

New Archaeological Data from the Abandoned Island of Alofi (Hoorn Archipelago, Western Polynesia)

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ABSTRACT

The Hoorn Archipelago in Western Polynesia, comprising the islands of Futuna and Alofi, was in May 1616 the place of the very first long encounter between European navigators and Polynesians in the Central Pacific. The potential consequences of the two week stop of the Dutch sailors J. Lemaire and W. Schouten in Leava Bay have been a neglected topic of study until today. No proper consideration has been given to the possible introduction of foreign diseases during the close contacts and consequently to the hypothesis of a severe demographic impact well before the end of the 18th–19th centuries. In order to study the long-term demographic history of the archipelago, an archaeological research program was started on the island of Alofi. New archaeological surveys and spatial studies fulfilled in different parts of Alofi in 2019 have started to show the diversity and concentration of surface remains, testimony of a former dense settlement pattern. This paper highlights the main results of the first field season, allowing us to test the hypothesis of a massive depopulation on Alofi following first contact in 1616.

Keywords: Western Polynesia, Alofi, Settlement patterns, European contacts, Depopulation.

« Le mesme jour le Ry de l'autre Isle vint visiter cesluy cy, & apporta avecq luy 16 pourceaux, avec bien 300 hommes, qui estoient tous ceints par le milieu de certaine herbe verde, desquoy ils font leur boisso (The same day the king of the other Island came to visit this one and brought with him 16 pigs with well above 300 men, who carried around their belt a green herb that they use for their drink) » (Schouten 1619, p. 57).

INTRODUCTION

The inhabitants of Alofi Island, located about 1.5 km south-east of Futuna in the Hoorn Archipelago at the northwest limit of Western Polynesia (fig. 1), entered modern his-

tory on the morning of May 30, 1616, when a chiefly party came by canoe to Leava harbour, to meet with the crew of a strange vessel without outrigger. This encounter with the Dutch crew of J. Lemaire and W. Schouten led to the first written European description of a kava ceremony (Schouten 1619: 58), and testified that Alofi was indeed inhabited. Nearly 200 years passed without new direct contact, and the few European castaways stranded on Futuna from the beginning of the 19th century, left no written description of their stay. Only in 1838 Marist missionary P. Chanel, after settling on Futuna to convert the islanders, wrote a new account about Alofi island. In it, he stressed that only a few people were still permanently living on the shore of Alofitai facing Futuna, although ruins of some abandoned habitations could be seen in the overgrown bush (Rosier 1960: 367). When asked of the reasons of Alofi's recent abandonment, the Futunans explained to the missionaries that endemic wars and fierce cannibalism by the chiefs had depopulated the island (Burrows 1936: 41; Rench 1985: 72), a statement that remains today deeply embedded in the Polynesian population through a rich set of oral traditions (see Frimigacci *et al.* 1987; Frimigacci 1990).

Futuna stands out in the history of Oceania, as the very first island of Western Polynesia to have witnessed an extended contact with Europeans. The two weeks' stay of the Dutch crew in Leava, on the west coast of the main island, started with a violent clash that led to the use of guns and the death of Polynesians, before peaceful relations followed during the rest of the stay. The European texts describe

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Submitted 15/12/2020, accepted 25/5/2021. First online 23/8/2021.

