, perhaps close family relations, were at some point able to construct individual stone tombs. It is feasible that the construction of these small Type 1a tombs occurred after warfare, territorial expansion and the institution of the Tu'i Ha'atakalaua which grew the politico-religious hierarchy of the Tongan state after AD 1450 (Clark *et al.* 2008; Gifford 1929). The alignment of the small tombs parallel to several large tombs also suggests that an important avenue lay to the east that has now been obscured by the modern road.

Apart from a few small tombs at Hamula (59) and Longoteme (60) there are only three tombs with stonework in the far west of Tongatapu. These tombs of Type 3 and Type 4b all belong to the Tu'i Kanokupolu lineage (61-63) that came from the Tu'i Ha'atakalaua line which was sent to administer west Tongatapu (Gifford 1929). The three tombs with stonework show the developing political foothold of the Kanokupolu lineage in the west of Tongatapu. After prolonged civil war in the 19th century when the Tu'i Kanokupolu gained the paramountcy of Tonga the monarchy established itself in the new capital of Nuku'alofa. The shift was analogous to the Tu'i Tonga's move from outlying 'Āfa-Heketā to Lapaha which improved the maritime and terrestrial networks necessary to maintain the Tongan state on Tongatapu and other parts of the archipelago.

Conclusion

The stone structures of Tongatapu are associated with the life and death of senior chiefs and they served as compound entrances, platforms for dwelling, holding court and the interment of semi-divine leaders. The use of white stone walls was an architectural innovation used to demarcate locations where highly-ranked title holders lived and presided. After death the paramount's body was similarly contained by a stone structure equipped with a stone vault. The quarrying of carbonate beach rock to make tombs and vaults may have built on the use of white beach sand to separate the body (*tapu*) from the earth (*noa*), but this requires confirmation by dating burials placed in beach sand that predate the emergence stonework. The uneven distribution of stone structures around the east of Tongatapu may represent attempts to establish a central place with Heketā fulfilling that purpose until it was deserted possibly after the death of the individual interred in the Type 2 tomb (3). The role of 'Āfa is unclear and whether it was a canoe landing zone to service Heketā, or a distinct chiefly compound connected with the Mo'ungalafa tombs. A degree of trial and error in the placement of tombs is seen at Lapaha where reclaimed land holding the early Paepaeotelea tomb (31) was abandoned for a landward strip where 19 large and small tombs were later built to form a row of monumental tombs. The large Tauatonga (41) tomb was made close to the defensive wall of the Tu'i Tonga's compound and might have precipitated the placement of several Type 2 tombs in Talasiu and Makaunga. The construction of a large linear fortification that protected the eastern part of Tongatapu could have been the critical event that allowed a section of the Tu'i Tonga's defensive earthworks to be infilled and another four tombs to be constructed in the residential area (see tomb construction phases suggested by Clark 2014; Kirch 1984; Spennemann

1989b). In a recent paper, Jennings and Earle (2016: 484) suggest that without a strong historical record the Tongan state would not have been recognized, but this is unlikely given the pattern and scale of stone architecture on Tongatapu, particularly the arrangement of chiefly tombs at Lapaha that testify to a central place that existed for centuries. Stone structures are important for reconstructing the political development of the Tongan state and future work should aim to develop a ^{14}C chronology of stone structures and to investigate their relationship with other parts of the prehistoric landscape such as road networks, fortifications, earth mounds (Freeland *et al.* 2016) and stone quarries. Many of the stone structures on Tongatapu have been negatively impacted by vegetation growth and human activity and the significant cultural heritage values of these sites would benefit from additional study and community-government management.

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Lithic drill points: an ethno-historic case study from Motupore Island (Papua New Guinea)

Hubert Forestier[1], Teppsy Beni[2], Henry Bailles[3], Francois-Xavier Ricaut[4], Matthew G. Leavesley[2,5]

[1] Muséum national d'Histoire naturelle, UMR 7194 CNRS-MNHN-UPVD, Sorbonne Université, Institut de Paléontologie Humaine, Paris, France
[2] Archaeology, School of Humanities & Social Sciences, University of Papua New Guinea
[3] Muséum national d'Histoire naturelle, UMR 7194 CNRS-MNHN-UPVD, Paris, France. Centre Européen de Recherches Préhistoriques, Tautavel, France
[4] Laboratoire Évolution & Diversité Biologique (EDB UMR 5174), Université Paul Sabatier, Toulouse, France
[5] CABAH at the College of Arts, Society & Education, James Cook University, Cairns, Queensland 4811, Australia

Abstract

Motupore is the name of an island and the archaeological village site located upon it in the Central Province of Papua New Guinea. The occupants of this site have been described as specialist manufacturers of earthenware clay pots. During the late 1800s and early 1900s ethnographers recorded 15 different pot types, two of which were dominant in the assemblage. The pots were transported by voyaging canoes to the Gulf of Papua and primarily exchanged for sago. This exchange network, known as the *hiri*, began when the site was first occupied about 800 years ago. A recent excavation on Motupore Island in 2016, led by M. Leavesley and T. Beni, found a series of 80 lithic pieces with relatively standardized dimensions. These pieces were collectively categorized as 'drill points' based on their relative homogeneity, but this categorization can be misleading. The first aim of the study was to analyze lithic tools from a techno-morphotypological perspective to better characterize the drill points on Motupore Island. Specifically, our objective was to determine whether a standard production process was followed to manufacture homogeneous points or conversely did production processes vary to manufacture heterogeneous drill points with a few dominant types. Based on quantitative and qualitative characteristics, five morphotypes were identified: truncation, shouldered piece, triangle, bore and point. The second aim of the study was to propose functional uses of these 'drill points' based on macroscopic observations of retouch on the surface of pieces, and to test hypotheses proposed by ethno-historical sources.

Keywords: Papua New Guinea, Motupore island, *Hiri* exchange network, drill point

Résumé

Localisée dans la Province Centrale de la Papouasie-Nouvelle Guinée, Motupore est une île, mais également un village-site archéologique du même nom. Les occupants du site ont été décrits comme des fabricants spécialisés dans la production de poterie. Au cours des XVIIIème et du XIXème siècles, les ethnologues ont recensé 15 types de pots différents, dont deux étaient dominants dans les assemblages. Les poteries étaient transportées en pirogue vers le Golfe de Papouasie, puis échangées essentiellement contre du sago. Ce réseau d'échange, connu sous le nom de *hiri*, a débuté dès la première occupation du site, il y a environ 800 ans.

En 2016, sous la direction de M. Leavesley et T. Beni, une fouille sur l'île de Motupore a mis au jour 80 pièces lithiques avec des dimensions relativement standardisées. Cet ensemble d'artefacts avait initialement été, sur le constat de leur apparente homogénéité, classé en « drill points ». Cette appellation pouvait cependant être trompeuse. L'objectif de cette étude a été d'analyser ces outils lithiques selon une perspective techno-morpho-typologique afin de mieux caractériser les « drill points » de l'île Motupore. Plus précisément, existait-il un standard dans le processus de production suivi d'un traitement de mise en forme homogène, ou inversement des traitements de mise en forme différents des « drill points » comprenant quelques types dominants ? En se basant sur des caractères qualitatifs et quantitatifs, cinq morphotypes ont pu être identifiés : troncature, à cran, triangle, bec et pointe. Enfin, des hypothèses concernant les modalités d'utilisation de ces « drill

points » sont proposées, elles s'appuient sur le repérage en macroscopie d'arrachements sur les arêtes des pièces qui valident les hypothèses proposées par les sources ethno-historiques.

Mots-clés: Papouasie Nouvelle-Guinée, île de Motupore, réseau d'échange *Hiri*, foret en pierre

Introduction

Motupore Island is located at the entrance of Bootless Bay, at the south-eastern end of the Gulf of Papua on the southern coast of Papua New Guinea. Bootless Bay is one of many bays along the coast of this region, 13 km from the capital Port Moresby, and less than 1 km from the mainland of Papua New Guinea. The island is relatively small in size, with a length of 0.9 km, maximum width of 0.3 km and an area of 174 km^2 (Figure 1).

The first archaeological research undertaken on Motupore Island was conducted by R. J. Lampert and J. Golson in 1967 (Lampert and Golson 1967). During their excavations they discovered faunal, lithic and pottery remains, and a layer without pottery underlying layers rich in pottery sherds. In 1968, R. J. Lampert described the importance of this lithic material, as at the time it represented the only archaeological traces of human occupation predating the use of pottery along this coast of Papua New Guinea (Lampert 1968). He also identified the lithic artefacts as drill points manufactured from siliceous rocks.

Following this early work, J. Allen and others, including staff and students from the University of Papua New Guinea (UPNG) conducted extensive excavations (1970-1976), on a natural inlet formed

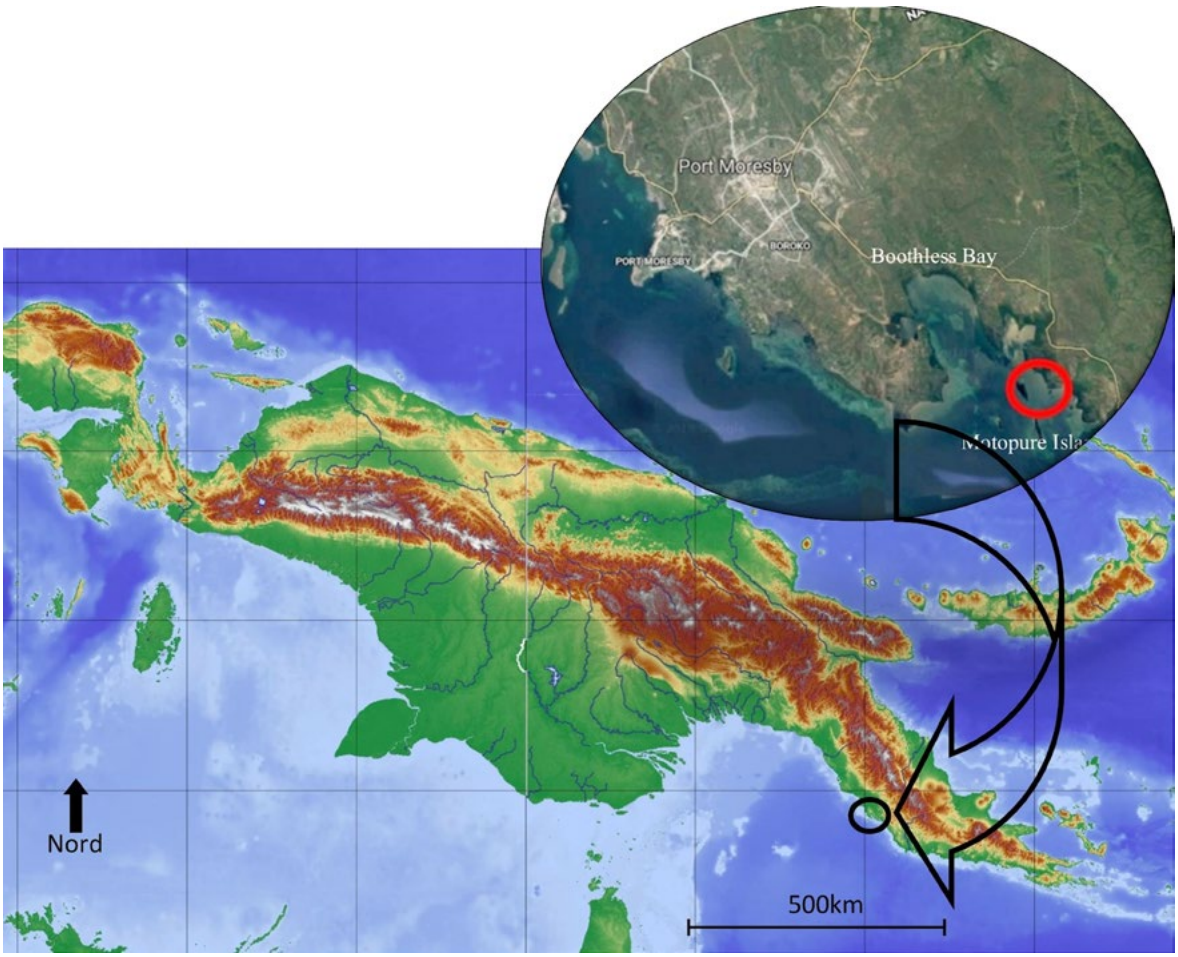

Figure 1. Physical geography of Papua. Inset, the area south of the Gulf of Papua and the island of Motupore (Google Earth modified).

Figure 2. Motupore island. One distinguishes the present buildings and the area of the excavations (© J. Allen, 2017).

by white coral sand, the only area on the shoreline not occupied by mangroves (Figure 2) and where three houses are located today.

Between 1978 and 1983, L. Groube pursued archaeological research by opening a long trench 20 m in length, west of the previous excavations. More recently, a team from UPNG, led by T. Beni, M. Leavesley and J. Allen, have restarted archaeological research on this site.

Researchers chose to start working again on Motupore island 50 years after the first discoveries, because it is a rich archaeological area close to Port Moreby. This island is also a crucial area for understanding the origins of the traditional 'Hiri', a trading network of the Motu people along the Gulf of Papua New Guinea through which clay cooking pots (*uro*) and others gifts are exchanged for sago (*rabia*) (Oram 1982; David *et al.* 2009, 2010, 2016; Skelly *et al.* 2017).

Early archaeological results from Motupore emphasise the importance of the site as a place of pot production and lithic knapping. Given that earthenware pottery has high archaeological visibility and utility, this site is central to our understanding of the entire trading network. The precision of dating techniques, such as radiocarbon, has increased dramatically since the early research carried out by Allen and others. Therefore, our new study programme (2016) aims to re-date the site so as to provide a better understanding of the site chronology, stratigraphy, artefacts, and by extension, the entire area from which pottery was traded.

The lithic material presented in this study is from the last excavation period (2016) and was discovered associated with other perforated artefacts (e.g., ceramic, pumice stone). It is mainly composed of lithic drill points which are characteristic objects and well-represented in the archaeological assemblage of Motupore. Analyzes were based on direct observations of the shaping of these pieces, their dimensions and morpho-structures. We aimed to categorize pieces into different morphotypes, to determine their defining characteristics and their diversity.

Drill points are very distinctive and unusual pieces; their obvious morpho-structural standardization must be demonstrated by a metric study, and hypotheses regarding their functions can be accepted or refused by observing their marks.

Material and method

The focus of this study is the 99 lithic pieces excavated by the UPNG archaeology team (ML TB, ML and JA; 2016) which are from a clear and well dated stratigraphic context. Among this assemblage were 80 artefacts identified as drill points plotted in the upper part of the stratigraphy. They were retrieved from 9 layers of sediment identified during excavations in square A and B (Table 1).

	Total direct retouched edge associated to a discontinuous inverse retouched edge	Two discontinuous inverse egdes	Two total inverse edges	Two discontinuous inverse retouched edges	Discontinuous direct retouched edge associated to a discontinuous inverse retouched edge	Total direct retouched edge associated to a total inverse retouched edge	Total inverse retouched edge associated to an unretouched edge	Total direct retouched edge associated to an unretouched edge	Total direct retouched edge associated to a continuous direct retouched edge	Total inverse retouched edge associated to a discontinuous inverse retouched edge	Discontinuous direct retouched edge associated to a total inverse retouched edge	Two discontinuous direct retouched edges	Two unretouched edges	Discontinuous direct retouched edge associated to an unretouched edge	Discontinuous inverse retouched edge associated to an unretouched edge	**Total**
Truncated points T	T1 [1]	T2 [3]														**4**
Proximal shouldered points C	CA1 [1]				CA2 [1]											**2**
Distal shouldered points C						CA3 [1]										**1**
Triangle TR1						T [1]										**1**
Straight borer points B		BA1 [1]														**1**
Assymmetrical borer points B		BD1 [4]	BD3 [1]			BD2 [4]	BD4 [1]									**10**
Straight points PA	PA4 [2]	PA2 [11]	PA11 [1]			PA5 [3]	PA8 [4]	PA1 [7]	PA3 [5]		PA6 [1]	PA7 [1]	PA9 [2]	PA10 [2]		**39**
Assymmetrical points PD	PD4 [2]	PD1 [8]		PD6 [2]	PD5 [1]	PD2 [2]	PD8 [2]	PD3 [1]		PD7 [1]				PD9 [2]	PD10 [1]	**22**
Total	**6**	**27**	**2**	**2**	**2**	**10**	**7**	**8**	**7**	**1**	**1**	**1**	**2**	**3**	**1**	**80**

Table 1. Numbers of the sub-morphotypes of the drill points.

The deepest layer, layer 9, was formed by white sand and was archaeologically sterile, but the presence and dating of an echinoidea shell gave the oldest date, 2 267±18 BP (ref. N23-ES001/Wk 47848). This result agrees with the deep dating obtained by J. Allen who did not detect occupation on this site before 900 years BP (Allen, 2017, p. 119-120, vol. 1). Layer 8 and 7 could not be dated because of lack of samples for dating (organic matter).

Layer 6 contained human occupation but without the presence of drill points. It was dated from charcoal samples at 958±17 BP. (ref. N23-CS006/Wk 47847). The lowest part of the stratigraphy, from layer 9 to 6, did not contain drill points.

Finally, only layers 3, 4 and 5, with a total thickness of 85 cm contained drill points and gave a dating from charcoal samples, of respectively 620±16 BP (ref. N23-CS005/Wk 47846), 621±17 BP (ref. N23-CS003/Wk 47844), 611±17 BP (ref. N23-CS004/Wk 47845) and 410±19 BP (N23-CS002/Wk 47843).

No reliable dating material from layers 1 and 2 were used for dating, due to an absence of samples and/or top soil disturbance making sample origin uncertain (Allen 2017: 88, vol. 1).

It is clear that drill points are associated to the period of most intense economic activity on the island, which corresponds to the top archaeological layers and a period of human occupation between 600 and 400 years BP, so from the 14th to 16th centuries.

Methodology was based on the decontextualisation of the 80 drill points from their ethno-anthropological context, which is later taken into consideration in the discussion. We considered these archeo-historical artefacts using a typological and morpho-technological approach. Results were confirmed or rejected using ethno-anthropological and ethno-historical data. Beyond the archaeological and technological interest of these artefacts, as a testimony of past knowledge and expertise, our approach validates the interpretations of these lithic artefacts originating from an ancient technological context. The technological 'memory' has not been forgotten because it was integrated within a trading system and also present in oral traditions and recent history (Figure 3).

The study we conducted on this archeo-historical material also has an anthropological value, because it is part of a 'go-between' with two temporalities (recent past and present) which are addressed by archeology and anthropology in a dual process of decontextualization/ recontextualization (Figure 3).