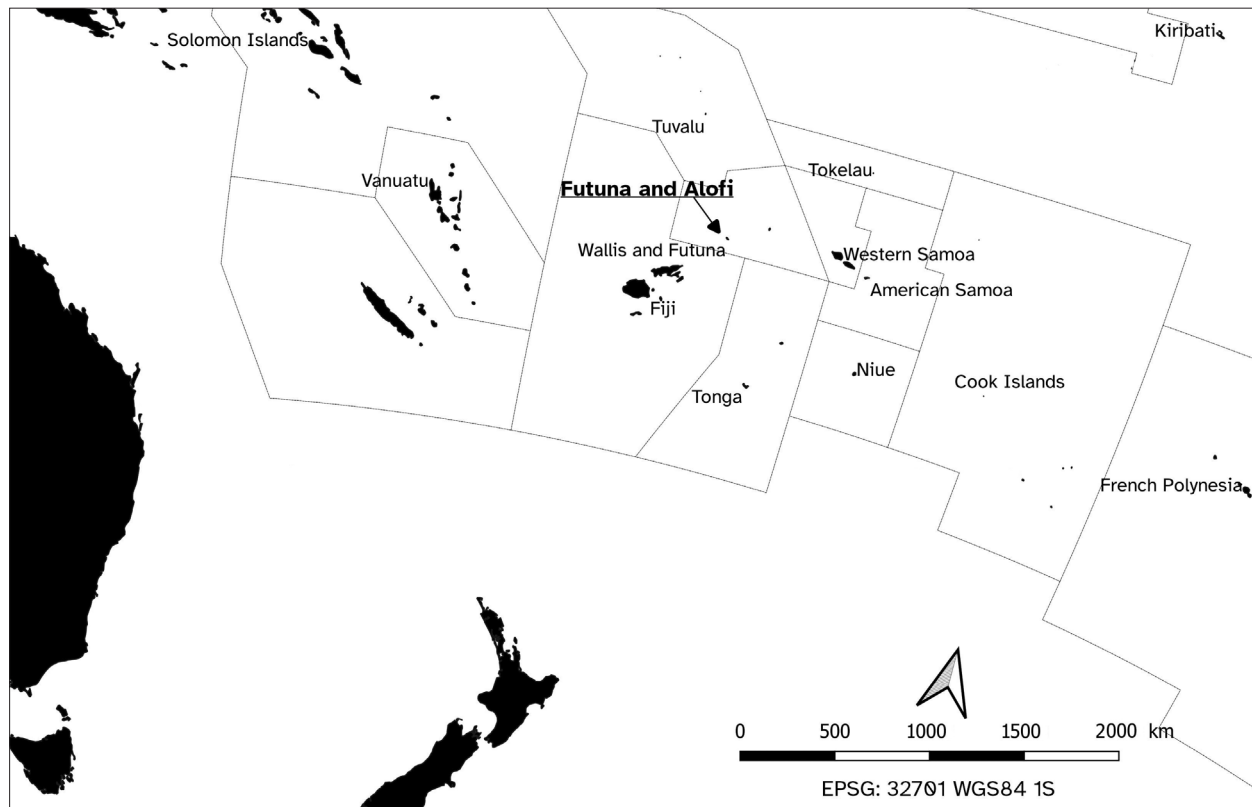


Figure 1. Location of Futuna and Alofi in the Central Pacific (Map J. Garcia Sanchez).

friendly parties with the sharing of food, exchanges of objects and clothes, sexual intercourse between sailors and young girls, elements of local customs, and even an inland visit (Schouten 1619). Notwithstanding these elements of close contact, historians and anthropologists have nonetheless until today considered that after the departure of the *Eendracht* from Leava on May 31, 1616, the inhabitants just got back to their normal traditional lifestyle, before the significant change in the historical course of the archipelago through the adoption of the Christian faith in 1840. This ‘first encounter’ has thus been considered as a ‘non-event’, highlighted by the fact that no Futunan oral tradition appeared to recall the 1616 stop in Leava (Burrows 1936:17). Accordingly, the local hierarchical organisations categorized by anthropologists as structured around two status levels with low complexity (Sahlins 1958:11–12; Panoff 1970), have been seen as aptly characterizing the endpoint of a Polynesian culture-historical trajectory that had started with the arrival of Lapita explorers at the beginning of the first millennium BC (Frimigacci 1990; Frimigacci & Vienne 1987; Kirch 1975, 1994). Noone has until recently questioned the possible impacts of this ‘first encounter’ on Futuna’s historical path, although a potential loss of 90% of the population before Christianisation was made apparent by an archaeological analysis nearly 30 years ago (Kirch 1994:41).

For Alofi, aside from Dutch testimony, local oral tradi-

tions and missionary writings (ex: Girard 2008:215–331), former occupation was demonstrated by different research teams through the archaeological survey of house-mounds, burial grounds, meeting places and agricultural field structures (see Sand *et al.* 2020a for a synthesis). Applying a horticultural production calculation, P.V. Kirch proposed a first general estimate of 1300 to 2600 former inhabitants for the Island (Kirch 1994:241). Furthermore, a recent reappraisal of the different historical data about Alofi’s abandonment (Sand 2017) has challenged the orthodox views of a linear culture-historical pathway for the Hoorn Archipelago until the early 19th Century (Angleviel 1994). Instead, it has fostered the hypothesis that the first European contact on Futuna could have been the start of a massive change in the history of the archipelago. As elsewhere (see Kirch & Rallu 2007; Quimby 2017 for regional cases), the introduction of foreign diseases might have prompted a first population collapse, leading to a profound reshaping of the political divisions and customary organisations before the arrival of the missionaries.

The written accounts clearly state that the population was low on Futuna during the 19th century and completely absent from Alofi after 1840, which implies that a significant demographic drop occurred in between 1616 and the first half of the 19th century. To investigate the hypothesis of an early 17th century disruption in the Hoorn Archipelago’s history and contribute to the overall reappraisal of

the consequences of first European travels across Oceania, sometimes over two centuries before James Cook (Cruz Berrocal & Sand 2020), an archaeological research program on Alofi Island was proposed to the customary and administrative authorities of the archipelago. Alofi, due to its size, lack of inhabitants, and early abandonment, is an appropriate setting for a project seeking to address the archaeological data in a holistic manner. The first general survey of Alofi fulfilled in 1984, had already recorded a total of 50 archaeological sites along the seashore plains as well as on the inner plateaux, some of the powerful political centres like Lokā, being located inland and with difficult access to the ocean (Frimigacci 1990; Sand *et al.* 2020a). Excavations identified early ceramic occupations on different seashores (Sand 1990), with continuous human presence on the Island until the last centuries, mainly materialized on the surface by house-mounds, burials, ceremonial structures and field-walls.

In August 2019, a first fieldwork-season within the current project addressed the diversity of surface remains and the settlement pattern organisations, through a series of systematic surveys targeting different parts of the island, combined with detailed mapping of some sites (Sand *et al.* 2020b). The scope was to record the archaeological structures present in the different ecological landscapes of Alofi, from coastal flats to inner plateaux and natural ridges, and integrate our surveys in a Geographic Information System (GIS) of the island. This will contribute to highlight the main traditional occupation nodes archaeologically identifiable, their relations to natural constraints like topography, fresh-water sources and the most fertile cultivation areas, while also contributing to identify the best sites for future sub-surface excavations and for studies of landscape modification.

GENERAL CHARACTERISTICS OF ALOFI AND SURVEY METHODOLOGY

Alofi is a high island, 17.78 km² in surface and reaching 417 m altitude (Mount Kolofau), composed of a succession of five stepped limestone plateaux resting on a basaltic core, which emerges to the present surface in different parts of the island. The island lacks permanent streams but has a number of short valley formations due to fresh-water erosion. Large parts of Alofi are forested today, the most fertile areas being used for gardening, while a restricted degraded fern-covered landscape (*Toafa*) is present near Mount Kolofau. The most protected seashore access and the only part of the island with a small lagoon-formation is Alofitai on the northwest side of Alofi, the rest of the coast being characterized by cliffs and a series of beach flats facing fringing reefs. Traditionally Alofi's polity is divided between three chiefs, all settled today in the Alo chieftdom on Futuna. The western part of the island is devoted to the title Vakalasi, the northern and eastern parts to the title Tui'asoa and the southern part to the title Tuisa'avaka.

Some families from Alo have land-rights on Alofi and come during the week to cultivate their plot of land, although no permanent settlements have been present on the island over nearly two centuries now.

The 2019 survey addressed the extent of the former occupations in Alofi with the goal of reconstructing in detail the former settlement patterns. We targeted the different micro-spaces that compose the ecological niches of the island in terms of soils, slope and vegetation. Previous research (Sand *et al.* 2020a) had identified that the island's archaeological landscapes are complex settings, grouping in diverse numbers house platforms, tombs, walls, ceremonial areas, and living spaces. We designed a survey strategy to record each of these structures individually, while also grouping features like burials into cemetery spaces. We surveyed, through transects of up to 200 m wide, a total length of nearly 11 km of 44 artificially defined transects across some of the coastal flats and inland plateaux. Once 10% of Alofi's surface that is too steep to be usable was removed, about 9% of the island has been surveyed intensively or randomly during the first field season (fig. 2). This was done through successive pedestrian transects about 30–50 m wide, a total of three to six people identifying all the structures visible under the vegetation, the limits of each feature and pottery scatter being recorded individually by a number of GPS points. Written descriptions of the structures and their photographic record were completed for integration in the geodatabase linked to the project GIS, and surface artefacts were collected for future analysis. The set of points was then downloaded on the desktop GIS. The GPS points were converted in a polygon which represents each individual archaeological feature, allowing us to complete a preliminary settlement pattern analysis to avoid the circularity of the *a priori* definition of 'archaeological sites' during the field survey. After finalizing a complete spatial and archaeological record of the structures and features on return from the field, these were related to previously recorded sites and oral traditions, to help us define the coherent extent of different traditional settlements. The digital mapping of the survey conducted on Alofi allows comparisons with several Digital Elevation Maps (DEM) built upon cartographic sources (SCAN25 created by the French *Institut national de l'information géographique et forestière*). This allowed for example calculations of flow accumulation models to be compared to settlement areas and well locations. Other GIS analyses of Alofi's present land-use and survey designs were performed using satellite imagery from ESA Sentinel 2 series. Detailed mapping of a number of sites with traditional survey methods was also undertaken to record in detail the layout and the diversity of the structures present. These sites were chosen to represent the diversity of spatial organisations identified in the surveys, in order to address questions of typological and chronological variability. The outcomes of these detailed maps are presented with the survey results for the four main geographical areas that were studied in 2019.