We used the software Access to manage data from the 80 artefacts (Microsoft®Access® 2016-16.0.10287.20118). Data obtained from each drill point was entered on a standard form which

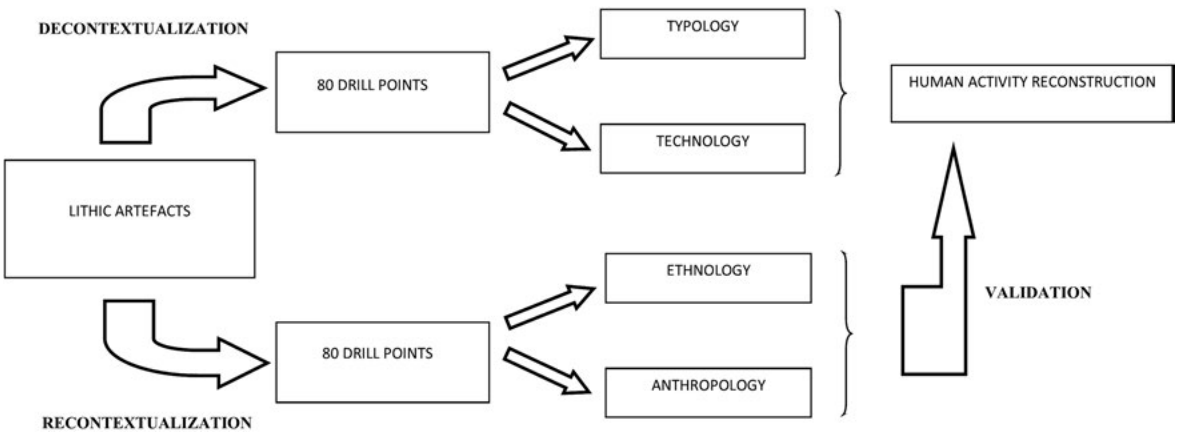

Figure 3. Diagram of the decontextualization/recontextualisation approach applied to the drill points.

listed 20 variables. Some variables were quantitative, such as length, width, thickness (a numerical value from a measurement using a calliper), inventory number, and morphotype code, and some were qualitative (macroscopic observations directly observed on the piece), such as preservation state, transversal or longitudinal profile, detachment type, butt morphology and preparation, distal shape and artefact name. Finally, a last categorical variable was related to more general observations. The definition used to describe the detachment type, butt morphology, distal shape, for example, and to distinguish between notch, beak and truncation was taken from an handbook on lithic technology and typology (Inizan *et al.* 1995; Shott 2015).

The morphotype of each drill point was individualized according to three qualitative criteria: the morphology of the tip (particularity of the active part), the morphology of the prehensive zone (the nature and the location of the notch) and finally, the general silhouette of the artefact (symmetrical/asymmetrical). This step allowed us to classify the pieces into five main morphotypes, despite some intermediate morphologies that did not influence the classification of the 80 artefacts defined as drill point. All the analyzes were made using this data bank.

Results and discussion

Based on the general morphology of the pieces within the assemblage, we characterized a set of five morphotypes (Figure 4). Although there are morphometric traits specific to each morphotype there are also some similarities among morphotypes (Figure 5). In addition, according to the nature and position of particular retouches for each piece (when visible), we identified 32 different sub-types within the five main morphotypes (Figure 4), which were coded accordingly (Table 1). Codes were: truncation [T], notch [C], beak [B] or point [P].

For the points and beaks, a comparison of the apex position and morphological axis of the piece (dejeted or axial) further categorized the sub-morphotypes. Thus, points and beaks were identified as: axial point [PA], axial beak [BA], dejeted point [PD], and dejeted beak [BD].

The axial beaks [BA] and truncations [T] are very rare in the assemblage, as only one piece was found for each type. In contrast, the axial points [PA] dominates the assemblage with 39 specimens (Table 1). Standard deviations of the three measurements (length, width and thickness) for the 80 pieces showed that the stone carvers followed a standard production for the manufacture of the pieces as shown by the measurements: an average of 16.9 mm for the lengths, 6.2 mm for the widths and 4.7 mm for the thicknesses. This strategy is very apparent when considering the length of the pieces which show a small 3 mm standard deviation and 0.9 mm standard deviation for the width and the thickness, respectively (Figure 6).

The average dimensions of the total assemblage of 80 drill points is 17 x 6 x 5 mm (Figure 6); standard deviations are very small, especially for thickness and width. Therefore, these pieces are standardized, as confirmed by the unimodal Gaussian normal distribution curve (Figure 6). Conversly, if these parts were not standardized, we would have obtained a bi-modal or poly-modal distribution.

The degree of homogeneity in drill points is particularly important for students of Motupore archaeology and the *Hiri* more generally for a number of reasons. While pots were known in the region at nearby Caution Bay 2900 years ago (McNiven *et al.* 2011) it is only with the *Hiri* that archaeologists have invoked explanations that revolve around notions of specialized trade and degrees of specialization in pot production (Irwin 1991: 508). In this context specialization has been proposed with reference to the shear quantity and relative homogeneity of the pots that were produced for the *Hiri*. While pot sherds dominate the assemblage the importance of other activities at the site, including shell bead manufacture, were also important and was recognized from the start of the study. If homogeneity is indeed an indicator of specialized production then

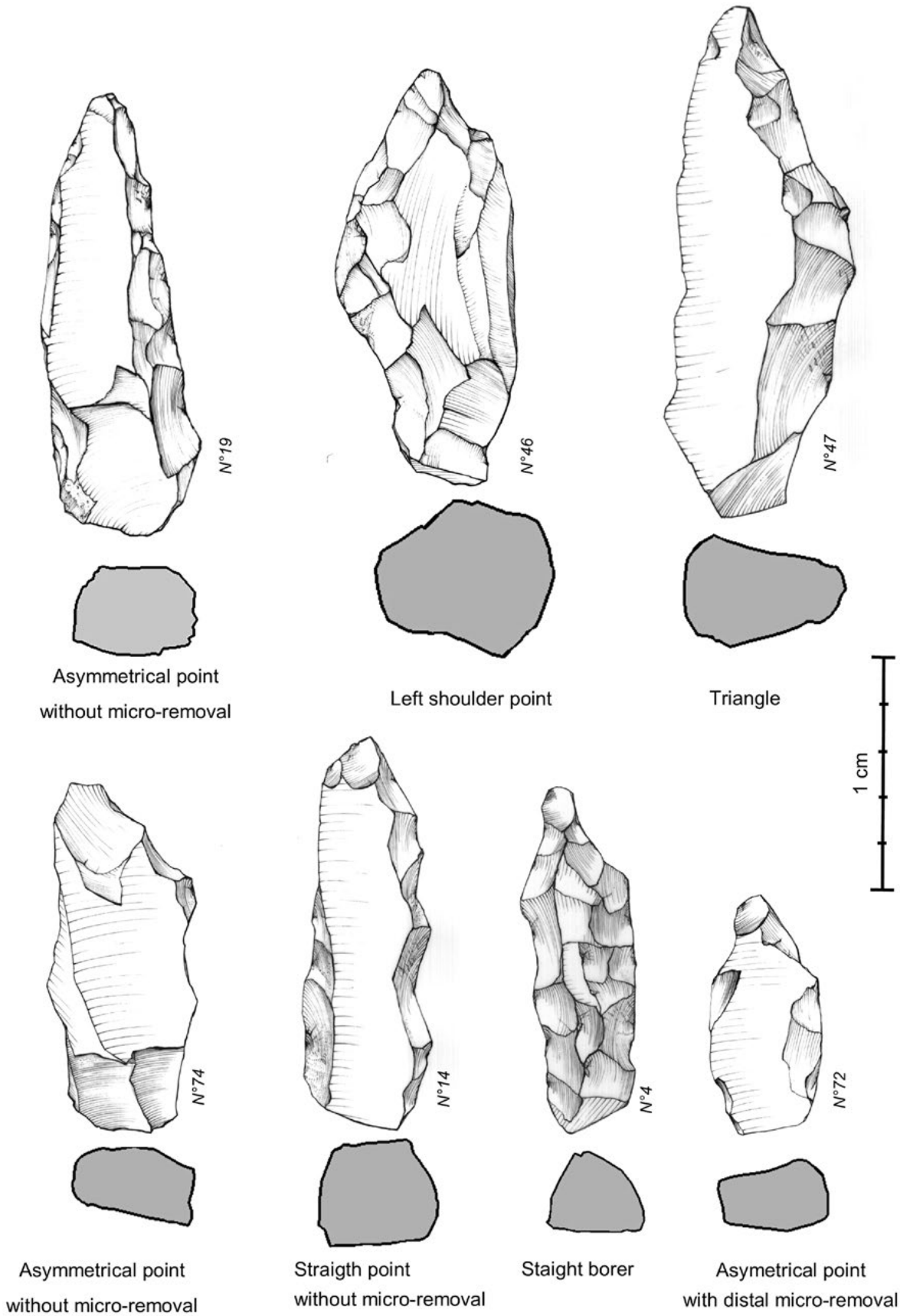

Figure 4. The main morphotypes of the drill points.

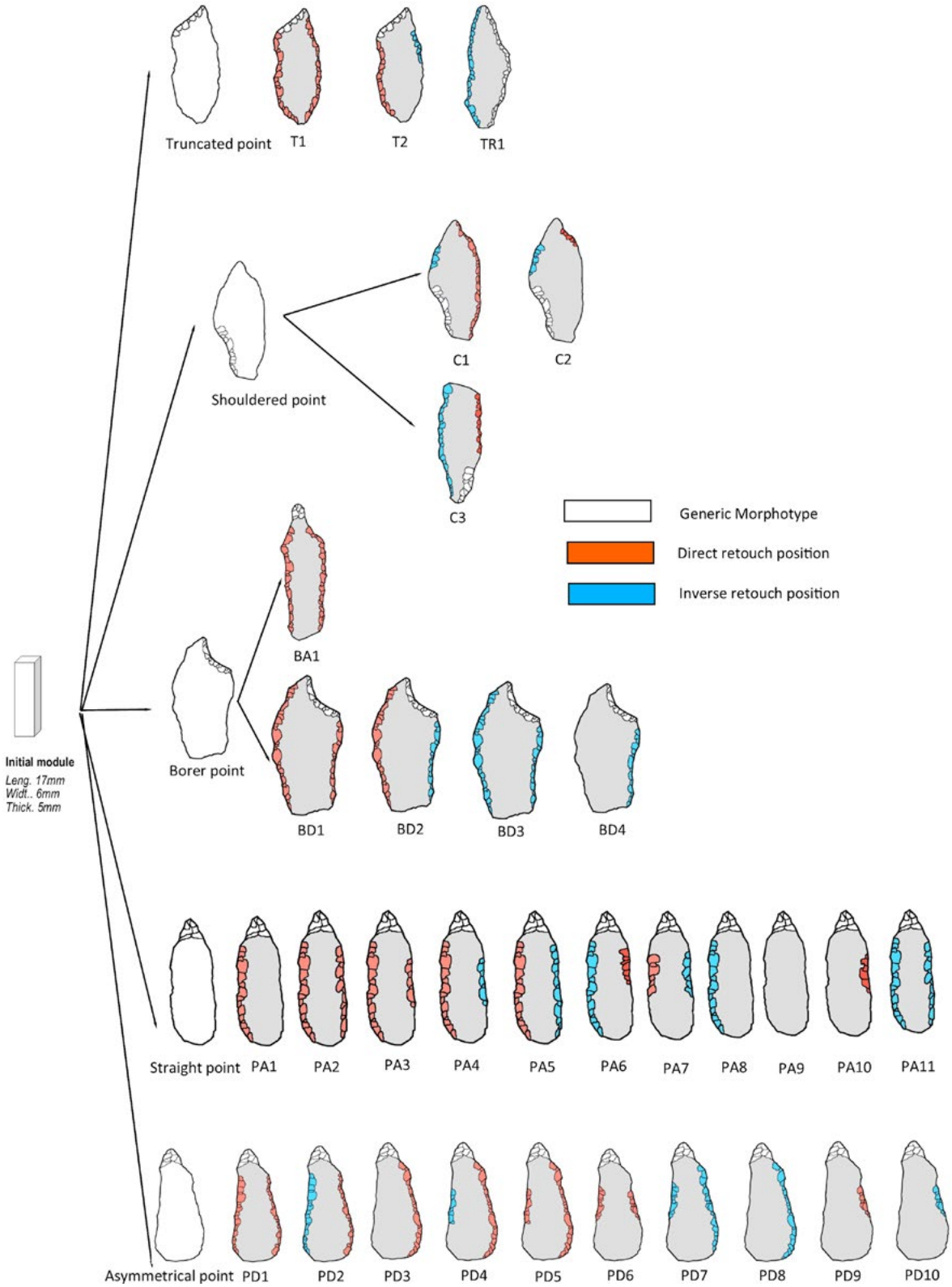

Figure 5. The 32 slot-morphotypes of the drill points.

investigating this in drill points is only one way to gauge the importance of shell bead production for the residents of Motupore island.

Local chert was readily available to manufacture drill points, but it was not used by the stone carvers of Motupore due to its low quality. It appears that the 80 drill points were made from

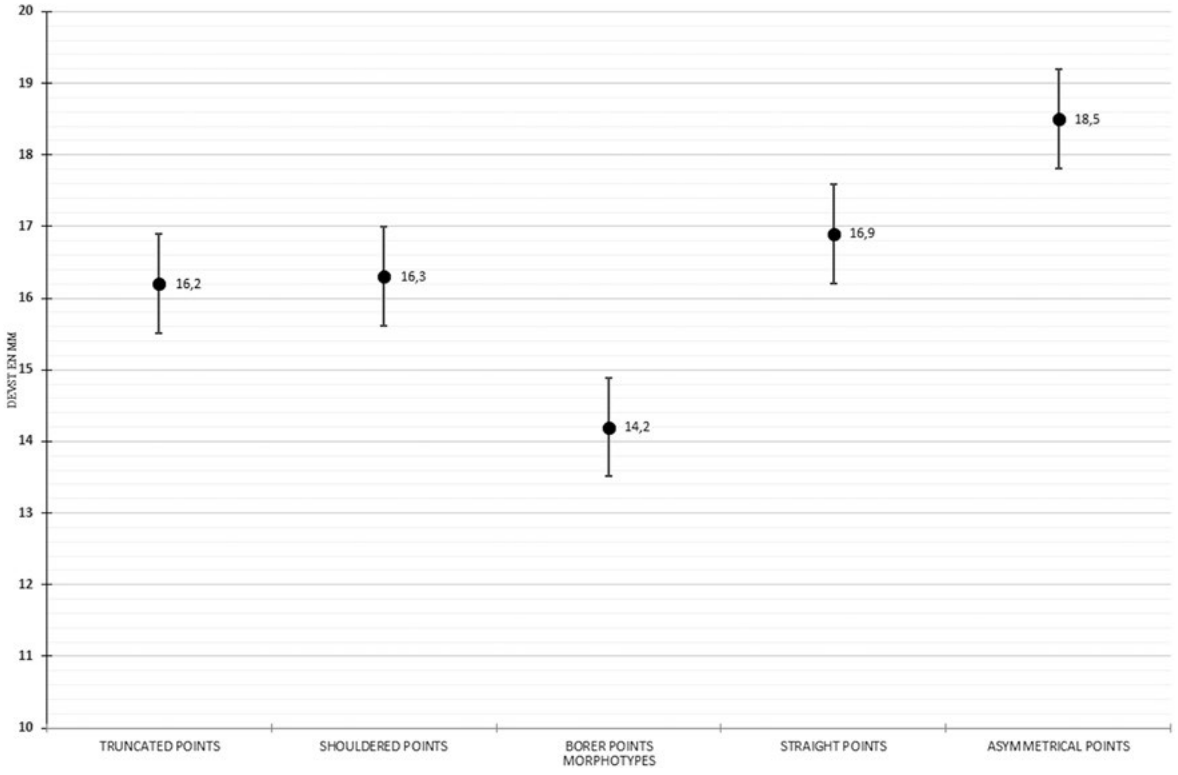

Figure 6. Length, width and thickness standard deviation of the drill points with a normal distribution (Gaussian normal curve).

different raw materials such as flint, jasper and chalcedony. These originate in detritic formations in the local environment at Bootless Bay, only 0.8 km from the island (Glaessner 1952).

The homogeneity of the pieces suggests that the stone carvers selected specific supports based on their overall morphology, similar in style to that of the final piece and with dimensions of around 17 x 6 x 5 mm. The few specimens found during the excavations demonstrate that drill points were made from small quadrangular blocks of raw material used as preforms which controlled and standardized manufacturing (Figure 6).

However, our knowledge of the complete '*chaîne operatoire*' remains incomplete, because we only observed the final product: the drill points. It is only through the recent work of J. Allen (Allen 2017) that we obtain more information on the '*chaîne opératoire*' and the different production steps taken to manufacture the drill points: the different products of the reduction sequences, the elongated/laminar flakes, the preforms of drill points, the multiplatform, and the bipolar or single platform cores (Figure 7).

Macroscopic observations show that the drill points have micro-removal on their edges which are morphologically similar to crests (Figure 8). These features are located on the part of the drill point which was in direct contact with the 'drill material', and could be the result of rotating hand-work, with probably a rotative instrument.

This type of instrument could be a 'pump drill with stone point' as suggested in the ethnographic and anthropological literature on Papua New Guinea (Leroi-Gourhan 1943). This proposition is only hypothetical but it finds some support from ethnographic collections.

The observation of the location of these micro-removals on the piece infer the diameter of the perforation they created. We noticed that some drill points generated wide diameter holes (around 1 cm) because the micro-removal impacted the length of the piece.

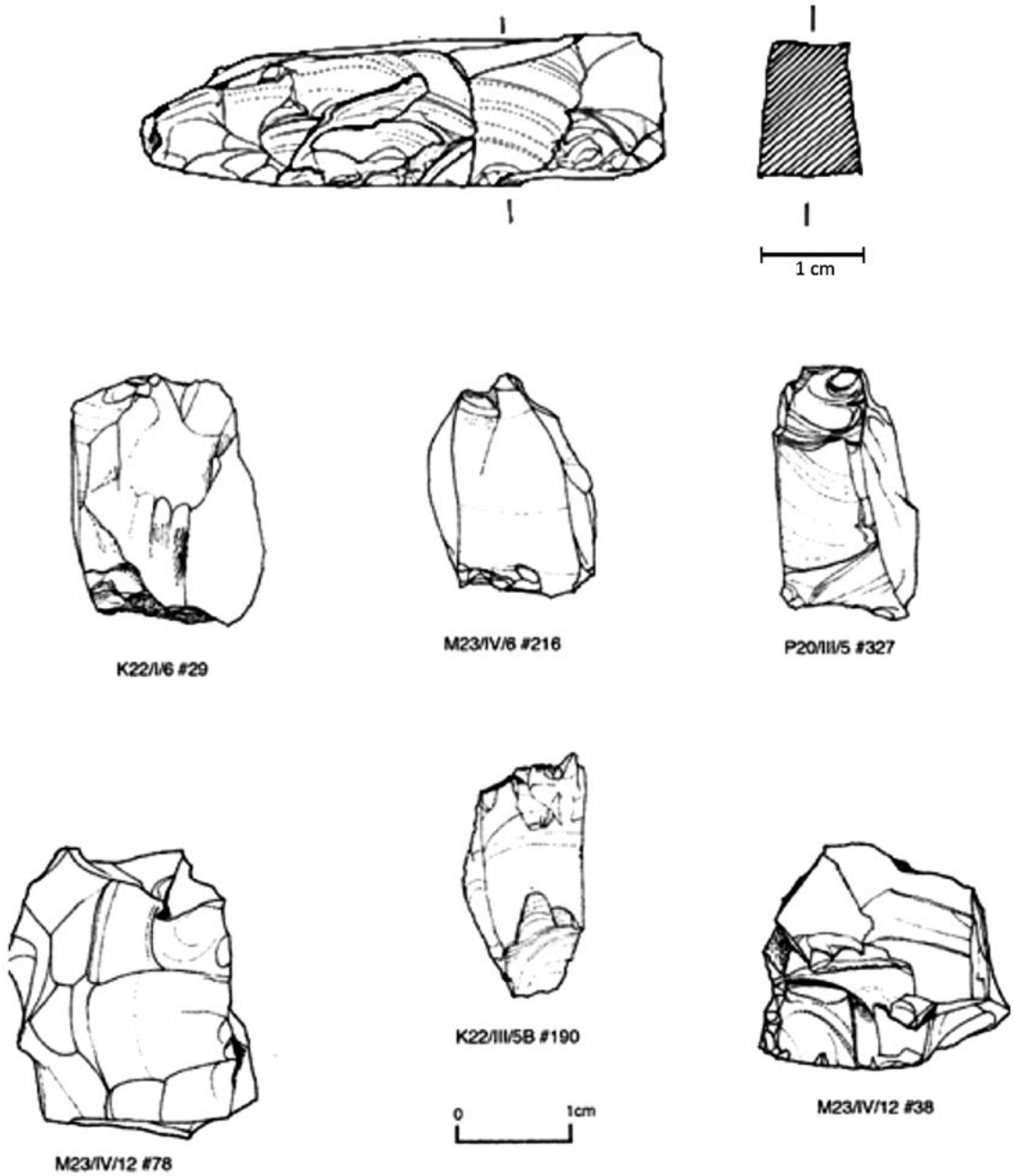

Figure 7. Top: preform drill point; down: unipolar or bipolar nucleus (Drawing J. Allen 2017).