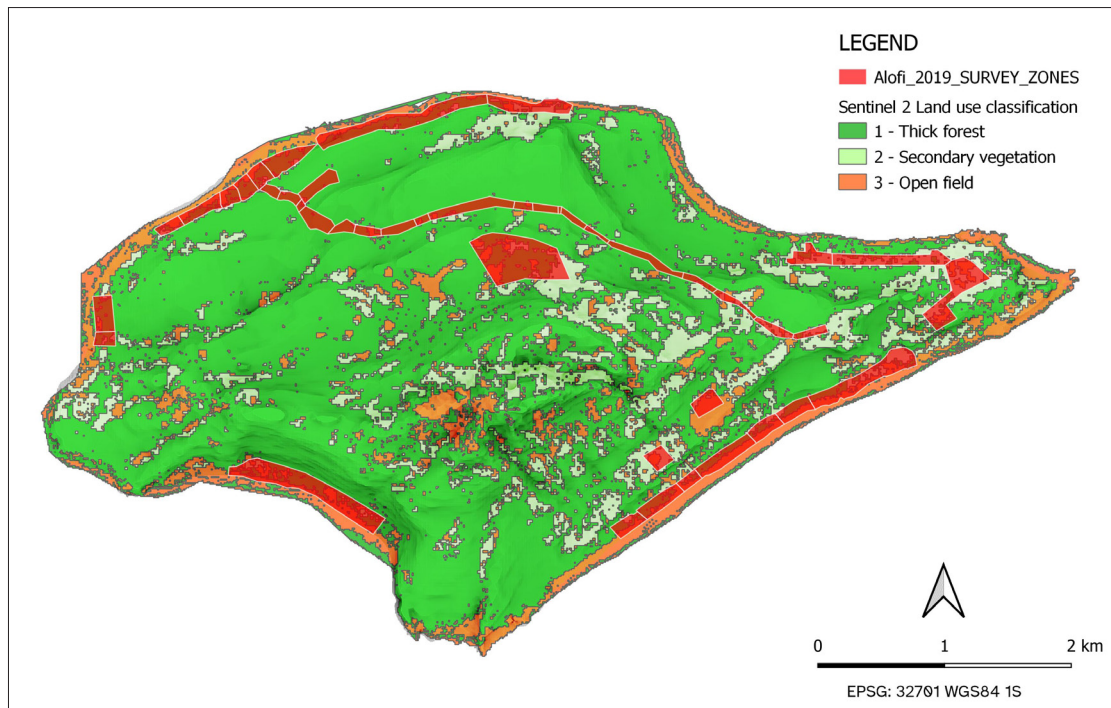


Figure 2. Map of Alofi Island, detailing the biotopes and locating in red the different transects surveyed in 2019 (Map J. Garcia Sanchez and I. Grau Mira; base-map produced through photographs of satellite Sentinel 2).

ARCHAEOLOGICAL AREAS IN ALOFI

The sheltered coastal plain of Alofitai (northwest Alofi)

The sheltered coast of northwest Alofi, facing Futuna and separated from it by the deep 1.5 km wide channel of the *Vasa*, has probably always been the best settlement location of the entire archipelago. Its orientation sheltering it from the southeast trade winds, the presence of the only protective lagoon-formation of the two islands, the outflow of a number of permanent water sources along the coast, the easy access to the first fertile plateau, all concur to give to Alofitai its appeal and uniqueness. The coastal plain, oriented northeast to south and circumscribed by the first limestone plateau, is about 2500 m long and reaches over 200 m width in its central portion. The plain has an uneven topography, with the presence of a dune-ridge built parallel to the coast in its centre, which testifies of the progressive enlargement of the plain during the last millennia. Potsherds collected on the surface were restricted to the inland half of the plain, ending at the highpoint of the central dune. First settlement layers containing Lapita sherds are likely to be found in the inner half of the plain, at the foot of the first plateau.

The intensive survey was fulfilled starting from the northeastern limit (Mu'a), over a total distance of 1100 m towards the southwest (fig. 3), without completing the survey of the southern half of the bay (Keu). The surveyed

area faces the best access-spots for canoes, where present-day visitors' locations as well as seashore plantations are concentrated. A total of over 160 individual features were recorded in the 6 artificial zones that were surveyed, representing a density of about 7 features per hectare. The excavations of 1985 in the central portion of our survey area (Mala'emalu) had shown a fill of up to 200 cm of archaeological deposits over the course of the past 2500 years (see Sand *et al.* 2020a:96). It is therefore tentatively hypothesised that most of the surface structures recorded date to the very end of the occupation of the plain and are chronologically at least partly contemporaneous. Spatially, the survey made clear that all the archaeological features recorded are located in the backside of the plain, spread from the edge of the first plateau to about the first two thirds of the flat, while all the present-day constructions are built along the last third, facing the seashore. The spatial analysis of the data also allows us to identify a clear distinction between two settlement patterns. In the southwestern zone surveyed, about 550 m long and in the area where the plain reaches between 150 m and 180 m wide, nearly half of all the foundations of former *Fale* (houses) are concentrated, surrounded by only isolated burials or small cemeteries with simple marking. This settlement pattern is indicative of a dispersed hamlet organisation, interpreted as occupied by low-status families. To its northeast, over a distance of over 500 m and positioned in the area where the plain reaches up to 250 m wide and the central dune-ridge is highest, the survey has recorded a total of 4