These drill points were probably used for piercing pumice stones (Figure 9). Other drill points, with micro-removals limited to their axial part, suggest small perforations of a few millimeters on a softer material, which requires more precaution and precision on contact with the 'drill-material'. During the excavations numerous cylindrical beads made from shell were discovered; these were probably pierced using these specific drill points. Further microwear analyzes can validate or reject these hypotheses.

Piercing was probably performed using the saw bow technique, or a drill pump technique if we refer to the ethno-historical data known in this region of Melanesia (Figure 10) (Cranstone 1961, cited by Allen 2017 p. 439). This hypothesis is also supported by the localisation and type of micro-removal present in alternate positions on the edges, the piercings being performed following clockwise or anti-clockwise rotations.

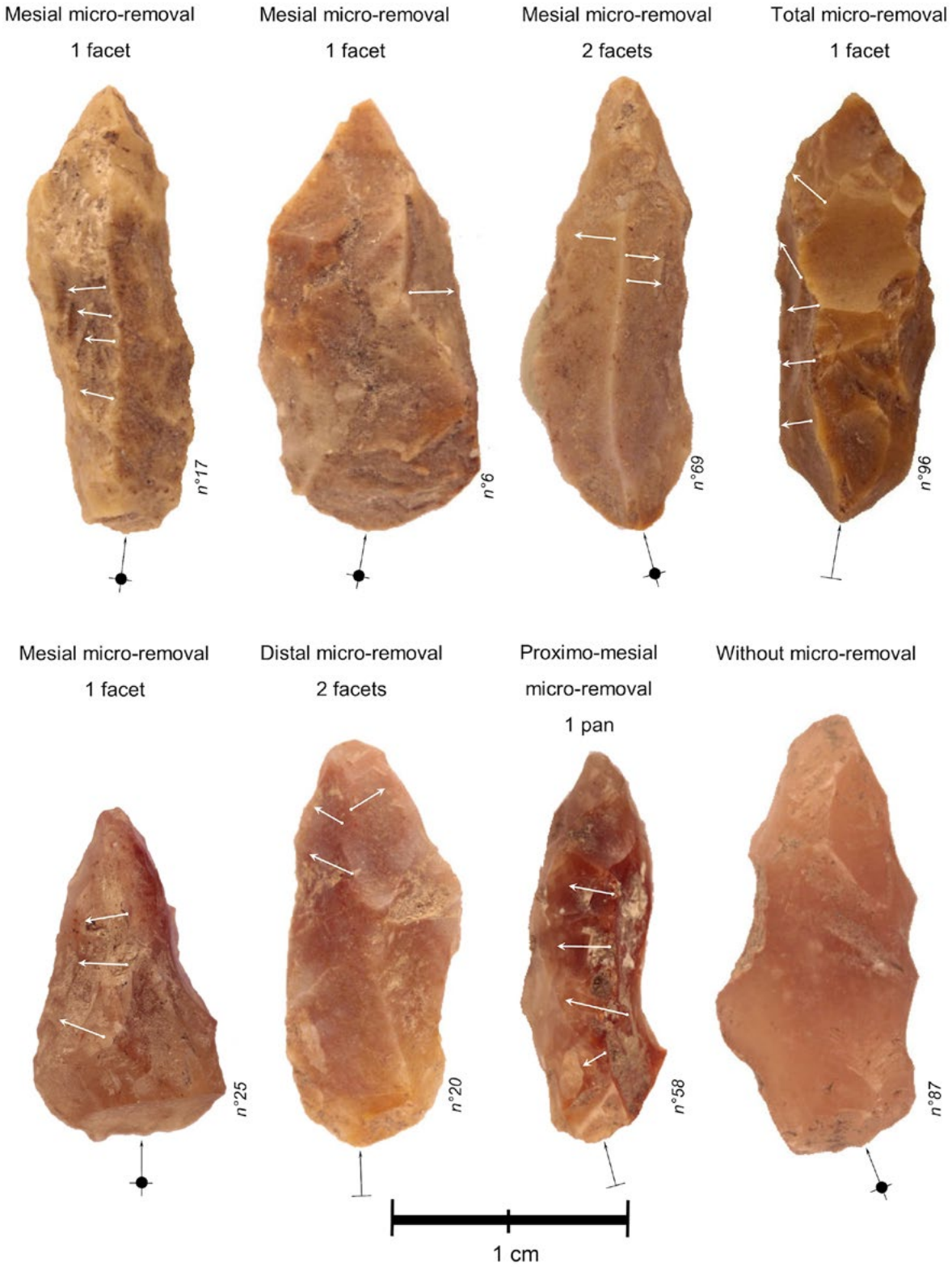

Figure 8. Location of areas with micro removals on the drill points.

Due to descriptions made by missionaries at the end of the 19th century, and ethnographic reports, we know there was an ancestral 'fair-trade activity' along the gulf of Papua interrupted after the Second World War. Named the '*Hiri* trade circle' (Allen 1977, Groube 1973, Skelly *et al.* 2017), this network was mainly coastal and of average size, involving population groups speaking Austronesian, the *Motu* (Figure 11). Since then, the *Hiri* motu has been a trade language used in the south-east part of the island, one of 800 different languages spoken in Papua New Guinea. Within

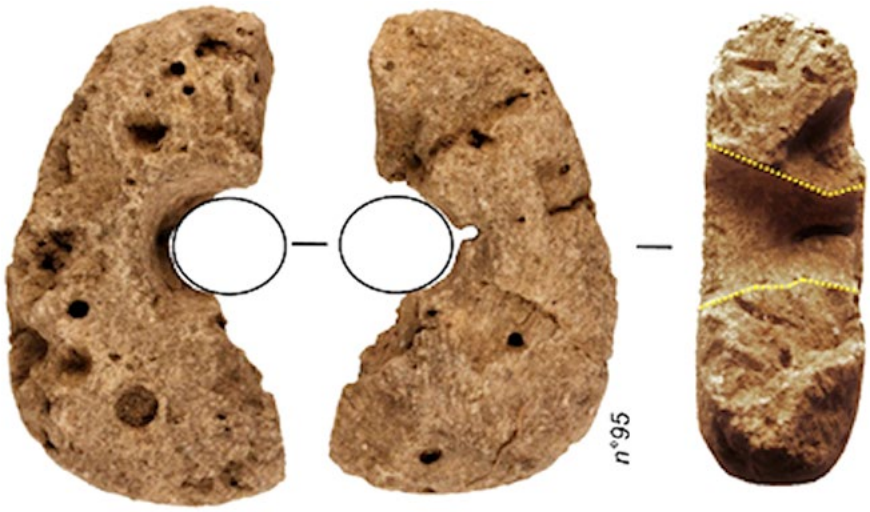

Figure 9. Pumice stone and ceramic shard drilled.

Figure 10. Forest to pump (© Museum of Orgnac, France).

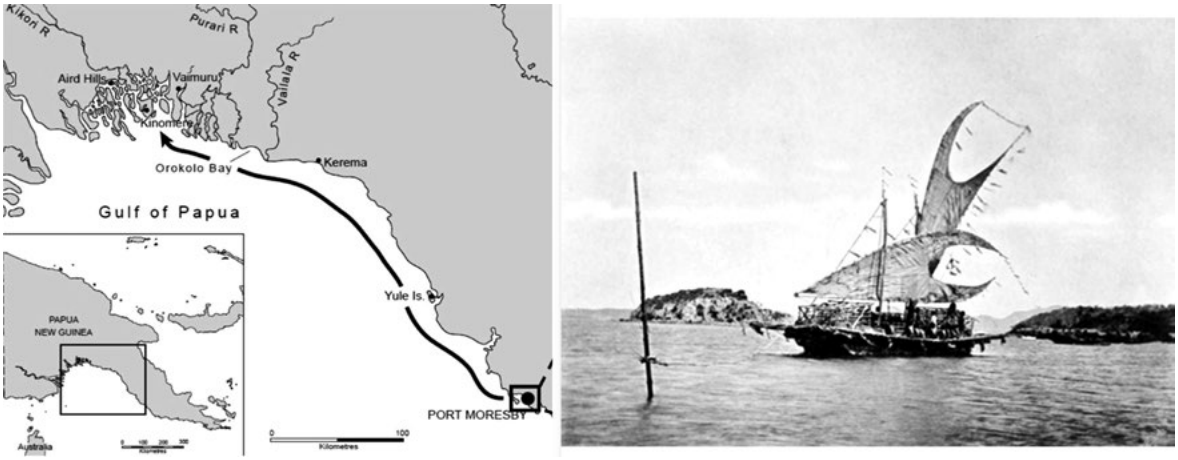

Figure 11. Left: the sea route of the Hiri trade along the coast of the Gulf of Papua; right: The lagatoi: a traditional boat used for Hiri trade (© M. J. Mennis 2014).

this context, populations from the southern part of the Gulf of Papua exchange, over distances of 400 km, pottery, beads and bracelets made in shell, and other material items made in bone, for sago starch which does not grow in the Port Moresby region (Figure 11).

The drill points found during past and recent excavations on Motupore island indicate the presence of a regional craft activity: the piercing of shells, pumice stones and pottery sherds, and less frequently bone (fish vertebrae) and tooth (mammal) items (Allen 2017). These pieces give us a better understanding of the *hiri* trading system and the exchange of manufactured products.

Conclusions

The first aim of our study was to analyze lithic tools from a techno-morphotypological perspective to better characterize the drill points on Motupore Island.

The second aim was to propose functional uses of these 'drill points', and thus validate or refute the hypotheses proposed by ethno-historical sources (Allen 2017, Skelly & David 2017). The techno-morphotypological approach determined that the lithic pieces excavated at Motupore were used as rotating pump drills from their utilisation features.

The characterization of five main morphotypes suggests that each could have been used on a different material (bone, shell, pumice stone, pottery, etc), and that human groups had specialized technical and craft work. In the absence of use-wear analysis this hypothesis cannot be tested.

The ethno-historical data obtained from Motupore site confirm this interpretation and include these drill points in a larger and more complex socio-economic system along the Gulf of Papua from 800 years ago to the present day: the '*hiri* trade circle' (Allen 1977). Beyond this technical context, the ethno-historic background recontextualized these original pieces within a technical and trade system from the specific location of Motupore, well-known for its Motu people with *Motu* language, specialized stone-carver craftsmen in this region of Papua New Guinea.

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Development of Exchange Networks in the Western Solomon Islands

Peter Sheppard[1]

[1] Department of Anthropology, University of Auckland, Auckland, New Zealand

Abstract

As Nicholas Thomas (1991) has observed, the 19th century cultures of the Western Solomon Islands illustrate the over simplification created by simple binary distinctions of gift economies and social exchange versus market based trade in commodities. In the Western Solomons shell 'currencies' were elaborated to a very great degree, allowing the near commodification of exchange; yet these 'currencies' were not simply units of asocial value. They were intricately entangled with systems of identity and symbolism. In this paper I briefly review systems of exchange and areal interaction in the Solomon Islands, and then focus on the archaeology and ethnohistory associated with the development of the Western Solomons 'currencies'. I conclude with some general comments on the archaeological study of 'trade and exchange'.

Keywords: Exchange, Solomon Islands, shell, archaeology, ethnohistory

Résumé

Comme Nicholas Thomas (1991) le notait, les sociétés des îles Salomon du 19ème siècle démontrent à quel point la dichotomie entre économie du don et économie de marché est trop simpliste. Dans les îles occidentales des Salomon, les monnaies de coquillages étaient si élaborées qu'elles permettaient presque la marchandisation des échanges de biens. Pourtant ces « monnaies » ne peuvent pas être considérées comme de simples unités sans valeur sociale ; au contraire, elles sont étroitement intriquées dans des systèmes symboliques et identitaires. Je propose ici une synthèse des différents systèmes d'échange et des zones d'interaction dans les îles Salomon, puis j'examine le développement des « monnaies » des Salomon occidentales du point de vue de l'archéologie et de l'ethnohistoire. Mon analyse aboutie à plusieurs commentaires généraux à propos de l'étude des transactions et de l'échange de biens à partir des vestiges archéologiques.

Mots-clés : Échange, Iles Salomon, coquillage, archéologie, ethnohistoire

Introduction

The Solomon Islands are known for their numerous systems of exchange media and areas of cultural interaction, which they generally index (Figure 1). Although these systems often facilitate the movement of commodities or economic exchanges required to alleviate food shortages or differential distributions of resources, they are not easily explained in simple formalist economic terms or within models assuming resource maximisation. Jim Specht in reviewing the complex 'trade' within the Buka region of the Northern Solomons concluded the following:

> The pattern of trade in the Buka region can thus be regarded as the product of environmental differences, social production, the desire to maintain the continuity of various socio-religious activities, and past culture history. I suggest that no one element is of greater importance than another, but rather that they interact in a finely balanced system of exchange that links nearly all of the Austronesian-speaking communities of the area (Specht 1974: 235).

'Trade' or movement of goods in Buka was thus a function of a pattern of cultural sharing and interaction, which integrated a considerable number of language groups within one day's travel of each other. This facilitated access to resources, but also reflected a shared cultural history of

the development of socio-religious systems which presumably underlay both social and economic intercourse. These systems thus may have complex histories of development.

Solomon Island exchange media are generally made from strings of shell beads or animal teeth, which historically have often been described as 'money' sometimes described as being made at 'mints' (Kirch 1991 provides a more general discussion of Western Melanesian exchange). Anthropologically we have come to privilege the importance of social exchange or 'gift' exchange over commodity 'trade', or the asocial purchasing of goods divorced from on-going social entanglement, as might be found in systems using 'money'. Archaeologists often adopt this analytical duality and refer to 'trade and exchange', although in practice their analytical models tend to assume commodity trade with resource use economic maximisation, often in the support of theories of the development of social hierarchy through differential access to goods. The anthropologist Nicholas Thomas has described the shell 'money' systems of the Western Solomons as blurring the distinctions between conventional anthropological categories. There is in fact commodity trade in the Western Solomons using exchange media which in turn play fundamental roles in social exchange (Aswani and Sheppard 2003). Thomas notes that: 'The problem of such unitary conceptions [gift versus commodity] of indigenous economies is that they suppress the entanglement with other systems such as capitalist trade' (Thomas 1991: 4). In the Western Solomons this suppresses the nature of indigenous commodity exchange, and its entanglement with 19th century capitalist trade, but we can also imagine it limiting our understanding of entanglements among indigenous economic systems.

The complexity of the values associated with exchange media in the Solomon Islands has been discussed by Daniel Miller who spent time working with the Solomon Islands National Museum in the late 1970s. Referring most directly to the 'shell money' of the Western Solomons, Miller notes that: 'Exchange media are of importance not only for their place in the redistribution of goods, but in setting up equivalence between otherwise separate cultural categories. They act to establish spheres of acceptable relationships and serve as a basic scaling device and medium of comparison' (Miller 1978: 288). They therefore create systems of value which can structure relations, but also associate cultural meaning with exchange transactions beyond simple 'payment'.

In the following I will very briefly introduce the spheres and systems of exchange in the Solomons and then focus in some detail on the Western Solomon shell 'money' system, describing its manufacture, associated values, economic and social roles and its developmental history and role in integrating the Western Solomons. In many respects the complexity of this system mirrors that described by Specht (1974).

Solomon Island interaction spheres and exchange

Figure 1 illustrates spheres of interaction and exchange in the Solomon Islands including the Kula system in the Massim region of the Solomon Sea. Although there is evidence of exchange across the Solomon Sea in prehistory (Tochilin *et al.* 2012), there appears to be none in the recent past (Sheppard *et al.* 2015), however inclusion of the Kula provides an interesting contrast between a more open ocean exchange system, like the Red Feather system of Temotu, with the short distance, paddle canoe based systems of the sheltered waters of the main Solomons. This is a general overview and will miss some local detail (e.g. Shaw and Langley 2017) but illustrates what I think are the major systems. As a general rule these systems are found within networks of neighbouring islands, or parts of islands falling within a circle of a radius of 100 to 60 km, often linking areas across short inter-island passages. Within the main Solomons, paddle canoes (Woodford 1909) provided the means of transport along the more sheltered coastal waters and lagoons and over the generally short one day crossings between inter-visible islands in the interior of the archipelago. Open ocean systems such as the Red Feather exchange system of

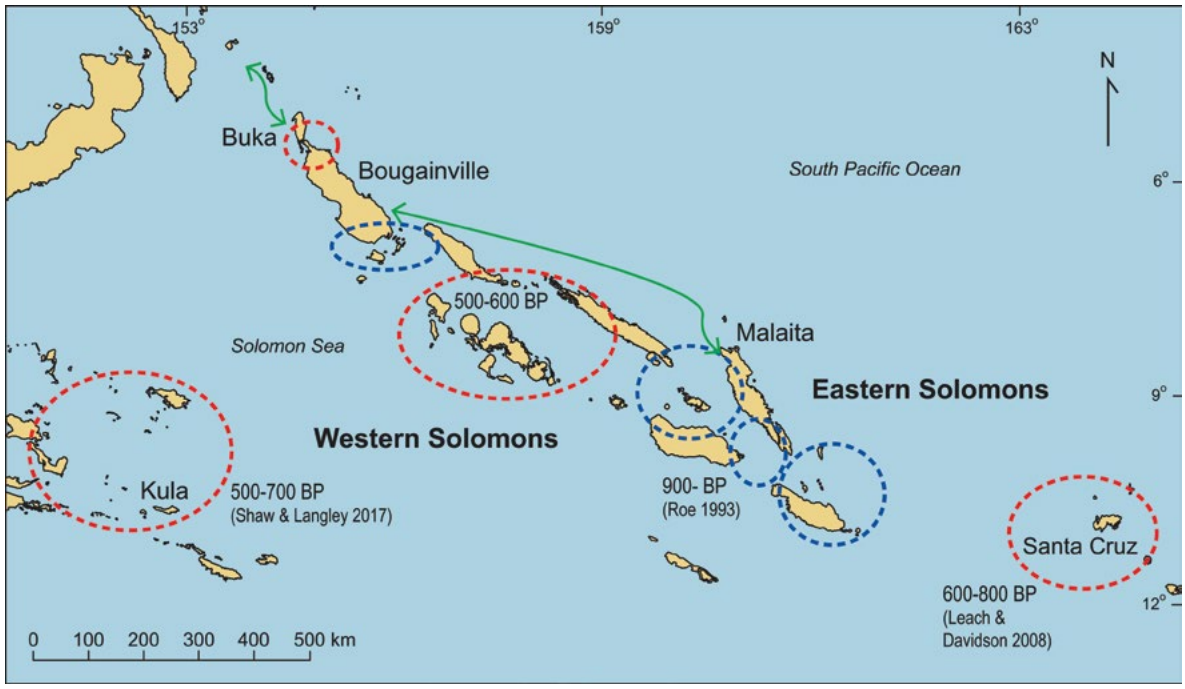

Figure 1. Major Exchange interaction spheres
in the Solomon Islands (by the author).

the remote Temotu province of the Southeast Solomons (Davenport 1962) and the Kula of the Massim (Leach and Leach 1983) required significant ocean crossings making use of outrigger sailing canoes. Although these systems are illustrated in Figure 1 as closed spheres, there is generally leakage between systems, or connections among systems whereby aspects of the neighbouring system are accepted or understood and partially participated in by neighbours. The one major case of regular long distance trade is the historic trade in shell beads from Malaita into Bougainville (Connell 1977) and on into the Bismarck Archipelago, which appears to have been facilitated by both European traders linking into indigenous economic demand and the development of 20th century trade links with Papua New Guinea.