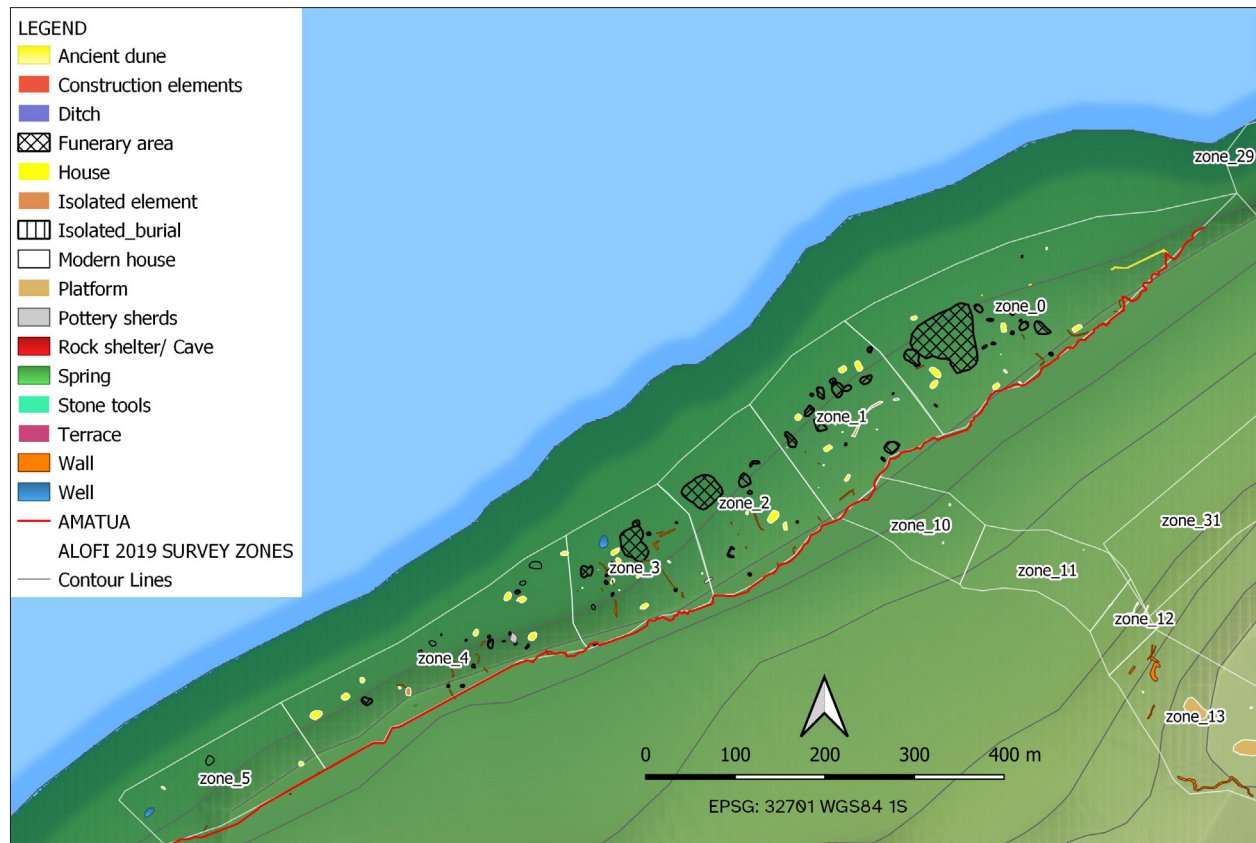


Figure 3. The northeast half of Alofitai, locating the main archaeological structures and features recorded (Map J. Garcia Sanchez, I. Grau Mira and H. Goudiaby).

large cemeteries and a dozen smaller-ones. The extended burial grounds enclose systematically some large tombs with complex architecture (see Sand *et al.* 2020a, fig.10), related in the oral traditions to high-status individuals. The overall sizes of the house-basements in this part of the plain are also more extensive, some *Fale* limits being marked with upright slabs. Some of these former large ceremonial house-structures are linked to an open meeting space (*Mala'e*). The layout of the constructions surveyed in this area is placed in a more organized pattern than the nearby hamlet area, with wall-divisions between land-plots in some cases. Each of the two most important *loci* of Alofitai highlighted in the oral traditions, Mala'emalu and Sokisoki, also include a large well. Consequently, the spatial organizations identifiable through the survey in this part of Alofitai have been interpreted as the remains of several high-status compounds (*Kaiga*). Their customary elite-occupants (*Aliki*) had secured their control over the zone of the plain positioned in front of the best landing spots, with direct access to fresh water and having the largest as well as the most fertile cultivation areas of this northwest coast of Alofi.

The core of Mala'emalu (fig. 4) was organised around a large artificial basin positioned at the sea-facing foot of the central dune, resulting from the excavation of a large well.

The well is about 4 m by 3.5 m at its top with an oval shape, maintained by a retaining wall of coral boulders nearly 1.3 m thick at the upper edge and 2.8 m high, before reaching the low tide water level. The remains of a surrounding circle of large standing stone-slabs built between 5 m and 8 m from the centre of the well can still be identified, positioned at the outer limit of the artificial basin. This circle materialized a restricted area protecting the well and it is probably not coincidental that the largest coral slab, 120 cm long and 60 cm high above ground, is oriented due north. Two *Fale*-base, marked by a low surrounding alignment of coral blocks, are present in immediate vicinity of the well towards the ocean. On its inland side, the well faces a low wall retaining the top of the central dune, which stabilized a large flat open area that served as a ceremonial plaza (*Mala'e*). A total of 6 *Tupe* (flattened discs), used for the pan-Polynesian game of the *Lafo*, have been collected on the surface of the flat, indicating the preferential play of this chiefly game on the *Mala'e*. A large *Fale*-basis of elongated form measuring nearly 12 m long and over 7 m wide, with a surrounding of upright standing stones is positioned at the inner limit of the *Mala'e*, flanked by a near-rounded low mound oriented on a different axis. These structures have evidently been built at the highest point of the site, as the dune then slopes downwards towards the inland