Most of the exchange media are forms of functional body ornaments such as necklaces or belts of shell beads and/or teeth, chest ornaments or arm rings. The exceptions are the red feather coils *tau* (Beasley 1936) of Temotu, the arm shells (*mwali*) and necklaces (*bagi*) of the Kula, which Malinowski (1920) states were rarely worn and then only on special occasions (Malinowski 1932: 87), and the *kesa* display units of matched shell cylinders from Choiseul (Piko 1977; Scheffler 1965). Most of the simpler forms of bead or teeth assemblies can be made in a non-specialist fashion and there is no evidence of restricted production in the form of 'mints'. The exceptions are cases requiring skilled specialist, such as the production of red feather coils (Pycroft 1935), and very likely *kesa* cylinders, although the method of production of *kesa* was unknown in the 20th century (Piko 1977). The red shell beads used in Kula may have been produced at specific manufacturing centres (Malinowski 1932; Shaw and Langley 2017) but the *conus* shell arm rings appear to have been made by the finder of the shell (Damon 2002). Mass production of shell beads is known from Langalanga lagoon in Malaita (Guo 2006), although the method of production is comparatively non-specialised (Woodford 1908). During a brief visit in 1989 I saw much chert debitage on the small islands of the lagoon which may relate to the production of drill points as traditionally used in the perforation of shell beads using a bow drill. As will be discussed in detail below, the shell valuables made of fossil *Tridacna* shell in the Western Solomons may have required some specialised skill in finding the shell but the production appears to have been widespread, although intensified production seems to have existed in some locations.

The age of these exchange/interaction spheres, as defined by movement of exchange media, is very difficult to determine and it seems probable that in most cases exchange of some form, although perhaps generally not in the historic form, has great antiquity and dates from a point when the arrival of food production and enhanced population density warranted it. Most of the historic systems for which we have some estimate of age, date within the last 500 to 1000 years. The Kula dates back over 500 years and perhaps back to 700 cal BP based on dated Kula valuables (Shaw and Langley 2017), although the expansion into its historic form is most probably due to reduction in warfare within the Massim in the 19th century (Irwin *et al.* 2018). On Guadalcanal, Roe (1993) dates interaction across from the Honiara region to Malaita, based on the appearance of Malaitan chert and shell beads like those known ethnographically to *circa* 900 cal BP. Leach and Davidson (2008: 195) suggest that the Temotu red feather system dates back to 600-800 cal BP based on the age of what they interpret as bone spacers found in burials on Taumako and possibly used in the construction of red feather coils. In the Western Solomons the appearance of shrines and shell valuables like those used historically dates from 500-600 cal BP as discussed in detail below. All of these systems will have patterns of potentially complex development over time and, as discussed by Irwin *et al.* (2018) for the Kula, we cannot simply project the historic pattern back into time. In the following I will examine in some detail one such development in the Western Solomon Islands.

Western Solomon Island Exchange Media and Interaction

In the late 19th century the islands of the New Georgia Group (Figure 2) were renown as the home of head-hunters who ranged, in their large war canoes (*tomoko*), throughout the Group and across to the north onto Choiseul and Santa Isabel, and even occasionally east over 160 kilometres to the Russel Islands and western Guadalcanal. At the centre of the New Georgia Group lies Roviana Lagoon and from at least the perspective of the British colonial government, the Roviana people were the most active and feared raiders. The centrality of Roviana, and its sheltered lagoon system, made it attractive to European traders and by the mid 19th century,

Figure 2. The Western Solomons Islands and Roviana lagoon (by the author).

Figure 3. Chief I(H)ngava and his wife at Sisieta, Munda, Roviana *circa* 1902 photo by George Brown (with permission ©British Museum (Oc,Ca42.53)).

despite the fierce reputation of the Roviana, it was the base for many traders, perhaps the highest concentration in the Solomons at that time. Visitors to these trading stations have left us a considerable textual and photographic record of the Roviana and their neighbours. These photos are often of prominent people wearing the shell valuables which were central to Roviana society, both as valued items of desire and items underlying sociality and economy. Figure 3 is of Ingava and his wife at Sisieta in modern Munda at the centre of Roviana. This photo was taken *circa* 1902 by the missionary George Brown, most probably at the trading station at Nusa Zonga islet just off the western end of Munda. Ingava was a chief (*mbangara*) of Sisieta and a powerful leader in Roviana having close relations with European traders and colonial authorities. In this photo he is wearing a *mbakiha rapoto* on his chest. The shell ring, which forms the centre of the ornament, is a *mbakiha* and the highest valued shell valuable in Roviana. On his arms and those of his wife are arm rings called *hokata* which are also exchange media of lesser value. Generically these and other Roviana shell exchange media were known as *poata* (Aswani and Sheppard 2003; Thomas 2004). Possession of *poata* denoted status and economic wealth and ultimately underwrote the power of men of chiefly rank such as Ingava.

In 1908 the anthropologist Arthur Hocart, along with W. H. Rivers, as members of the Percy Sladen Trust expedition to the Solomon Islands recorded information on the shell 'currencies' in use in Roviana and on Simbo, located within the Group to the south of Roviana. Table 1 presents information on scale of value of the different exchange media in 1908 in Simbo. The items referred to as *poata* by Hocart are plain shell rings similar in form but lacking the yellow stain characteristic of *mbakiha*. *Mbokolo* is the Simbo term for arm-ring equivalent to Roviana *hokata*. Missing from the table are the very rough shell rings called *mbareke*, considered to be the oldest form and associated with spirits (*tamasa),* or made by them and closely associated with ritual transactions rather than common exchange.

The value of these shell rings relates both to their size and finish but most importantly to the material from which they are made. *Mbakiha* are made from fossil giant clam (*Tridacna gigas*) (Figure 4) mined from the raised fossil reefs which form many of the barrier islands of Roviana and the other lagoon systems of the New Georgia Group, which are subject to considerable

Simbo Unit 1908	Simbo Unit	Copra [nut]	English Pounds	Copra man days (after Bennett 1987: 81)
1 large (6 inch) *mbakia*=	15 *mbokolo* [Roviana *hokata*]	1500	?	12.5 man days
1 small *mbakia*=	10 *mbokolo*	1000	£5	8.3 man days
1 large *poata*=	5 *mbokolo*			
A small *poata*=	Not valued in *mbokolo*			
1 large *mbokolo*=	20 Tobacco sticks	100	Approx. 1s6	0.8

Table 1. Western Solomon Islands exchange media (after Hocart (MSSc)).

Figure 4. Cache of fossil shell at Maravari, Vella Lavella (photo by the author).

tectonic uplift (Sheppard and Walter 2009). The hinge portion of these fossil shells is apparently stained red or yellow from iron deposits, creating a stain on a portion of the shell used to make a 'true' *mbakiha*. This material is valued as having supernatural associations because the shells are considered, at least by one of Hocart's (MSSc) informants, to be the discarded food shells of the gods (*tamasa*). Other *poata* although similar in form with a rectangular cross-section but without the stain, cannot be identified as fossil shell, but could be made from fresh shell which might account for their lesser value. The fossil shell was found by a ritual specialist who divined or 'fished' for shell using a bamboo rod amongst the jagged *makatea* of the raised reefs. Arm-rings or *hokata* have half-round sections and are apparently made from fresh clam (Somerville 1897: 364) or *Conus* shell. The *mbareke* form is made from small clam shells (*Tridacna squamosa*) and retains the natural flutes of the shell (Figure 4). Hocart notes that these and many of the *poata* are often too small to be worn on the arm.

Manufacture of shell valuables involved a laborious process of cutting and grinding the blocks of fossil shell. A large arm-ring is reported to have taken 2 days labour to manufacture using traditional methods (Ribbe 1903: Figure 77a; Somerville 1897: 364). A weighted bow and a cord made of vine was used with abrasive to cut the fossil shell into slabs and then to cut the interior core from the slab to form the rough ring (Figure 5a). In the 19th century metal wire came to replace the fibre cord (Hocart, MSSc). The rings were finished using stone files and grindstones, as shown in the photo of a ring production workshop from Roviana *circa* 1907 (Figure 5b, c). Such work was apparently only conducted by men, and was a common sight with stories of old chiefs being daubed with the white powder from rings they were grinding. The extent to which captive or slave labour was used in Roviana to produce rings is uncertain, however the

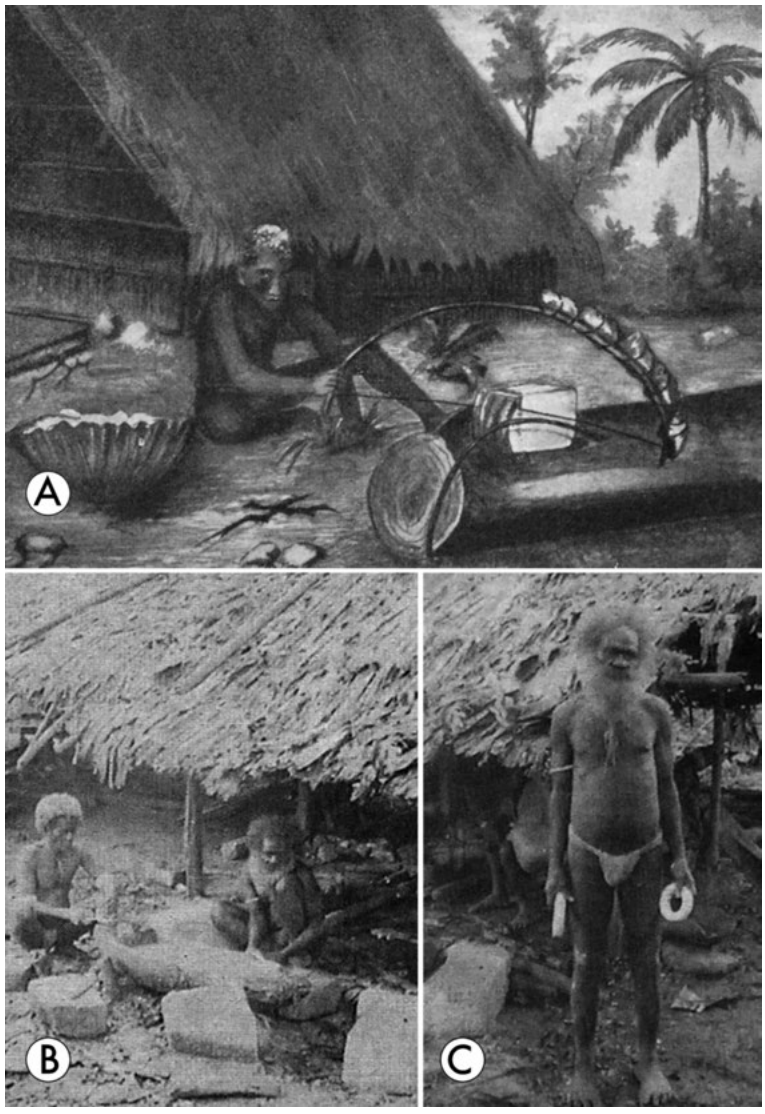

Figure 5. Shell ring production in Roviana (a) sawing of shell (Ribbe 1907: Figure 77a); (b) ring workshop in Roviana (with permission British Museum © Oc,Ca44.85); (c) 'Old Man of Choiseul. Money maker in Rubiana [Roviana]' (with permission British Museum © Oc,Ca44.61).

Item	Value (1908 in Simbo)
1 pig	4-6 *poata*
1 shield	1 *mbakia*
1 canoe	1 *poata* per rib – 17 ribs in *tomoko* (6 *mbakia*?)
1 basket (*elaka*) of taro	1 *mbokolo*
1 small child in Choiseul	20 *poata*, or one shield, two *mbakia* and 18 *poata*; this was considered expensive

Table 2. Commodity purchase price in shell valuables in Simbo 1908 after Hocart (MSSc).

ring-maker in Figure 5c is described as a man from Choiseul who would probably have been a Roviana captive.

As shown in Table 2 these rings could be used in commodity purchase and as described by Hocart generally formed inter-changeable units of value. Roviana people strove to acquire shell valuables and greatly valued their possession as a central cultural value. Hocart reports the use of magic to attract people to houses to buy goods with shell rings. Rings were most commonly acquired in exchange for goods such as food or manufactured items, or services rendered such as canoe or house construction. Hocart notes that payment for some services seems to have no direct relationship to the amount of labour, but marked a standardised social transaction. Such transactions included rings paid to a priest for repairing a skull house, presentations to the crew of a new war canoe,

payment for killing a man, payment for a wife, for cohabitation with an unmarried girl, and payments related to death rituals and feast giving.

Roviana chiefs were descended from chiefly lineages and were leaders of a bilateral cognatic descent group (*butubutu*). As leaders it fell to them to make or facilitate the payments associated with the social life of their people, ranging from common transactions upon marriage and death and associated costs of feasts, to compensation payments to aggrieved parties in inter-personal crimes, to successful headhunting boat crews or to external leaders to make peace. How chiefs managed to acquire and renew the wealth needed to cover these costs is not clear. Hocart reports that shell money could be inherited in the male line or borrowed and chiefs could sell manufactured goods or food to neighbouring chiefs for rings along with services such as support in conflict. The only other clearly identified way for chiefs to obtain shell rings was through ritual prostitution, where in certain circumstances chiefs manged the provision of unmarried girls as sexual partners for rings. Of course direct manufacture of rings by chiefs and craftsmen working for them as captive labour is reported in Roviana and may have become more common in the late 19th century when raiding intensified (Aswani and Sheppard 2003).

In the 19th century the exchange media system described by Hocart for Roviana and Simbo was in use throughout the New Georgia Group, and recognized beyond into at least Choiseul and Santa Isabel. In 1892 Soga, the powerful leader in the Bugotu area of easternmost Santa Isabel, was photographed wearing a *mbakiha rapoto* (White 1991: 96). As I have discussed elsewhere (Sheppard and Walter 2013) the presence of the shell exchange media facilitated easy commodity trade (Table 2) within the region creating a networked economy. Not all resources were equally naturally distributed within the region. Roviana is described by Hocart as an area with limited food production given its high population, but a centre for the production of manufactured goods. Barter of these goods, along with direct purchase, allowed the chiefs of Roviana to provide the food required for large feasts, as befitted their status as effective leaders. Taro and canarium nuts were commonly purchased and moved from areas of abundance to meet local shortages arising from limited production or large feasts. Even against the backdrop of potential violence from head-hunting, movement of people and goods across the region seems to have been continuous (Hocart 1931, Shineberg 1971) facilitated by trading friendships (*mbaire*) (Hocart, MSSd) or inter-marriage between language groups, which was common at least among the chiefly class, and by negotiated alliances. Goods could also be purchased from European traders who had integrated the shell 'currency' into their trade, both selling (Hocart, MSSc) and purchasing with rings and by the late 19th century ceramic copies of shell rings were being provided to traders through Austrian and German manufacturers (Beck 2009; Richards 2010).

Despite the routine commodity or asocial use of *poata* they had additional attached values and meaning beyond simple exchange value as 'money' (see Thomas 2004: 227 for detailed discussion). Rings had value both in terms of size (*mbakia* 12-14 cm in diameter) but also quality of finish and colour. As noted above the fossil shell had associations with the ancestral spirits, as food shells of the *tamasa* (gods). Shell rings were also used in divination rituals suggesting they had the ability to facilitate connections with ancestral spirits and the *mana* they could provide (Hocart 1925), while Simbo tales suggest shell rings were considered to have spirits like humans and go to the land of the dead when broken (Hocart 1922: 80-81, 95). Mounted *mbakiha rapoto* had associations with heads, with the circular shell given 'ears' of beadwork. Along with the standardised value associated with correct exchanges in social settings, such as exchanges around death and marriage, *mbakiha* were ritually associated with authority. The ceremony (Hocart, MSSa) which recognized a young child as a chief (*vambangaria*) involved ritual breakage, using a *mbakiha,* of an arm ring sitting on top of a *mbareke*. And upon the death of a chief his skull must be placed upon a *mbakiha* in the ancestral skull shrine in order to keep the soul with the skull. Such shrines contain many rings and as such must have formed the ultimate sink or removal of rings from the

system. The breakage of rings also seems to have been a ritually significant act. Deposits of large numbers of broken rings are found in Roviana (Walter and Sheppard 2001: Figure 9) and may have been associated with rituals around rights to land (*reqe*), where rings are hung on the roots of upturned tree stumps in garden shrines (Hocart, MSSd). Finally rings could acquire histories and be known as rings given to create alliances or peace and kept at specific locations (Aswani and Sheppard 2003).

The exchange media of Roviana, and the Western Solomons more generally, were entangled with most aspects of culture and although we can view them through an economic, social or spiritual lens they embody all these aspects of value at once to create a media which is much more than 'money' or tokens of convertible exchange value. Something of this difference is conveyed in Hocart's (Hocart 1935: 109; 1925: 251) descriptions of the purchase of magic spells whereby it is the act of giving a shell ring and establishing a relationship which makes the magic work, not simply the payment.

The intersection of these multiple aspects of shell 'money' is no more clearly expressed than in its relationship to its roles in underwriting chiefly authority through headhunting and ancestor worship. This, I would argue, is like one of those types of 'socio-religious activities' which Specht (1974: 235) suggests underlies the preservation of complex trading systems on Buka. In the Western Solomons the rise and spread of this head-hunting complex is entwined with the development and spread of the historic exchange media.

Chiefly power, headhunting, shrines and exchange media

Many Roviana chiefs claimed descent from ancestral figures who became upon death on Nusa Roviana, supernatural beings known as *mateana* (Aswani and Sheppard 2003). They thus had some claim to authority or special status through descent. However as with most chiefs they also needed to demonstrate through their actions the support of the ancestors and the *mana* or efficacy (Keesing 1984) which they could bestow. In the Western Solomons chiefs demonstrated their *mana* through success in head-hunting and the display of skulls taken in the rafters of their canoe houses. In the 19th century head-hunting was widely practised throughout the New Georgia Group, with regular raids late in the century across to Choiseul and Santa Isabel with reports of large convoys of canoes leaving from Roviana. In 1893, Ingava was reported to have led a raid on Santa Isabel which included 20 war canoes and 500 men (Somerville 1897: 399). The costs of a headhunt could be very large. We can estimate the cost of construction of a war canoe as 17 *poata,* based on the number of ribs in a *tomoko,* however that was a very small part of the total cost of the expedition, as it was surrounded by ritual involving many payments of rings and the supply of feasts associated with different stages of the activity. Hocart (1931) describes in some detail the sequence of events which could be associated with a headhunt. His account lists four feasts, often for 50-60 people, although one requiring 1000 taro puddings is described, and seven separate transactions involving numerous rings including payments to all of the canoe warriors. The shell valuable economy was the means of funding the feasts and payments, but more fundamentally it provided a material mechanism replicating cultural structure and meanings central to the societies of the Western Solomons.

Headhunts were considered successful because the leader had been given the necessary *mana* by the ancestors. Seeking *mana* from the ancestors required showing them proper respect through ritual activity at ancestral skull shrines (Sheppard *et al.* 2000). These were maintained by chiefs, who employed priests (*hiama*) to carry out the offerings of food cooked on shrine ovens and to annually renew shrines. These shrines contained, along with the ancestral skulls, shell valuables of many forms, including the *mbakiha* and other rings which the skulls would have been bound with when deposited. The remains of these shrines are found today throughout the Western Solomons, and

it is through their history that we can propose a history of the development of the shell valuable economy and potentially the associated head-hunting complex in the region.

The Development of Shell Exchange Media in the Western Solomons

Skull shrines such as those known historically appear in Roviana *circa* 1500-1600 AD (Sheppard *et al.* 2000). Earlier earthen platforms, faced with basalt, are found within the interior of New Georgia and on the barrier islands of Roviana lagoon. The oldest of these in the interior dates *circa* 1200 AD, and is found in the area described by oral tradition as the origin place of Roviana. These appear to be shrines as they are isolated platforms with no evidence of house construction. They do have associated, large table like, stone slabs set up on cobbles and small excavated pits or cists at one end of the platform. They have no associated ovens, skulls, shell valuables or the faunal remains common on historic shrines. Excavation within and around these platforms shows them to be extremely clean unlike the carpet of human remains, artefacts, shell and pig bone around the historic shrines. The only exception to this was the appearance of a few *mbareke,* traditionally the oldest form of shell rings, on two of these early sites.

Oral tradition relates that the Roviana people came down to the lagoon and the island of Nusa Roviana at the time of the chief Ididubangara, 11 generations before 1900 AD (Nagaoka 1999: Figure 1.3), and defeated the earlier inhabitants. It is at this time that radiocarbon dating (Sheppard *et al.* 2000) indicates the construction of the very large walled hillfort which dominates the island of Nusa Roviana and served as the traditional base of the Roviana people. It is also at this time that we see the appearance of the historic shrine forms and the associated shell rings. The association of the defensive location and the skull shrines suggests the rise, at that time, of the modern Roviana society and the chiefly headhunting complex.

Dating the spread of this complex is difficult, although we can assume that once the headhunting complex appeared, it spread rapidly and was adopted by neighbouring groups who were otherwise just victims. By the 19th century it is found through the New Georgia Group. Our study of the archaeology of Vella Lavella 70 km to the north of Roviana shows the presence of skull shrines and shell valuables, like those of Roviana, appearing in the hills back of the coastal flat some one or two hundred years after their appearance within Roviana (Sheppard and Walter 2014; McKenzie 2007). A very similar chronology for shrine development is reported by Thomas on Rendova and Tetepare (Thomas 2009). Local, and probably earlier, exchange media systems existed in Vella Lavella and it is possible that fossil shell was used to make body ornaments and rings more widely in the Western Solomons. In 1568 AD the Spanish expedition of Mendaňa reported seeing men on Santa Isabel wearing polished rings and plaques of white bone-like material which looked like ‘alabaster’ (Amherst and Thomson 1901: 112, 125, 268-269) and may have been fossil shell.

Conclusion

In his review of exchange in Western Melanesia Kirch (1991: 160) concluded:

> The examples cited above make it clear that models for the origins and development of Melanesian exchange systems must go beyond simple functionalist or adaptationist accounts. They must be based not upon populations who passively adapted to sets of ecological or economic constraints but upon groups of social actors who actively created and seized opportunities for trade and exchange (whether these were material, social, or political). Exchange networks do many things, and our models must be mindful of the multiple economic, social, political, and ideological possibilities.

He then goes on to argue that patterns of areal integration and interaction over the longue durée ‘must be investigated and constructed through the application of uniquely archaeological methods

and concepts, rather than through seeking in prehistory the same kinds of social interactions recorded by the ethnographers'. His final sentence however calls for 'coupling the ethnographic insights with the long run of prehistory' if we are to understand the origins and development of these systems (Kirch 1991: 161). It is this coupling which is difficult. Most archaeological discussion of 'trade and exchange' still falls, as it did in 1991, within a form of adaptationist or simple evolutionary argument. We look for intensification and control of commodity production and specialisation of production and distribution within an overall neo-evolutionary theory of increasing inequality of access to resources and developing political control ending with the state. In the Solomon Islands we have many systems of areal integration (Figure 1) marked by movements of exchange media, some of which (e.g Temotu Red Feather, Western Solomons) are parts of very elaborate exchange systems; however most are rather simple exchange systems marked by regular social interaction based on shared cultural traditions of many kinds (e.g. religious, artistic, social organisation etc.). These are the sort of socio-religious activities, with shared histories, discussed by Specht (1974: 235) for Buka. There is very little evidence of intensification and control over commodity production in the Solomon Islands. Irrigated production is generally considered a form of intensification, yet although there is evidence of small scale irrigated taro in Western Guadalcanal (Roe 1993) and a few localities in the New Georgia Group (Tedder and Barrus 1976; Bayliss-Smith *et al.* 2003) there is, despite widespread knowledge of the practice, no evidence for such intensification given opportunity in the Solomons (Yen, 1976). In the Western Solomons, and presumably elsewhere, we instead see the development of networked economies (Sheppard and Walter 2013) whereby systems of commodity exchange, facilitated by shared exchange media, allow movement of commodities to alleviate shortages or disparities in resource distribution. In the Western Solomons it can be argued that intensification/competition occurred within the headhunting system which underwrote the *mana* and status of chiefs. As with the Kula, cultural strategies for competing for status or renown in the Solomon Islands, either individual or community based (Davenport 1986), were based not on the differential economic control and distribution of commodity production underlying much evolutionary thinking, but on the potentially complex histories of local development of other systems of regional social/cultural interaction, possibly competition, such as the headhunting complex of the Western Solomon Islands.

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How to explain Polynesian Outliers' heterogeneity?

Wanda Zinger[1], Frédérique Valentin[2], James Flexner[3], Stuart Bedford[4], Florent Détroit[1], Dominique Grimaud-Hervé[1]

[1] UMR 7194 (HNHP), MNHN/CNRS/UPVD, Sorbonne Université, Musée de l'Homme, Paris, France
[2] UMR 7041-ArScAn-Ethnologie préhistorique, MSH Mondes, Nanterre, France
[3] School of Philosophical and Historical Inquiry, University of Sydney, Sydney, Australia
[4] School of Culture, History & Language, College of Asia and the Pacific, Australian National University, Canberra, Australia, and Max Planck Institute for the Science of Human History, Jena, Germany

Abstract

Eighteen islands or localities, distributed across Micronesia and Melanesia, are identified as Polynesian Outliers. Their current populations display Polynesian linguistic and cultural features. Linguistics, ethnography and archaeology have questioned the modalities of their formation. Rather than focusing on long-distance voyaging and migrations of Polynesian people into the Micronesian and Melanesian regions, we synthesised archaeological and biological data, the latter frequently omitted from this type of analysis, from the regions in question. While cultural remains show sporadic evidence of external contacts, biological data display a North-South cline emphasising a decrease of Polynesian affinities from Micronesia to South-Melanesia. We propose several hypotheses of patterns of interaction at different scales, considering various dynamics of encounters between the arriving and pre-existing populations, likely influenced by the size of the groups in contact.

Keywords: Polynesian human migrations, Interaction networks, Settlement history, Pacific Islands, Polynesian Outliers

Résumé

Dix-huit îles ou localités, situées en Micronésie et Mélanésie, sont identifiées comme étant des Enclaves Polynésiennes. Aujourd'hui, leurs populations présentent des traits linguistiques et culturels polynésiens. Les disciplines de la linguistique, de l'ethnologie et de l'archéologie ont interrogé les modalités de leurs formations. Plutôt que de s'intéresser aux sens des migrations effectuées par des groupes Polynésiens dans les régions de Mélanésie et de Micronésie, nous proposons ici plusieurs modèles d'interactions à différentes échelles spatiales à partir de synthèses de données archéologiques et de données biologiques qui sont fréquemment omises. Alors que les assemblages archéologiques des Outliers indiquent des contacts extérieurs sporadiques, les données biologiques humaines révèlent un gradient Nord-Sud selon lequel les affinités biologiques polynésiennes décroissent de la Micronésie à la Mélanésie du Sud. Ces modèles prennent en compte la diversité des dynamiques de rencontres entre une population migrante et une population déjà installée, probablement influencées par la taille des groupes.

Mots-Clés : Migrations humaines polynésiennes, Réseaux d'interactions, Histoire de peuplement, Iles du Pacifique, Enclaves polynésiennes

Introduction

Buck (1938) was probably the first to list the 18 Polynesian Outliers which are the ones most commonly recognised currently. 'Polynesian Outliers' is a general term used to designate islands

or localities on the windward sides of islands in Micronesia and Melanesia where human societies speak a Polynesian language, have a Polynesian kinship system and a wide range of Oceanian biological characteristics (Feinberg and Scaglion 2012). Since the 19th century, the question of the mechanisms of formation of these Polynesian entities has been a matter of debate. Were they 'relics' of a Polynesian settlement, as postulated by Churchill (1911) and Capell (1958), and restated more recently by Wilson (2012, 2018) and Hudjashov *et al.* (2018)? Or were they the products of 'backward' migration(s) originating from Polynesia into Melanesia and Micronesia, as claimed by Thilenius (1902) and Buck (1938), and a number of authors today (e.g. Kirch 1984; Carson 2012)?

Adopting the view that Polynesian Outliers result from East to West migration(s) and installations of newcomers in regions already occupied by pre-existing groups, we discuss the role of interactions with neighbouring Melanesian and/or Micronesian human populations in the Outliers formation. We emphasise the significance of a model including multiple Polynesian arrivals over the scenario of a single arrival evolving locally, based on archaeological and biological data (skeletal, genetic, genomic), and hypotheses of patterns of settlement at different scales which illustrate various situations of interaction and exchange. While cultural remains do not appear to co-vary and highlight unclear and sporadic evidence of external contacts, biological data, recorded on ancient and living populations, emphasises a North-South cline in which Polynesian affinities decrease from Micronesia to South-Melanesia.

On the heterogeneity of archaeological records

Figure 1 presents the geographical location of the 18 better documented Polynesian Outliers. Table 1 provides a summary of their geomorphology, chronology of occupation and an estimation of the time of arrival of Polynesian populations. Polynesian Outliers are generally divided into two linguistic subgroups: a Northern Polynesian Outliers group (with populations speaking Ellicean languages similar to those from Tuvalu and Tokelau) and a Southern Polynesian Outliers group (using Futunic languages analogous to those of East Uvea and East Futuna) (Wilson 1985; Marck 1999). In this paper, we decided to group the Polynesian Outlier islands into four groups according to their geographical location and their relative proximity to one another, in an attempt to better characterise the nature of their differences. Our four groups are the following: the Micronesian group comprising Kapingamarangi and Nukuoro; the Northern Solomon group with Takuu, Ontong Java, Nukumanu, Nukuria and Sikaiana; the Southern Solomon group with Pileni, Anuta, Taumako, Rennell, Bellona, Tikopia and the Southern group with Emae, Mele-Ifira, Aniwa, West-Futuna, and West-Uvea.

Archaeological endeavours have been undertaken on some Polynesian Outliers, while others such as the Northern Solomon Outliers remain under-researched (Table 1). Kirch (1984) and Carson (2012) propose syntheses, showing no clear correspondence between the archaeological sequences of each group of Outliers, and suggesting different histories of human migrations and settlements. However, a number of dates still need to be revised and more archaeological excavations must be undertaken in order to better define the timing and nature of occupation of several islands and localities.

Considering the possibility that the Micronesian atolls were not shaped before 2000 BP (Dickinson 2001, 2003), Micronesian Outliers appear to have been first occupied temporarily around 1000 BP or before. Kapingamarangi was intensively settled between 300 and 100 BP (Leach and Ward 1981) following a transient occupation period between 1000 and 700 BP. The site of Nu-6 on Nukuoro provided similar dates with a continuous occupation from around 1200-1100 BP to the present (Davidson 1992). However, because of her observation of similarities between Nukuoro and surrounding Micronesian island cultural assemblages, Davidson maintains that the Polynesians were not the first colonists but remains uncertain as to when Nukuoro became 'Polynesian'.

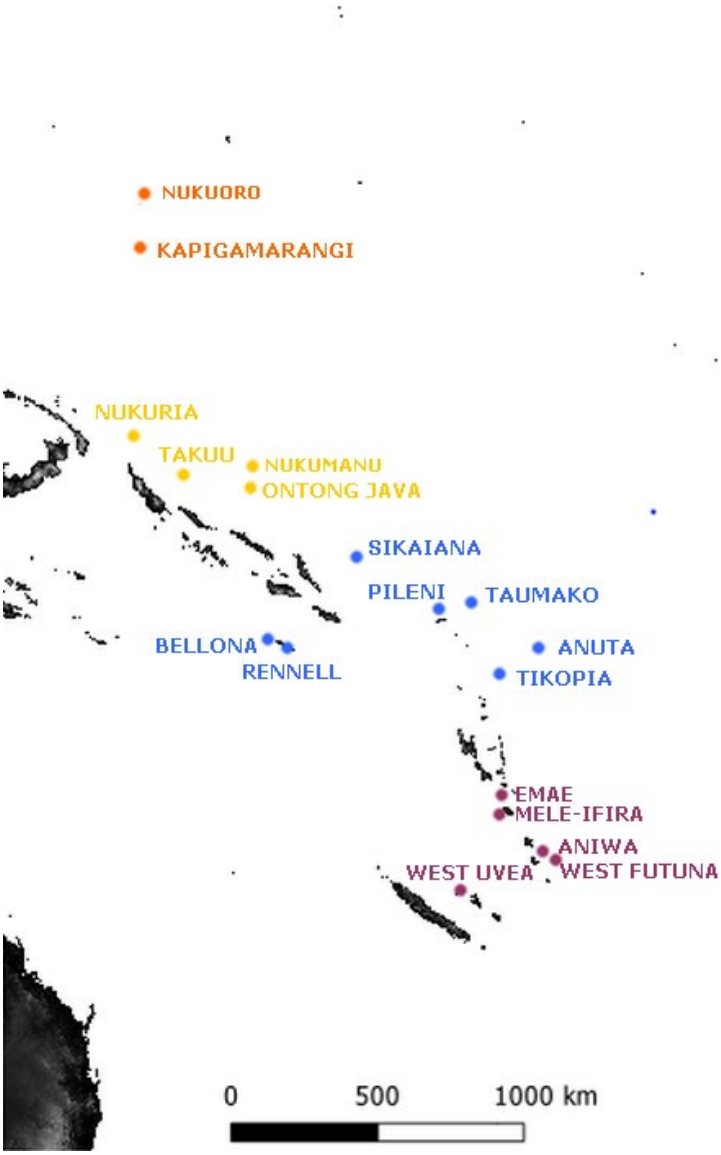

Figure 1. Geographical distribution of 18 Polynesian Outliers.

The Southern Solomon Outliers like Tikopia were first occupied at 2996-2719 BP by people making the calcareous tempered ceramics of the Kiki phase (which includes dentate-stamped Lapita) found at the TK-4 site (Kirch and Swift 2017: 326). Taumako was settled at the early date of 2602 BP with the site of Ana Tavatava. Dentate-stamped Lapita sherds were found in association with this site (Leach and Davidson 2008). The first occupation of Anuta occurred around 2793-2356 BP at the AN-6 site and the ceramic style is similar to that of the Kiki phase of Tikopia, although without evidence of dentate stamping (Kirch and Rosendhal 1973). These settlements correspond to early arrivals of human groups carrying a specific material culture associated with the Lapita Cultural Complex (Kirch 2017: 143; see also Sheppard 2011). Rennell and Bellona provide somewhat later dates with an initial occupation reported around 2000 BP (Chikamori and Takasugi 1985; Poulsen 1972). The Polynesian occupation of Tikopia is dated to 830-738 BP (Kirch and Swift 2017). Associated with the Tuakamali phase, it is characterised by the presence of trolling lures and basalt adzes of distinctively Western Polynesian form. On Taumako, possible Polynesian intrusions are associated with the Namu period dated to 950-150 BP (Leach and Davidson 2008). The Polynesian arrival on Anuta is indicated as dating to around 400 BP (Kirch 1982). The Polynesian occupation would postdate 950 BP on Rennell (Chikamori and Takasugi 1985), which is consistent with dates provided by the oral tradition encompassing 700-500 BP (Roberts 1958).

Island Groups	Polynesian Outliers	Island Type	Language Subgroup	Oldest occupation currently known	Polynesian arrival (estimated)	Cultural Sequence	References
Micronesian	Nukuoro	Atoll	Ellicean	1200 BP	1000 BP?	Undetermined	Davidson 1992; Carroll 1965; Lieber and Dikepa 1974
	Kapingamarangi	Atoll	Ellicean	1000 BP	300-100 BP?	Sporadic and continuous from 300 BP	Leach and Ward 1981; Elbert 1949; Emory 1965; Marck 1997; Wilson 1985
Northern Solomon	Nukuria	Atoll	Ellicean or (NO-EPN)	NO DATA	NO DATA	NO DATA	Pawley 1967; Wilson 2012, 2018
	Takuu	Atoll	Ellicean or (NO-EPN)	NO DATA	NO DATA	NO DATA	Pawley 1967; Wilson 2012, 2018
	Nukumanu	Atoll	Ellicean or (NO-EPN)	NO DATA	NO DATA	NO DATA	Pawley 1967; Wilson 2012, 2018
	Ontong Java	Atoll	Ellicean or (NO-EPN)	NO DATA	NO DATA	NO DATA	Pawley 1967; Wilson 2012, 2018
Southern Solomon	Sikaiana	Atoll	Ellicean or (NO-EPN)	NO DATA	NO DATA	NO DATA	Pawley 1967; Wilson 2012, 2018
	Pileni	Fragment of raised atoll	Ellicean	NO DATA	NO DATA	NO DATA	Pawley 1967; Bayard 1966
	Taumako	Volcanic Island	Ellicean	2602 BP	post 950 BP	Continuous	Pawley 1967; Leach and Davidson 2008
	Anuta	Volcanic Island	Ellicean	2793-2356 BP	Around 400 BP	Hiatus (1450-1370BP) Continuous from 450 BP	Pawley 1967; Kirch 1982; Feinberg 1989
	Tikopia	Volcanic Island	Ellicean	2996-2719 BP	830-738 BP	Continuous	Kirch and Yen 1982; Kirch and Swift 2017; Pawley 1967
	Rennell	Raised Coral Island	Ellicean	2000 BP?	Post 950 BP?	Continuous	Chikamori and Takasugi 1985; Elbert 1967; Roberts 1958
	Bellona	Raised Coral Island	Ellicean	2000 BP?	Post 950 BP?	Continuous	Poulsen 1972; Roberts 1958
Southern Outliers	Emae	Volcanic Island	Futunic	NO DATA	NO DATA	Undetermined	Garanger 1972
	Ifira	Islet and adjacent costal area of Efate	Futunic	1090 BP?	450-250 BP?	Undetermined	Shutler 1968; Garanger 1972
	Mele	Islet and adjacent costal area of Efate	Futunic	325 BP?	325 BP?	Undetermined	Shutler 1968; Garanger 1972
	West Futuna	Raised coral Island	Futunic	1180-1060 BP?	In-building data	Undetermined	Shutler 2002; Flexner *et al.* 2018
	Aniwa	Raised coral Island	Futunic	630-490 BP?	In Building data	Undetermined	Shutler 2002; Flexner *et al.* 2018
	West Uvea	Atoll	Futunic	ca 1780 BP	950-850 BP	Continuous	Carson 2002

Table 1. Summary of archaeological data for 18 Polynesian Outliers.

The Southern Outliers seem to have been settled after the Southern Solomon Outliers. Currently, the first known occupation of West Uvea is indicated by a temporary camp on Muli Islet (West Uvea), at the LUV030 site where a combustion feature is dated to 1780 BP and permanent human occupation (with finds including pottery, flaked lithic material, one shell armband, one fishhook), is interpreted as being associated to the Polynesian arrival, and dated to 1260 BP (Carson 2002). West Futuna provides evidence of human activities at 1080-1060 BP in the coastal area of Sinou (Flexner *et al.* 2018) and a burial, uncovered in the filling of a funerary rock-shelter (FURS 12), has provided a date of 1640 BP (date on human bone, Shutler *et al.* 2002), recently re-dated to c. 1100 BP (Posth *et al.* 2018). Recent excavations on Aniwa, at the coastal site of Iatoto, provided evidence of temporary occupations around 630-490 BP (Flexner *et al.* 2018). However, we expect that further investigations will confirm first settlement on Futuna and Aniwa sometime during the third millennium BP as has been demonstrated on the nearby and intervisible islands of Aneityum and Erromango (Bedford 2006; Bedford *et al.* 2016).