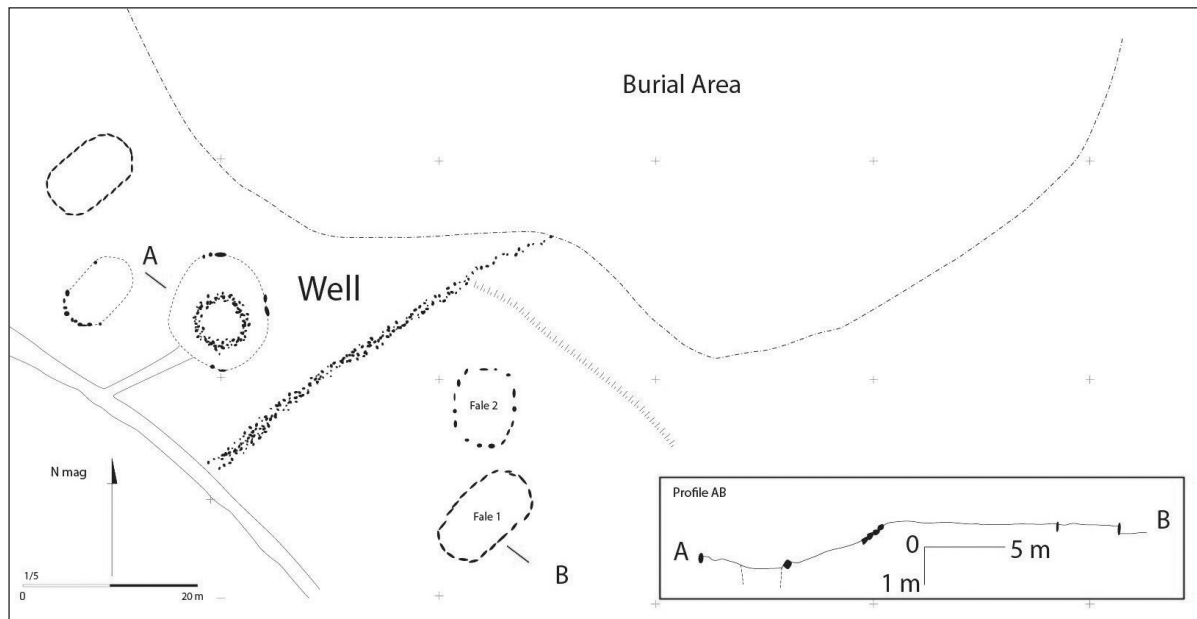


Figure 4. Features mapped around the well of Mala'ernalu (Map C. Sand).

plateau cliff. To the north of the *Mala'e*, the survey has recorded the largest cemetery of Alofitai, extending over a surface of more than 4000 square metres. Its size and the diversity of tomb architecture as well as orientations, indicate the long period of use of this burial ground.

The site of Sokisoki, positioned about 400 m southwest from Mala'ernalu, is also organized around a well. The good

preservation of this structure (fig.5) allows us to gain a proper understanding of the outer circle, present around 4.5 m from the centre of the well and composed of large beach-rock standing slabs. The largest slab is 130 cm wide and 130 cm high above ground, positioned to the west. The diameter of the well is 5.5 m long and 4 m wide in a north-west/southeast axis, retained by a beach-rock and coral wall



Figure 5. View of the well of Sokisoki after clearing, showing the row of standing slabs surrounding the central pit (Picture C. Sand).

80–140 cm thick at the top and reaching in a near-vertical orientation about 2 m deep before the low-tide water level. The mapping of the structure has allowed differentiation of at least two episodes of post-construction modification, with a probable rounded original form before the construction of a new retaining wall and the recent creation, on the northeast side of the well, of stairs to allow access to the water for pigs. To the southeast of the well has been identified the basis of a near-rounded *Fale*-basis, only the front-part of the encircling up right slabs still being present. At its back, the basis of a clear oval-shaped elongated *Fale*-basis is present. Another large oval-shaped elongated *Fale*-basis, 12.5 m long, is present to the immediate northeast of the well. The whole eastern side of Sokisoki is formed by a 1000 m² cemetery, enclosing some large tombs with double alignments of standing slabs, amongst numerous simple tombs. The largest burial, over 7 m long and facing the seashore, is known in oral traditions as having been built for a person called Mani'ulua, linked to a story of Alofitai (Frimigacci 1990, fig. 115; Sand *et al.* 2020a: 94).

A long use of the Sokisoki cemetery is hypothesized because of its height, resulting from the progressive build-up of the site, the tombs visible on the present surface pos-

sibly covering older bodies. This feature is not visible in the nearby smaller burial ground of Pufala, to the immediate southeast of Sokisoki. This site was mapped in 2019 as it appeared to be amongst the best-preserved cemeteries of Alofitai, possibly indicating a period of use at the very end of the permanent occupation of the northwest coast of the island. A total of 30 small graves were differentiated over a surface of about 400 square metres, organised in a set of 4 roughly parallel rows (fig. 6). No distinctive large tomb seems to be present, the typology being characterized mainly by elongated tombs of rectangular or partly curved shape. The enclosure is formed by coral blocks, less often of standing beach-rock slabs. A diversity of fill (*Kilikili*) is also observable, with the inner part of the graves being covered by basalt gravel, coral gravel, a mix of the two or no specific fill observable. While the rows of tombs are oriented on a northwest/southeast axis, the direction of all the tombs is oriented northeast/southwest. The vast majority of the structures measure between 1.5 m and 2.5 m long, allowing in theory for the burial of adults in a stretched position. Only 4 tombs might contain infants or adults buried in a flexed position.