On-going research issues associated with the Outliers'

Polynesian Outliers are generally poor in material culture and are exposed to specific environmental conditions. This situation explains the difficulty, mentioned by several authors (e.g. Davidson 1992; Bayliss-Smith 1974), in identifying a Polynesian occupation and detecting evidence of human intrusions on uninhabited or previously occupied environments. Three classes of archaeological data are indicative of external contacts: exotic materials; artefacts showing exotic stylistic features; non-local animal and vegetal remains (Kirch 1986: 37). However, Polynesian Outlier assemblages generally provide unclear evidence of foreign influences.

Firstly, the definition of the Polynesian culture is unclear for its formative period. Polynesian culture is better characterised for the period starting after 1000 BP, including stonework and monumental architecture associated with political or religious ideologies, the use of basaltic stone tools and polished shell pendants, as well as the absence of pottery production (Kirch and Green 2001; Burley and Clark 2003). However, differences exist in artefact forms between Western and Eastern Polynesian assemblages (Smith 2002; Walter 1996; Davidson 1977). Aceramic occupations could be seen as an indication of the Polynesian occupation of the Polynesian Outliers. However, a decrease in pottery use is not necessarily related to Polynesian arrivals as it seems to occur at different periods across the southwest Pacific. The loss of pottery seems to occur prior to the Polynesian arrivals on Anuta, where occupation layers dated to 350 BP do not contain potsherds (Kirch 1982). On Tikopia, the absence of local pottery manufacture characterizes the Sinapupu phase dated to 1050-750 BP (Kirch and Yen 1982). Similarly, the Loyalty Islands show a loss in pottery production by 2000 BP (Sand *et al.* 2011). Pottery-making ceased by 2000 BP in South Vanuatu and by 1200 BP in Central Vanuatu (Bedford and Spriggs 2018).

Two cultural elements appear nevertheless to be clearly related to Polynesian arrivals in Melanesia and Micronesia: basaltic stone adzes were found on Tikopia, Anuta, Taumako and two-piece trolling lures were found on Tikopia and West Uvea (Leach and Davidson 2008; Kirch and Rosendahl 1973; Kirch and Yen 1982; Carson 2002). Some basaltic stone adzes or flakes from Taumako were attributed to Samoan sources like the Tataga Matau quarries on Tutuila (American Samoa) by a petrographic analysis (Best *et al.* 1992). Anuta (Zone A) and Nukuoro excavations have provided artefacts including a fishhook, a bone lure point and bone beads which can be related to a specific Polynesian typology (Kirch 1982; Davidson 1992). Distinctive shell ornaments from Mele, Ifira, and West Futuna in the Southern Outlier group, as well as at the Roy Mata burial site on Retoka island (Efate, Vanuatu), might represent a local expression of Polynesian identity (Carson 2012: 35, 39-40; Garanger 1972; see also Shutler and Shutler 1968). Ivory reels, which have been ethnographically documented in Polynesian Islands including the Marquesas, Cook Islands, and Tonga, are another example of such objects found in the Namu burials, Taumako (Leach and Davidson 2008: 209).

However, the typologies of Polynesian artefacts require refinement, particularly for shell artefacts which are abundant in the Southern Solomon Outliers and in the Southern group. Changes in dietary practices, such as the consumption of shark and turtles in Tikopia during the Tuakamali Phase, could also be indicative of a Polynesian intrusion (Kirch and Yen 1982). Nevertheless, it remains difficult to determine to what degree one may replicate one's own culture following a long journey and with the discovery of a new environment, new resources, as well as unknown people and customs. Many practices are Pacific wide and not particularly distinctive to any cultural group (Flexner *et al.* 2018). Perhaps, our focus has for too long been on finding 'true' Polynesian archaeological features and we have underestimated the importance of lost traditions and of the advent of innovations as visible in linguistic studies (Bayard 1966; Pawley 1967; Wilson 2012). Some Outliers might exhibit in their more recent archaeological levels new and composite cultural features, which do not correspond to what is already known in Oceania (*cf.* Carson 2012; Flexner *et al.* 2019).

Secondly, the impact of ecological factors and of the climate; together with small island area may have influenced the way groups occupy the islands. For example, climatic events like cyclones may have caused the abandonment of the island and consequently a hiatus in the stratigraphic sequence as observed for Anuta (Kirch 1982). However, multiple responses to ecological and climatic constraints could be at play simultaneously. As demonstrated by Rasmussen *et al.* (2009), people living today on Ontong Java, Bellona and Tikopia are equipped to resist climatic crises (cyclones, droughts and erosion), by relying on a partial abandonment of the island. On Tikopia, pig husbandry was abandoned ca. 350 BP as means of reducing competition for resources (Kirch 1997: 37). Abortion practices have been used to regulate demography, as observed in Ontong Java (Hogbin 1931). Resource production and land use can be controlled (via technological innovations) to increase productivity, allowing for a larger population to be sustained (Bayliss-Smith 1974). Cannibalism has been used to endure periodic episodes of starvation as reported for East Futuna (Burrows 1937). Survival behaviours and adaptations to marginal environments were perhaps an integral component of the Polynesian baggage that the migrants brought to the Outliers along with an adapted socio-political system.

Biological anthropology data

Biological anthropology indicates differences between Outliers populations and those of the surrounding islands populations. Early works on living populations demonstrate the biological uniqueness and the specific biological history of the Outlier populations. The Kapingamarangi population was shown to be highly differentiated from Micronesian populations, based on anthropometrical data and genetic markers (Morton and Lalouel 1973). Outlier populations of Kapingamarangi, Rennell and Bellona were shown to display a high frequency (of 70%) of the L*M gene compared to the Melanesian populations of Bougainville, Vanuatu and New-Caledonia regions (30%) (Kirk 1989). Odontometric analysis of human groups from Bougainville, Malaita Islands, Ontong Java and Ulawa show that the dimensions of teeth from Ontong Java are aligned with the Austronesian-speaking samples of Malaita prompting the idea '*that language and, thus, historical affinity outweigh the influence of geography as the prime determinant of phenetic similarity*' (Harris and Bailit 1988: 258).

Patterns of variation among Outliers populations have also been observed, suggesting several biological trajectories. Analysing 11 polymorphic loci in individuals from Santa Cruz, Banks and Torres Island, Blake *et al.* (1983) noted that individuals from Tikopia are genetically closer to populations of the Southern Solomon's groups than individuals from Rennell and Bellona, and that individuals from Anuta exhibit an unexplained isolated position. Polynesian and Melanesian speakers of West Uvea have the same low HLA-A2 gene frequency (4-8%) as other Melanesian islands populations while Polynesian populations exhibit a higher average (18-30%) (Serjeantson 1984).

More recent genome-wide works have refined these analysis and interpretations. They demonstrate that western and eastern Solomon Islands populations have followed different historical trajectories, with the Polynesian Outlier populations displaying stronger similarities with Tongan populations, pointing to their common origin (Pugach *et al.* 2018). These Polynesian biological influences appear to not be restricted to Polynesian Outliers islands but encompass a larger area including North-Melanesia. However, it is still unclear whether this admixture signal reflects the initial Austronesian (Lapita) signal or relates to additional gene flow initiated by/with Polynesian migrations (Pugach *et al.* 2018: 875). Genome wide data assembled and analysed by Hudjashov *et al.* (2018) is interpreted as supporting a model of interconnectivity within the Pacific and the formation of the Polynesian genome around 1700-1200 BP. The authors consider that this has occurred within the Polynesian Outlier populations of the Solomon Islands from which Eastern Polynesian islands were settled, reinvigorating the old theory of 'Polynesian relics' within Melanesia. However, assessing to what degree current populations reflect the biological composition of past populations is a matter of ongoing discussion. In fact, the only way to reconstruct the composition and origins of past populations is through analyses of ancient human remains by combining morphological and ancient DNA data garnered from skeletons from known archaeological contexts. The homogeneity of the Polynesian make–up has long been recognised (Houghton 1996; Van Dijk 1999; Katich and Turner 1974; Pietrusewsky and Douglas 2016) as has its internal diversity (Stefan and Gill 2016, Stefan and Chapman 2003; Buck and Vidarsdottir 2012; Pietrusewsky 1969, 1996, 2005).

Skeletons from Polynesian outliers have been studied since the 20th century with a particular emphasis on the Solomon Outliers, offering a complementary picture to archaeology and ethnography. Shapiro's (1933) morphometrical study based on 13 measurements recorded on 157 modern individuals from Ontong Java demonstrates close relations with individuals from Micronesia, suggesting a shared ancestry. However, six individuals found at Kapingamarangi, at the Putau site, were identified as Polynesian, based on morphological and metric characteristics including the presence of rocker jaws and flattening of the femoral shafts (Houghton 1981, in Leach and Ward 1981). Other individuals from Nukuoro and Kapingamarangi were shown to also have affinities with Polynesian populations (Tonga, Samoa, Northern Cook Islands, Marquesas and New-Zealand) in a multivariate analysis of seven metrical characters in 151 Pacific-region population samples (Howells and Schwidetsky 1981).

Regarding the Southern Solomon group, the 226 skeletons uncovered at Namu cemetery (Taumako) and dated around 775-205 BP (Leach and Davidson 2008) were the focus of several bioarchaeological studies, resulting in contradictory conclusions (Houghton 2008; Katayama 1988; Pietrusewsky 2008). Relying on morphological analysis of the cranial, dental and infracranial elements, Houghton (2008) found that they present more Polynesian features than Melanesian features. Confirming this view, Katayama's (1988) non-metric study shows that specific anatomical variations (high frequency of the antegonial notch, supraorbital foramen, parietal notch, condylar canal patent, infraorbital suture and exsutural mastoid foramen) are shared by individuals from Namu and Mangaia (Cook Islands). Katayama's (1988) comparative metric study using the cranial index of 77 reconstructed skulls from Namu shows that their variability overlaps Easter Island variability. Interestingly, Pietrusewsky (2008) found that 12 male and 6 female crania from the same site displayed morphology close to that of prehistoric and modern Melanesian groups. A more recent study of these individuals reiterates this conclusion, underscoring affinities between Namu and modern individuals from Fiji, the Loyalty Islands and Santa-Cruz (Pietrusewsky *et al.* 2014). Analysis of the distribution of infectious diseases, such as yaws, is another way to gain information pertaining to populations movements. Interestingly, there are high incidence of infection in both the Namu population (57.7%) (n=41/70) (Buckley and Tayles 2003) and the Ha'ateiho population (TO-AT 36, Tongatapu, Tonga) (19.7%) (n=13/66) dated to precontact period (750-150 BP) (Pietrusewsky *et al.* 2019) while yaws is unreported in the region for earlier periods.

Polynesian influences have also been detected in the South Melanesia group. Weet's (1996) metrical and non-metrical dental analysis, conducted on 408 permanent and deciduous teeth from Melanesian and Polynesian regions including 58 individuals from West-Futuna (Vanuatu) dating to an undetermined time period, demonstrates similarities between individuals of West-Futuna and Hawaii. Polynesian influences were also detected through paleogenomic studies performed on other individuals from Vanuatu. Individuals of Ifira and Pango from the South-East coast of Efate, dating to ca. 150 BP, show significant allele sharing with a Tongan population (Lipson *et al.* 2018). Some living populations from Vanuatu, including Efate, Makura and the Polynesian Outlier of West-Futuna show a similar pattern (Lipson *et al.* 2018). However, four prehistoric individuals from West-Futuna, dated between 1270 and 970 BP, display a small proportion of initial Austronesian/Asian (FRO) ancestry (11 to 17%) like other present-day populations of Vanuatu (Posth *et al.* 2018), suggesting that any biological exchanges which might have taken place would have happened later in the last millennium.

To summarize, biological data tend to suggest a North-South cline, with a decreasing degree of 'Polynesianness' from North to South: very Polynesian-like in the North, contradicting data in the Southern Solomon group that show biological affinities interpreted as Polynesian or as Melanesian, and very Melanesian like in the South. This pattern suggests different biological trajectories in the north and in the south, with less Polynesian admixtures in the South than in the North. Polynesian influences, currently observable in the Polynesian Outliers, appear to have been mainly shaped by interactions between new-comers and settlers.

Hypothesis of multi-level interaction networks

The pattern of variations provided by biological and archaeological evidence needs to be investigated and contextualised considering the diversity of network dynamics operating in the Western Pacific during the last millennium. We propose three hypothetical models for settlement of the Polynesian Outliers. Our description relies on three levels of interaction, from the micro-regional to the inter-regional levels, depicting various situations of sharing and exchange, all plausible in the case of the Polynesian Outliers. Indeed, rather than seeing these as mutually exclusive, we would consider any of these models to apply to different islands at different times, depending on the archaeological, biological, and linguistic evidence. Figure 2 presents a schematic representation of our interpretation of these levels of interactions.

Local level hypothesis

Given the geographical situation of most of the Outliers on small islands located to the windward side of the larger islands in Micronesia and Melanesia, we, as others (e.g. Carson 2012), first hypothesise that Polynesians decided to approach an uninhabited, or sparsely inhabited island, as an easier area to settle. The Polynesian group would have had the possibility to invest in the whole island and develop a society preserving Polynesian features. While most of the Polynesian Outliers' chronological sequences indicate that the islands were already occupied prior to the probable Polynesian arrival, Polynesian groups did not necessarily meet pre-existing people. The Anuta sequence, for example, supports the idea that an island can be abandoned for a few centuries because of an unsuccessful habitation or due to an ecological and climatic crisis (Kirch 1982).

Our second case considers the Polynesian occupation of a previously occupied island and involves a range of interactions with the local population. In this case, a variety of possibilities emerge, from marriage between the Polynesian and local populations, to warfare between the two groups. Traditions, especially from Rennell and Bellona, Tikopia, West Uvea and West Futuna, feature various scenarios of sharing land and women and non-sharing: wars or competition. A mythical history of Rennell, recorded by Roberts (1958), mentions the presence of small people named

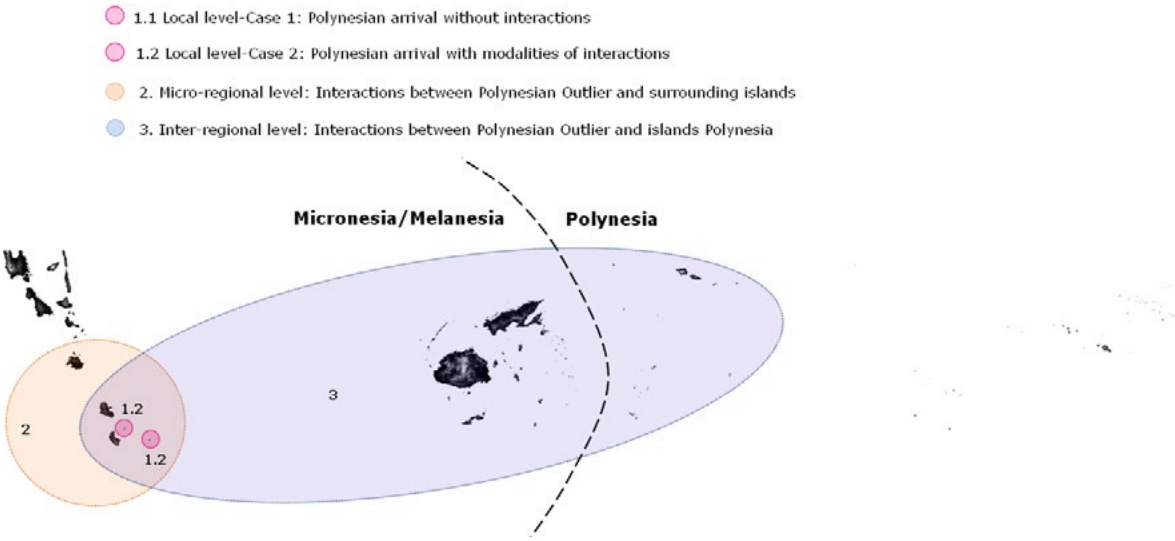

Figure 2. Schematisation of the three hypothesised levels of interactions.

Hitihiti on Bellona at the time of the arrival of Kaitu, one man from Ubea (Uvea, Wallis Island?) that passed through Hutuna (East or West Futuna?) during their journey. The myth details interactions between the local groups and the newcomers and indicates that a land was given to the Polynesian group with the authorization to cultivate it: '*One of the members of Kaitu's crew, Temoa, managed to capture one of the Hitihiti and to converse with it, and this Hitihiti led Temoa to water holes and to gardens of taro from which Kaitu and his followers were able to obtain food*' (Roberts 1958: 4). A mythical history of West Futuna mentions that 'toga' (meaning foreigners or Tonga) women often flew to Sinou on the Northern coast of the island, that one of them stayed with Mahjijiki, a mythical figure from the island, who hid her wings to prevent her from flying back to her homeland (Keller and Kuautonga 2007: 146-165). According to Guiart (1953a) single Polynesian men, who arrived from Wallis in the early 20th century, married local West Uvea women shortly after their arrival on the island. Marriage is a complex institution, resulting sometimes in particular situations. For example, in We-hali Austronesian villages (Timor Leste), women can marry Papuan men but their progeny adopts the maternal cultural system and ignore the language and customs of the paternal lineage (Lansing *et al.* 2011). Wars and competition between arriving and local groups are also reported in several ethnographies of Solomon and South Melanesia Outliers. One example is that of Bellona for which Robert (1958: 4) mentions: '*These Hitihiti had no knowledge of fighting, and in time Kaitu killed and ate them*'.

Micro-regional level hypothesis

The two local-level situations upon arrival can equally engage with multiple forms of interactions with surrounding islands of the Melanesian and Micronesian area including other Outliers islands. These range from an absence of interaction to a high level of interaction. Imported volcanic glass sourced from the Banks Islands (Vanuatu) in layers of the Tuakamali phase, associated with the Polynesian arrival in the Tikopia stratigrapy, illustrates continued interactions within the region after the Polynesian arrival on the island (Kirch and Yen 1982). Cases like Nukuoro (Micronesia) and West Futuna (Vanuatu) are more difficult to interpret in this respect. Davidson (1992: 296) claims (contra Kirch 1984) that for Nukuoro: '*There is no clear evidence of cultural replacement and nothing unambiguously Polynesian rather than Micronesian in the assemblage from the excavations*'. Shutler and Shutler (1967: 98) reached a similar conclusion for West Futuna: '*The artifacts which come from areas in which Melanesian languages are spoken today are indistinguishable from those found on Polynesian outliers'.* What are the mechanisms behind this absence of distinction: an absence of introduction of Polynesian material culture, as might have happened in cases of involuntary voyages (Kirch 2000: 130-134), or a total fusion between local

and outsider cultures resulting from an acculturation process involving the loss of typically Polynesian items?

Other Outliers' archaeological sequences witness other forms of interactions while biological data point to various forms of admixture, from a near absence, as in the case of West Uvea (Loyalty Islands) where populations speaking a Polynesian language display local genetic features (Serjeantson 1984), to a clear presence as in the case of Kapingamaringi where skeletons from Putau are identified as Polynesian-like (Houghton in Leach and Ward 1981). Such patterns of biological variation are likely related to the ratio between the size of migrant and local groups as well as the power of their political organization as emphasised by Spriggs (1997: 221).