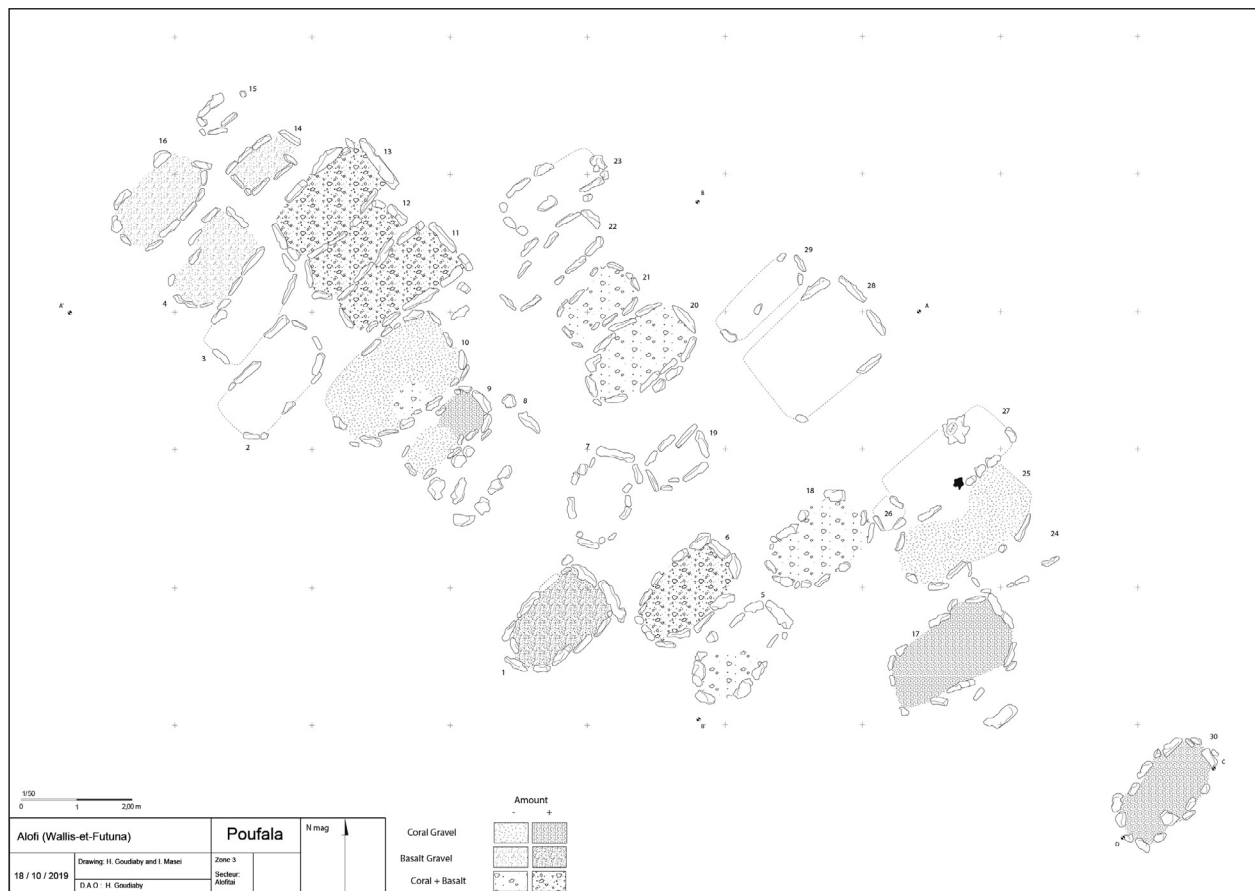


Figure 6. Map of the burial ground of Pufala in Alofitai (Map H. Goudiaby and I. Masei).

The narrow seashore plain of Sa'avaka (southeast Alofi)

The southeastern side of Alofi encloses the long coastal plain of Sa'avaka, nearly 2.5 km long, facing a fringing reef. The plain is nowhere larger than 100 m in width, positioned at the foot of the steep cliff of the third plateau. The systematic survey recorded 91 features over a total distance of 1850 m, divided into 6 successive areas (fig. 7), excluding at this stage the narrow southwestern end of Sa'avaka. This represents an overall density of 5 features per hectare. The majority of the structures are positioned in the inland half of the plain, where excavations had shown a fill of up to 200 cm of archaeological deposits (Sand, Frimigacci et al. 2020a: 97). This allows us to hypothesize that, as in Alofitai, most of the surface remains here are also contemporaneous overall. But contrary to the northwest seashore plain, no central political locus was identified in Sa'avaka, which is characterized instead by a succession of dispersed sites each organised around a *Mala'e* (ceremonial plaza), marked in different instances by an alignment of upright stones, some possibly used in the past as back-rests for high status persons. No large cemeteries were recorded, most of the burial grounds being restricted to a few adjoining structures or a few tens of tombs. Numerous low walls are

present in the inland part of the plain, creating successive compounds.