Inter-regional level hypothesis

The presence of Polynesian characteristics within Melanesian and Micronesian islands might result from larger spheres of interaction. Some local populations could have adopted Polynesian features in relation with exchange networks established with variable and not mutually exclusive purposes: political alliances, social relationships, and trade (Kirch 2017: 130-134). This model requires no massive Polynesian presence or Polynesian biological incorporation within the receiving populations. It is possible that a few Polynesians might have remained on the Polynesian Outlier representing a sort of authority, regulating exchanges and power, and maintaining connections between Polynesia and other islands in a large area involving several archipelagos. As such, Polynesian Outliers, like Tikopia and Taumako, were probably involved in the large network of the Tongan State which became increasingly active after 750 BP. Geochemical studies have demonstrated long-distance and multi-directional exchanges of stone tools from Tutuila (Samoa), in which Taumako and Tikopia were included (see Clark *et al.* 2014 for a synthesis). However, the existence of connected Polynesian Outliers used as satellites of Polynesian entities or trade-posts in large exchange networks in a 'continued contact' frame requires further investigations. Such mechanisms might have facilitated indirect dispersals of Polynesian features in non-Polynesian areas and vice-versa. For example, close connections are apparent between the Polynesian Outliers of Futuna and Aniwa, and the island of Tanna in Vanuatu. A moiety social system is practiced in both Futuna and Tanna (Lynch and Fakamuria 1994; Flexner *et al.* 2018). Other Polynesian influences, including the presence of the mythical figure of Mahjijiki (or Mahjijiki in Futuna spelling) in oral traditions (Spriggs 1997) and the use of Polynesian terms, including in the ritual drinking of kava (Lynch 1996) were recorded on Tanna.

Discussion

The available archaeological and biological data points to three main issues requiring refined discussion in order to improve the understanding of the formation of Outliers within their Melanesian or Micronesian contexts. These include: the timing and the number of Polynesian arrivals in a given locality; the degree of interactions between Polynesian migrants and local communities; and the size of the groups in contact.

As emphasised by several authors, Polynesian Outliers settlement does not belong to a single common history but to several distinct histories (Kirch 1984; Carson 2012). Even a single island or locality might have hosted several groups of migrants over time. As Kirch (2017: 333) mentions about the Tuakamali phase of Tikopia, it '*represents the successive arrival of several Polynesian-speaking groups who were the direct ancestors of the various social lineages presently occupying the island*'. These contacts would have occurred during the last millennium, postdating at the earliest 950 BP in Tikopia (Kirch and Swift 2017), and the major Polynesian diaspora to Eastern Polynesia that occurred around 925-829 BP (Wilmshurst *et al.* 2011; see also Horsburgh and McCoy 2017). A number of other arrivals from different sources occurred also in several Outliers in more recent

times: for example a mythical history mentions the arrival of one canoe from Tonga and of two others from Samoa a dozen of generations ago in Sikaiana, in the Northern Solomon group (Woodford 1906 in Bayard 1966, see also Guiart 1953b). The abundance of evidence of Polynesian contacts in the Melanesian/Micronesian region, during this millennium, suggests that the Polynesian components currently observed on the Polynesian Outliers were not necessarily brought into the island by a large group of migrants but rather by successive arrivals of smaller groups, overshadowing the effects/impacts of the previous arrivals in a cumulative process of influences from potentially different sources.

The three hypothesised levels of interaction could have intervened variously and successively, over the millennium, on any given island or within any given locality. Tikopia is a concrete example of an island with a non-'*closed system*' (Kirch 1986: 33) integrated in a multi-scale and directional interaction network. Tikopia was indeed involved in two-way circulations with Anuta in one direction, and Vanikoro (Santa-Cruz) and Vanua Lava (Banks Islands) in another. While contacts with Vanua Lava and Vanikoro seem to relate to rudimentary and strictly economic exchanges, relationships between Tikopia and Anuta are turned towards matrimonial transactions and social exchanges. Interestingly, the red-feather exchange system of Santa-Cruz which involved Vanikoro did not included Tikopia, emphasising the particular social, political and economic position of this Polynesian Outlier in the regional networks. Another example of a specific trading relationship, that may apply to the case of Polynesian Outliers, is that of obsidian/nephrite exchanges between the North and South Islands of New-Zealand. In this case, Walter *et al.* (2010) recognize two successive modes of interactions: first, a 'colonizer' mode implying intense interactions between the new settlers and the pre-established population, and second, a 'trader' mode implying interactions motivated by economic or political exchanges between the communities. The first Polynesian contacts, following the 'colonizer mode', could have resulted in cultural interactions and biological admixtures between migrants and settled groups. At a further stage, admixed populations of Outliers could have interacted with other Polynesian groups practicing the 'trader' mode, when interaction networks expanded across the Western and Central Pacific.

The culture, language and biology of the Outliers do not appear to co-vary. If the linguistic data, despite borrowings, point to a language replacement, biological data suggests a more varied pattern of integration: none of the ancient or modern individuals look entirely 'Polynesian'. The case of the Polynesian speakers of West Uvea is illustrative of the phenomenon, which is particularly visible in our Southern Outliers group. They share a low HLA-A2 gene frequency with Melanesian speakers from the same island suggesting that '*the arrival of Polynesian immigrants in Ouvea had a far greater impact on language than on genetics, a situation not uncommon in Melanesia*' (Serjeantson 1984: 167). Tikopia is also indicative of this paradox. The Tikopian population shows genetic affinities with Melanesian populations of the Santa-Cruz and Banks islands although archaeological evidence indicated limited contacts between both regions (Blake *et al.* 1983; Kirch 1985). By contrast, the Anutan population displays a genetic profile that does not match the range of the Melanesian variation (Blake *et al.* 1983) despite social and economic inter-island exchanges with Tikopia (Kirch 1986). This opposition between an apparent genetic continuity and a language replacement is likely directly related to both the power and the size of the arriving group relatively to the pre-existing group. Absent or limited admixture suggests that Polynesian groups were of smaller size than the local groups while the maintenance of Polynesian language and cultural features may represent what was seen as an advantage for both the arriving and receiving groups (cf. Bayard 1966).

In the same vein, Polynesian biological influences identified on Kapingamarangi may suggest that this region was less populated and in geographical isolation than Southern Melanesia allowing for the preservation of Polynesian features, a situation possibly facilitated by close genetic and phenotypic proximity between Polynesian and Eastern-Micronesian populations (Lum and Cann

2000, Valentin *et al.* 2016). These *'genetic similarities among Micronesian and Polynesian populations result, in some cases, from a common origin and in others, from extensive gene flow'* (Lum and Cann 2000: 151). Addison and Matisoo-Smith (2010) have recently suggested that this proximity resulted from human intrusions from Micronesian population into Western Polynesia at the origin of the formation of the Ancestral Polynesian Society.

Conclusion

One of the lessons to be drawn from this review is that in the case of the Polynesian outliers, language is not necessarily related to culture nor to biology, and that assumptions about historical process of their formation based on what we observe today should be handled with care. Contextualisation of each island within its own regional environment appears to be indispensable, as existing data tend to confirm that Oceanian societies have never evolved in total isolation. It rather emphasises the fact that external exchanges, or forces, have considerably contributed to build the present-day societies. The observed patterns of variation of biological and archaeological evidence, particularly the biological distinction between the Northern and the Southern Outliers, point to several distinct histories rather one, at both regional and island scales. Our hypothesis of multi-scale interactions, involving demographic and socio-political factors, reflects the multiple possibilities of interactions at various scales across the region. Both of these factors would have considerably shaped the prevalence of Polynesian components observed today in Polynesian Outliers and in the surrounding Melanesia/Micronesia areas. Those features would be the products of accumulations of various Polynesian components introduced from different sources during successive arrivals, in combination with conservation of local characteristics.

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Receiving and integrating: the other side of insular mobilities. A comparative approach of integration ceremonies for Melanesia and Polynesia

Sophie Chave-Dartoen[1], Denis Monnerie[2]
[1] MCF-HDR, Université de Bordeaux, PASSAGES – UMR CNRS 5319
[2] PR ethnologie, DynamE CNRS/UNISTRA (UMR 7367)

Abstract

The authors of this article propose a comparative analysis of a modality of encounter, namely the reception ceremonies in Arama (Kanaky, New Caledonia) and Wallis Island (Western Polynesia). In these two socio-cosmic societies, these ceremonies present a simple form of integration with three sequences which are different from those isolated by Van Gennep for the rites de passage. This simple form is repeated, developed and complexified in the large ceremonies of which it is a building block. These ceremonial procedures reconfigure pre-existing relationships with their dyadic form in which the receiving party, of superior status, represents its ancestors and its land, facing the arriving party and thus placed under their authority. Formal circulations of persons, speeches and objects sealed by a shared meal elaborate along different intertwined modalities the relations which are at stake. This creates a new collective which will last until the arriving party leave – if they do.

Keywords: Reception ceremonies, rites of integration, encounter, comparison, Polynesia/Melanesia

Résumé

Les auteurs de cet article proposent l'analyse comparative d'une modalité de rencontre, à savoir les cérémonies d'accueil à Arama (Kanaky, Nouvelle-Calédonie) et à Wallis (Polynésie occidentale). Dans ces deux sociétés socio-cosmiques, ces cérémonies présentent une forme simple d'intégration en trois séquences différentes de celles isolées par Van Gennep pour les rites de passage. Cette forme simple se trouve aussi répétée, développée et complexifiée, dans les grandes cérémonies dont elle est un composant de base. Ces procédures cérémonielles réaménagent les agencements relationnels préexistants ou créent des relations au sein d'une dyade où les accueillants, de statut supérieur, représentent leurs ancêtres et leur terre, face aux arrivants ainsi placés sous leur autorité. Circulations formelles de personnes, de paroles, et d'objets, scellées par un repas partagé, élaborent les relations en jeu selon différentes modalités entrelacées, donnant existence à un nouveau collectif jusqu'au départ (éventuel) des arrivants.

Mots-clés : Cérémonies d'accueil, rites d'intégration, rencontre, comparaison, Polynésie/Mélanésie

Introduction

Pacific societies may seem isolated, because of our own Euro-American preconceptions about insularity and too often monadic use of the concept of 'culture'. However, specialists in anthropology, geography and archaeology have underlined that Pacific populations have been highly mobile using their sophisticated knowledge of the land, sea, the world at large and navigation to move along regional networks of various scopes (Malinowski 1922; Lewis 1994; Hau'ofa 1994; D'Arcy 2006; Kirch 1990, 1997; Di Piazza and Pearthree 2008; Torrence & Swadling 2008; Sand & Bedford 2010; Noury & Galipaud 2011; Monnerie 2017; among others). Recent research has also shown that many Pacific societies have socio-cosmic characteristics which suppose that each constructs its own world (Barraud *et al.* 1984; Coppet 1990; Monnerie 1996; Chave-Dartoen 2000, 2016). In such contexts, rituals and ceremonies institute, organise, (re)configure and (re)generate relational networks in which humans interact with other entities, among them land, plants and animals,

ancestors, formerly deities and, more recently, the Christian God. These procedures constitute local socio-cosmic systems.

Hence, the capacity to engender one's own world does not imply closure and isolation. Oceanian societies are also prehistorically, historically and structurally founded on multiple relations with their close or farther neighbours: relationships to more or less distant ancestral places and entities, navigation, migrations and settlements, integrations of newcomers (due to overlapping peopling waves, adoptions of strangers as chiefs, the welcoming of drifting voyagers or refugees, etc.), exchanges and circulations linked to various networks (marriage alliances, the circulation of goods, crops, techniques and skills, words and languages, ideas, dances, 'artistic' forms, etc.)... All these kinds of external relationships were and are necessary for these societies, for their own dynamics, organisation, renewal and life.

On this basis, our anthropological fieldworks in Island Melanesia (Arama, Kanaky New Caledonia: Monnerie) and Western Polynesia (Wallis Island: Chave-Dartoen), also confirm the problematic character of a neat dichotomy between Melanesia and Polynesia (Douglas 1979; Thomas 1989; Monnerie 1998; Tcherkezoff 2003). One important point undermining this distinction is the essential role of ceremonial circulations in the organization and the dynamics of local societies which is documented in several parts of the Pacific (Malinowski 1922; Mauss 1950; Thurnwald 1932; Strathern 1971; Wagner 1974; Coppet 1981; Monnerie 1996, 2005; Chave-Dartoen 2000, 2006, 2010). Another point, which we will examine in this paper, is that ceremonial – or ritual – systems may present striking analogies at some level of organization and conceptualisation. Taking a close look at ceremonies in Arama and Wallis, we discovered strong similarities linked to common principles. We thus suggest the hypothesis that this observation is linked to a common way, or a common rationale, in elaborating and understanding social relationships and relations with the world.

Looking closer at the ethnography in a comparative perspective, we made three important observations. First, as is the case in many other places in the Pacific, every arrival of visitors, in Arama as well as in Wallis, implies a ceremonial encounter including an arriving and thus also a welcoming ceremony, which we will call a receiving ceremony. If this is not performed, relationships are usually marked with flimsiness, defiance, or even violence from one or both sides. Second, those arriving and receiving ceremonies include formal behaviour and verbal salutations and speeches, as well as non-verbal circulations of participants, objects and food ('material exchanges'). Although their performance is very fluid, these ceremonies follow three sequences: arrival *cum* presentation, reception and integration. Third, beyond the basic forms of arriving and receiving ceremonies, all main ceremonies in Arama and Wallis are derived from the simple ceremonial form given to such encounters, implying variations, complexifications and assemblages of these integrating ceremonies so that their simplest realisation appears as the minimal form of all main ceremonial or ritual events. Conversely integration ceremonies can be identified and analytically construed as being the basic building blocks of most ceremonies.

We will add to these three points a last, but important remark: often described as exchanges, barter, gifts, buying, etc., Pacific societies know numerous procedures aimed at enabling people to satisfy their physiological and material needs. However, the latter are not the main objective of the procedures described here, which are markedly ceremonial in that they perform a solemn kind of relational processing focused on socio-cosmic relationships.

This paper aims at contributing to a better understanding of Pacific societies, their shared conception of the world – social and beyond – and especially of what is at stake in the encounters resulting from mobilities, that is, what makes them so important from a local perspective. For the Pacific, the now classic scheme of the 'stranger-king' refers to the integration of foreign people at the higher level of society (Sahlins 1981, 1985, 2008; Monnerie 2001, 2003; Naepels 2010;

Chave-Dartoen 2017). In this paper, we are dealing with a more basic, wider, more widespread and encompassing feature, which operates the processual ceremonial integration of external social elements, of 'others', be it for short or long periods: complete strangers, outsiders, administrative or trading partners, affines, ceremonial counterparts, etc. We also underscore the necessity of this integration for the ongoing elaboration of socio-cosmic relations linked to the processes of the society's life and renewal. An important aspect of this simple ceremonial form of integration has to do with the relation to the land, the ancestors attached to it, and the authority it gives to the landholders. From this particular authority involving land, ancestors and people stems the controlled form – ritualized, ceremonial – Pacific people give to the arrival of strangers and to their integration.[1]

Preliminary precisions

Our approach points out two often overlooked aspects of the elaboration, or fabrication, of relationships with outsiders and strangers. First the hosting-receiving party's spatiotemporal position, and second the formalisation of the ceremonial procedures for the elaboration of the relationships thus processed. Before turning to our data and their analysis, a few precisions are appropriate with respect to elements that are at the backdrop of our argument.

Concerning the social acts we describe in this paper, we won't make the distinction between 'ceremony' and 'ritual', since these categories mainly have an analytical purpose which is not relevant in this paper (Kreinath, Snoek, and Stausberg 2008). What we are going to study here are ritual/ceremonial forms and dynamics, especially in terms of sequentiality and meaning(s). For reasons of homogeneity, we will principally use words derived from 'ceremony'. 'Sequentiality' refers, in this text, to the temporal succession of the ceremonial process' components: operations, sequences, phases and stages.

As speeches, material goods and people are concerned, the term 'circulation' is more accurate and less loaded with connotations (economic for instance) than 'exchanges' to refer to the process taking place in ceremonies (Monnerie 2018). Operations within these circulations will be qualified, when necessary, as 'transfer' and 'counter-transfer'.

Particularly important dimensions of these ceremonies are (i) the formalization of the speeches, with the great importance of the words uttered, (ii) the circulating of very specific material items, and (iii) the body movements and the gestures required in enunciating speeches and circulating ceremonial goods. We want to stress that the meaning(s) and efficiency of these acts emerge from the complex formalized combinations and synchronisations of different modes of action and expression, thus going beyond what is generally called communication.

But communication and interactions go even farther: because these societies are socio-cosmic, the involvement of non-human agents has to be added to the personal or collective actions of humans. Entities from the cosmos, such as ancestors, deities, the Christian God, places (pathways, the land or country, settlements, houses, etc.), objects (yams, taros, cloth, kava roots, money, etc.), have important ceremonial aspects and roles in these events and act along with people regarding the relationships being processed.

Arama (Northern Kanaky New Caledonia, Melanesia): description of the minimal integration ceremony

The simplest form of Kanak receiving and integrating ceremonies is the formal meeting of two men, marking the arrival of one of them in a land and a group which he does not belong to and

[1] For the ceremonial complex and idiom presented here, defining its precise geographical and civilizational extensions is beyond the scope of this short paper and will be done in other contexts.

his reception by the other one, a local dignitary. It thus is a process elaborating a relation with an 'other'.

The reception, which often has been agreed upon beforehand, takes place in an appropriate place and unfolds as follows. The two men are standing face to face. In a first sequence of transfer, the arriving person holds and shows a composite prestation: money, often wrapped in a piece of cloth, held in one hand. His other prestation, of food – ideally yam and taro from his own land – is displayed on the ground. This double display – held in the hand and grounded – is accompanied by his delivering of a formal speech expressing the context of the encounter, often glossing elements of the prestation. These are then handed over to the host who solemnly takes them in his hands after having respectfully listened to the arriving man's speech. In turn, the recipient, holding in his hand a similar prestation of cloth and money, makes a speech relating to his views of the context of the meeting, often linking the encounter with pre-existing, present and future kinship, marriage or other relationships. He then transfers his prestation, which he hands over to the arriving man. Meanwhile, in a nearby kitchen, (at least) one woman related to the receiving dignitary has been preparing food. When the ceremonial sequences between the two men have been performed, the receiving dignitary invites the arriving man to share this food. Note here the key role played by the woman who has prepared the food to be shared by the two men as this commensality is an indispensable final sequence validating this elaboration of the relationships initiated by the integration of a stranger.

It is important to stress that this minimal ceremonial form of receiving and integrating a stranger – involving at least two men and one woman – often develops into what we shall call simple forms, which are more common. In these, the same process is performed by two men; however, each one represents a few people on the arriving side, and on the receiving side (Figure 1). A few women are generally involved in the preparation and serving of the food to be shared by all. Later, the elaborated integration will come to an end with a ceremony of separation conducted by the arriving and receiving party.

Wallis (Western Polynesia): description of the minimal integration ceremony

In Wallis, a reception ceremony is performed for any encounter involving some arriving party (one or more people) to a place. Usually, such a formal visit or arrival is motivated by a request: asking for help, to participate in an upcoming ceremony, for staying a while or for a long-term settlement, etc. These involve the building of a ceremonial setting of interactions between people of the place and newcomers (Figure 2). Thus, as in Arama, it is the elaboration of a relationship with someone other which is at stake. In the first sequence, the newcomer has the initiative: he can show up alone, but preferably will be accompanied by an arriving party, and may wait a little while, sitting down, facing the receiving people: preferably a male dignitary (the house master or an elderly man) with local people (elder female home-keepers and men) quickly gathering around him. A prestation (called *ma'u kava*) is provided – some kava root wrapped in a piece of cloth or some banknotes in an envelope or a bottle of alcohol (whisky) wrapped in paper. The head of the visiting party sits facing the hosts, lays the prestation on the ground in front of him, and listens to the ceremonial greetings made by the receiving dignitary. This includes the enunciation of the arriving man's name and of those of his suite[2] – if he is not alone – in decreasing order of status. Then he acknowledges this by enunciating the names of his hosts in a similarly decreasing order of status. The receiving dignitary further asks for the reason for the visit. The newcomer, or a young man acting as his assistant, brings the *ma'u kava* in front of the receiving dignitary, sits beside it, and describes the prestation (i.e. 'this is a *ma'u kava* made of pounded kava root presented in a piece of cloth') before going back. Thus, as in Arama, the

[2] In Wallis island people usually know each other, and an important arriving party would beforehand let know its intention to come. If not, discreet inquiries are made so that the receiving people quickly find out who is, at least, the leading person of the visitors showing up.

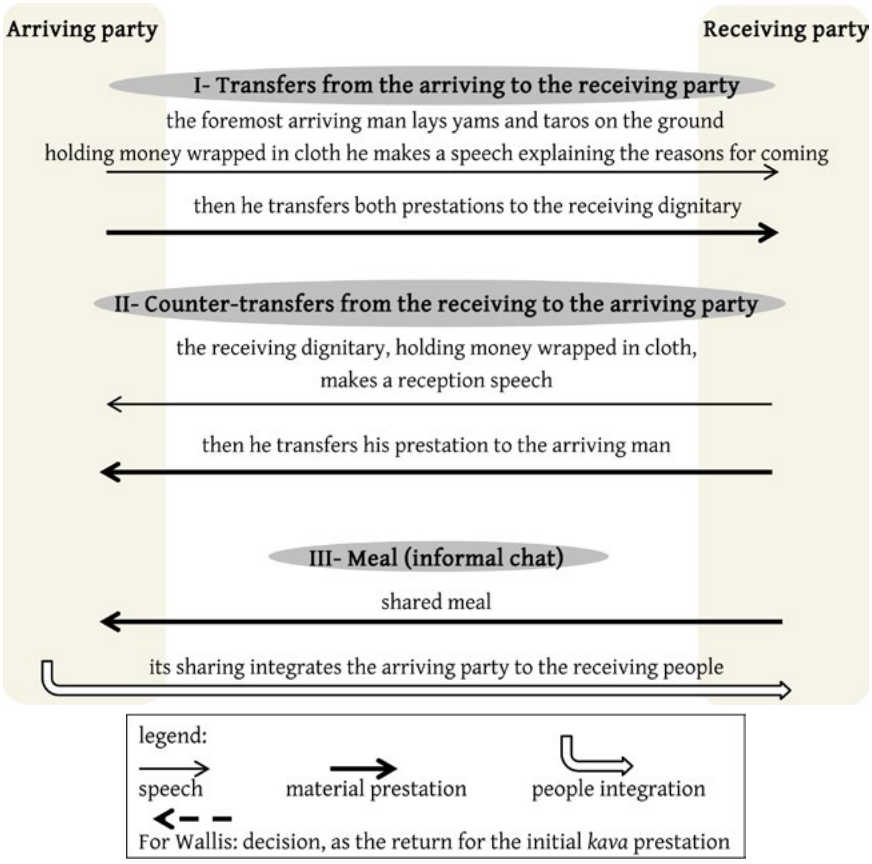

Figure 1. Receiving ceremony in Arama.

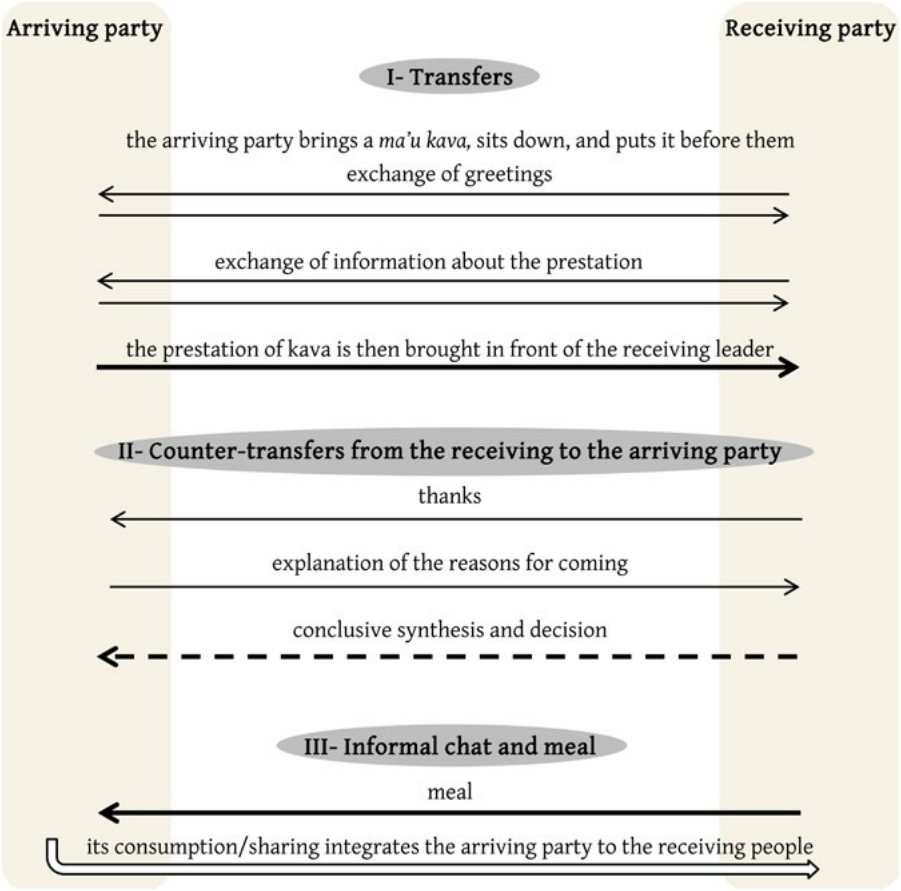

Figure 2. Receiving ceremony in Wallis.

first sequence of transfer is a composite: a material prestation, which is generally wrapped, displayed on the ground accompanied by a verbal description. The second sequence however is different from Arama, since no material counter-prestation is transferred here, but only a verbal acceptation or refusal of the prestation, of the newcomers and of their request: the receiving dignitary thanks the arriving party for having come and for their offering, now asking what their motives are. The newcomer now makes the context more explicit, explaining the situation and the reason why he has come. After this, the receiving dignitary reformulates the context and the situation from his own perspective, and concludes by accepting the demand – refusal is infrequent. If necessary, he specifies the way they will proceed. Food, which has been quickly prepared in the cooking space by young people, is offered in the third sequence: it is generally a substantial snack, ideally a real meal.

The basis for comparison

If we try to summarize these data, the ceremonial acts in Arama and Wallis are ordered into the following sequences:

- A sequence of arrival *cum* presentation: the initiative pertains to the arriving person who, coming from outside, first engages in the ceremonial encounter.
- A sequence of reception: the initiative pertains to the local, receiving dignitary who is anchored in his place.
- A sequence of integration: the initiative remains with the receiving dignitary, who defines the conditions of the integration and validates it by having a meal prepared which is offered and shared.

At this stage of our presentation, striking similarities are pointed out by this broad description of successive sequences: arrival *cum* presentation/reception/integration made up of operations of transfer and counter-transfer. This ternary organization reminds one of the processual and structural patterns with its three sequences which Arnold van Gennep (1909) proposed for the rites of passage. For van Gennep, the succession of the separation, liminality and integration phases is necessary because of the symbolic threshold that needs to be crossed. In the cases studied here, the principle is not only that of an integration via a passing through a threshold (which characterizes rites of passage), but an integration via the global reconfiguration of the social relationships and their effective manifestations. This integration opens a span of time where the social relationships which are at stake are elicited and re-arranged so that action is made possible on new basis. The common principles lying behind the unfolding of these 'arrival *cum* presentation/reception/integration sequences' need to be singled out and analyzed.

1) One of their common principles is the encounter and formal interaction of two persons or parties, one on his/its land, the other arriving. It displays a status dissymmetry between them. Even though strangers are generally prized and their company sought after, arriving into a place in which one doesn't belong is always a hazardous endeavour, which people avoid unless they have some strong reason to do so, as this means submitting oneself to a 'place', that is to the authority of its people, living and dead. As long as the integration ceremony is not performed, the pre-eminence of the people of the place is strongly expressed: the newcomer may have to wait and his reception depends on the receiving dignitary who has a superior position, representing his whole group, the land with its ancestors and, in Wallis, the authority granted by the Christian God, all of which participating in the ceremonial process.

2) As we said previously, the ceremonial reception opens a social space which only a formal, ceremonial separation can close. Thus, a spatiotemporal framework is created in which a performance (re)organizes social relations under the authority and responsibility of the receiving dignitary.

3) This ceremony sets up the conditions for more or less durable new, or renewed, relationships and implies a re-organization of responsibilities. Thus, the authority under which personal and collective actions will be organized for the time opened by the performance is formally acknowledged. The shared meal, constituting the third sequence, makes effective the integration which will last until the departure of the newcomer(s). From then on, he/they will be granted status position and responsibilities within the local group and be at liberty to speak and act more freely, often joining the other members of the group under the supervision of the local dignitary.

4) The arriving party's integration can be modulated depending on the situation: a mere visit for a request, the arrival of a delegation coming for a ceremony, a longer-term integration into a household, etc. In Wallis, an essential aspect is that all that has arrived – the goods as well as the people and even the clothes they carry – may, from then on, be used in the activities of the new collective that has been ceremonially constituted.

5) In both cases, formalized ceremonial procedures enact the performance which reorganizes a former situation and, with the arrival and reception procedures, elaborates new relationships. This process of elaboration is largely enacted – and can be analyzed – as articulating operations and sequences which, for Arama, Monnerie (2012, 2016, 2018) has described and interpreted as operating procedures for the elaboration of relations. It should be stressed that the ordering of ceremonial actions – motions in space-time, the attitudes and gestures of transfers, the objects that are transferred, the speeches and their special scansion, the vocabulary and rhetoric – all follow a protocol which organizes the ceremonial interactions in different ways in Wallis and Arama, but according to a few common principles.

Three of them are particularly prominent:

- The dynamics within dissymmetric dyads: the ceremonies take place within a form which is a dyadic face to face posture marked by dissymmetric and complementary values. The affirmation of the local anchoring of the receiving side (dignitary and party) and its superior status depend on the presence and contrast of otherness and exteriority provided by the arriving entity.
- The institutionalization of the relationships elaborated through the ceremonial performance within the dyad: the entire ceremonial set up has a performative and institutionalizing dimension (Castoriadis 1975; Descombes 1996) for the elaboration of relationships. This is achieved not only through the carefully defined and ordered interactions between and for the sake of the living, but simultaneously concerns the land itself, the ancestors and the state and becoming of the world.
- The validating and sealing of the ceremonial process through sharing and consuming foods: in both Wallis and Arama, some of the most highly valued edible crops having been grown in the local gardens are brought and transferred by the arriving party to the receiving entity. This is linked to their (immediate and/or delayed) preparation, sharing and consumption once they have undergone a highly valued and specific process of preparation and distribution. The sharing and consumption provide personal feelings of satiation and at the same time they bring the collective ceremonial process to its conclusion.

A wider view of ceremonial processes

Going beyond the scope of this description and analysis of the (comparatively) simple ceremonial procedures described above we want to underline the important fact that, both in Arama and Wallis, they are the building blocks of complex ceremonies. These are ceremonial assemblages, always constituted of two sides in which the simple dyadic ceremonial form is replicated several times, increased and complexified over a set period of time into numerous ceremonies – ceremonial stages – of growing sizes, which eventually converge towards the focal ceremony which is the

largest of all the stages in a ceremonial assemblage. The latter implies a process of redistribution aimed at all the original contributors in the first ceremonial stages of the assemblage.

One of its particularly important aspects is that our model is relevant – but with different arrangements – both for the ceremonies concerning local configurations as well as the cycle of life ceremonies of persons. They are associated with local ceremonies or translocal receptions as well as adoptions, marriages, funerals, the integration of 'stranger kings', etc. This may be linked to violence, subjection and dependence. Complex ceremonies involve circulations of 'material' goods (valuables, standardized prestations, foods...) and 'immaterial' representations (speeches, narratives, rhythms and dances, titles and names, rights and obligations, ideas and concepts...). All these complex ceremonies also participate in forms of integrations: as a process, they organise a form of encompassment under the authority of the land and its people.

Thus, medium, large or very large ceremonies, which are always dyadic in their form (i.e. being made up of two sides facing each other) can be viewed as ceremonial assemblages made of more and more expanded building blocks which themselves are always dyadic. They develop into both space and time, (re)creating relational networks in which each ceremonial stage, whatever its size, is a node. In both sides of such a ceremonial assemblage, the increasingly enlarged and intensified ceremonial stages perform imbricated circulations of people, objects, food, words, ideas, etc., in numerous operations, sequences and phases. Eventually, both sides of the ceremonial assemblage meet in the focal ceremony (which is too often the only one described by observers).

In this process of assemblage, whatever the side of the ceremonial assemblage or its node, two sides are facing, one on its land, the other arriving with the aim to participate in the ceremony. Each dyadic encounter implies an articulation involving several sequences made up of synchronized operations of non-verbal and verbal – read speeches – transfers and counter-transfers. The non-verbal transfers articulate specific gestures and motions dealing with specific ceremonial objects. These operations and sequences crucially elaborate strands upon strands of relations between the two ceremonial sides (for Arama: Monnerie 2018).

Just as the processual, sequential, order of ceremonial acts is of prime importance, their meanings are an important aspect of ceremonies (in Arama, most operations and sequences are named). Ceremonial gestures and the objects which they display and move have non-verbal meanings which can – and often are – glossed whether in conversation or in the speeches. The ceremonial speeches which have a strong and specific scansion or prosody are themselves saturated with meanings as well. They verbally describe the relationships being elaborated. In large ceremonies they have very strong poetic dimensions thanks to which their meanings may be debated.

Meanwhile, and close by in dedicated kitchens, which may have huge dimensions in large ceremonies, the preparation of foods is going on. The concluding sequence of each ceremonial phase is the collective sharing and consuming of these foods which are always plentiful. The validating and sealing aspect of this sequence has a marked experiential and existential dimension of satiety, which is one of the modes of ceremonial expression.

Synthesis and proposals

At this point, we want to submit a synthesis linking the specific dynamics of Pacific societies and some of their historical or contemporary trends to the most basic directions of the above comparative presentation, which derives from our ethnographic observations and the deep rationales we believe are at work in them.

Oceanian societies have numerous procedures aimed at enabling people to satisfy their physiological and material needs. These are often described as exchanges, barter, gifts, buying, etc. These

purposes and procedures are not the main objective of the ceremonial procedures of integration described here – even though the latter may, and do, interact with the former. Conversely, this kind of ceremonies may open moments for different forms of exchanging and sharing. The circulations we have described, notably those of persons, objects and representations, belong to and derive – at least to a large extent – from ceremonial integration in that it is a building block for larger ceremonies.

In their simple form, one aspect of these ceremonies is that they give a specific shape to a potentially universal situation: that of the arrival of a stranger into an inhabited land. It brings together into a ceremonial dyad the arriving side and the receiving side, the latter enjoying superior status because, along with its ancestors, it stands on the land from which he gets its very existence and the authority necessary to its renewal. All these elements confer ceremonial events – even the basic ones – a specific form of sociality, linked to the socio-cosmic framework of their actions.

These ceremonies are primarily formalized procedures which (re)construct, or (re)affirm socio-cosmic relationships through the distinction and (re)elaboration of their constitutive, dissymmetric and complementary elements. In their dyadic framework, each particular ceremony implies a ceremonial performance with its own relational ordering and corresponding types of action. All this is processually, sequentially, organized. Within a place and in reference to it, participants are gathered into ceremonial dyads, which elicit the recognition of the relationships of otherness existing between them. They are confronted face to face and formally interact in order to (re) elaborate their relationships, bridging both sides of the dyad. It is important to stress that these ceremonies deal with various degrees of otherness and exteriority: from the intimate otherness and the much-used pathways that characterize relations of affinity to the strong otherness of a European crew arriving from an unknown place on a strange kind of ship.

In the fluid performance of these ceremonies, we have distinguished three sequences: arrival *cum* presentation, reception, and integration. They differ from Van Gennep's classic model in that the central sequence is not liminal, but is characterized by strongly formalized social activities which are immediate and intense, implying verbal and non-verbal transfers and counter-transfers.

Our model also accounts for large ceremonies, that we call ceremonial assemblages – their most developed stage being the focal one. These implicate two dimensions of the building blocks related to central aspects of the large ceremonies they construct. On the one hand, these ceremonies operate on common basic principles which are repeated in order to constitute ceremonial assemblages. On the other hand, many aspects of the common basic features of the building blocks are developed, complexified and articulated into the progressively expanding and intensified ceremonial stages constituting ceremonial assemblages. In order to do this, participants, with their non-verbal and verbal prestations, circulate between the ceremonies constituting the assemblage, each successive stage gathering more participants and prestations. A ceremonial web, or network, is thus created or reaffirmed in the country (*phweemwâ* in Arama, *fenua* in Wallis) in which each ceremony of the assemblage is a node for relations and specific sociality. Thus, in etic terms, the system described here results from processes combining incremental, recursive, fractal and reticular developments and forms.

We suggest that our comparative model points out at something like a ceremonial idiom which articulates different relational elaborations within the South Pacific area. In this general framework, specific configurations can be observed and documented which vary according to the rationales, values and histories of the different societies and regions. However, we have insisted upon the fact that common principles are observable. It is these common principles which are described in this paper. Among them, an important principle is the necessity of a ceremonial integration of newcomers into a place, giving them position and status in a new arrangement. The ceremonies'

encompassing scope accords with an overarching principle: the socio-cosmic dimension of Oceanian societies, in which the ceremonial interactions of the living imply the action of the dead, the ancestors – the Christian God when relevant –, as well as many of the features of place: the land, the country and the whole cosmos of which they are a part.

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Sessions XXXVIII-1,2 of UISPP 2018 in Paris were dedicated to monumental constructions and to complex exchange networks in the Pacific. Both topics have been extensively commented on and described by indigenous experts, explorers, missionaries, and scholars over the last two centuries, however these have been made famous only for the most impressive examples such as the *moai* statues of Rapa Nui (Easter Island) or the *kula* exchange system of the Trobriand Islands. Some of the latest research on these key aspects of Pacific islands societies are made available in this volume to researchers focusing on the region, but also to a more global scientific community and to the general public. The volume reflects the tremendous progress made in Pacific island archaeology in the last 60 years which has considerably advanced our knowledge of early Pacific island societies, the rise of traditional cultural systems, and their later historical developments from European contact onwards. Interdisciplinarity is particularly stimulating in the Pacific region, where the study of the archaeological record and of chronological sequences are often combined with other kinds of information such as ethnohistorical accounts, oral traditions, and linguistic reconstructions, in the French tradition of *ethnoarchéologie* and the American tradition of historical anthropology.

Aymeric Hermann is a post-doctoral researcher at the Max-Planck Institute for the Science of Human History in Jena, Germany. Since 2010, he has directed archaeological projects in several archipelagos of French Polynesia as well as in central Vanuatu. His research addresses the settlement history of Polynesia and the Polynesian Outliers, the socio-technical relations between technical systems and social organisations, and the evolution of inter-island voyaging and interconnectivity in the Pacific.

Frédérique Valentin is a researcher in Oceanic archaeology at CNRS (UMR 7041, MSH Mondes, Nanterre, France). She specialises in funerary archaeology and biological anthropology. Her work focuses on the human populations and societies of the Pacific. She has worked in many archipelagos of Oceania such as Vanuatu, New Caledonia, Tonga and Samoa.

Christophe Sand is Head Archaeologist for the New Caledonia Government at the IRD Research Centre in Nouméa, working on Southern Melanesia, Western Polynesia and Western Micronesia. His main fields of interests are the first Austronesian settlement of the region related to the Lapita complex, the cultural dynamics of the Pacific peoples over the succeeding millennia, and the impact of Western expansion in the Pacific.

Emilie Nolet is an Assistant Professor in Archaeology at the University Paris I, Panthéon-Sorbonne. Her current research work focuses on the cultural changes which occurred in French Polynesia from the late 18th to the early 20th centuries through a methodology combining historical studies and the analysis of material culture.

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