The presence in Sa'avaka of a set of unique spatial organisations structured around an alignment of standing stones, prompted a more detailed mapping of a total of three alignments. The southern-most site, Asau, is located at the western end of the coastal plain. About 60 m from the cliff face, the end of the high part of the plain created by the dune ridge, is retained by a 41 m long alignment of a total of about 30 standing beach-rock slabs, facing an open space and looking towards the ocean. The slabs observable today at the northeastern end of the alignment are near-totally buried in the sand, while part of the slabs at the southwestern end have been dismantled by trees and roots. The central portion of the alignment still preserves a set of large cut beach-rock slabs, the largest identified measuring 110 cm long and 60 cm high above ground. The main purpose of the alignment was clearly to hold the sediments forming the upper platform of the site, on which a large *Fale* platform and two large tombs stand, facing the *Mala'e*. Another cluster of four large tombs is present at the northeastern end of the alignment, with limits marked by upright beach-rock slabs and a fill of coral and basalt pebbles (*Kilikili*). A similar spatial pattern is present on the nearby site of Faletiale, with the presence of two tombs on

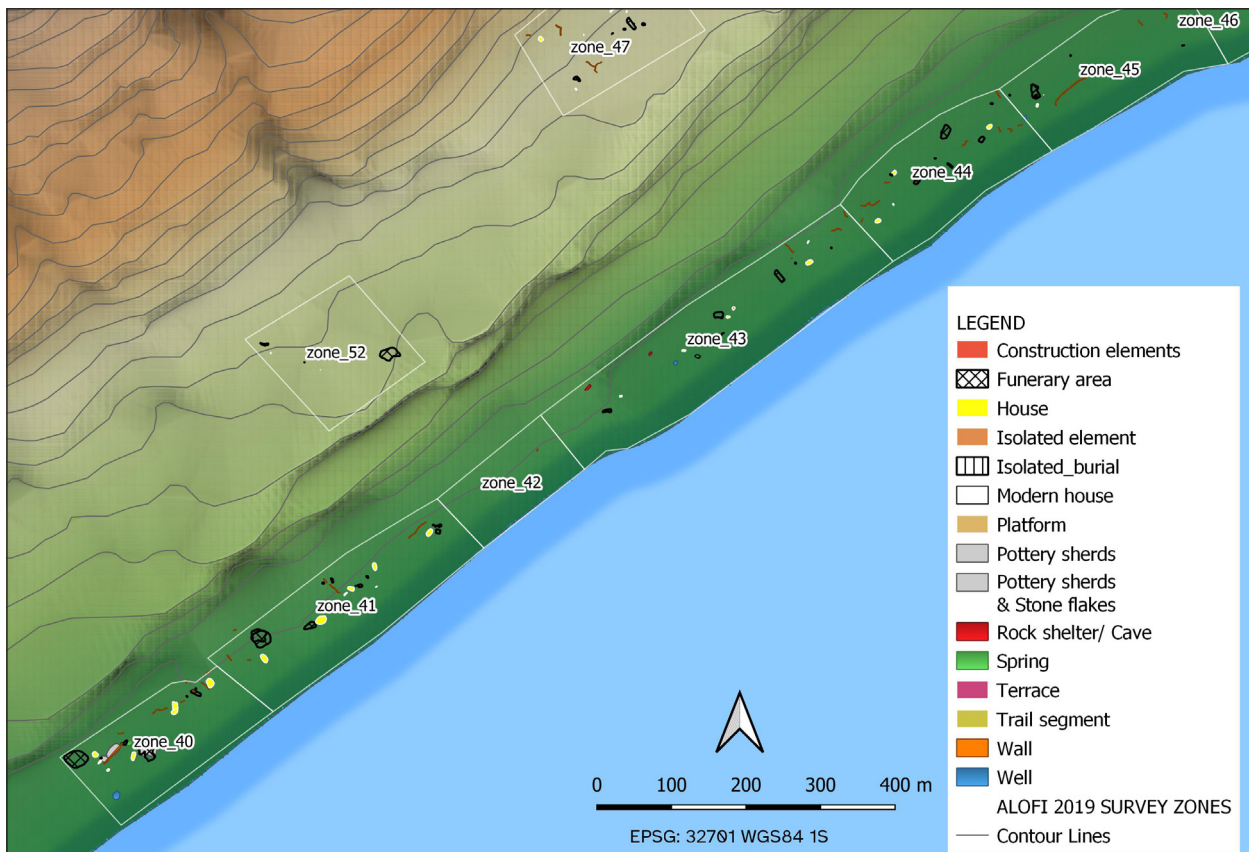


Figure 7. Position of features recorded on the southwest half of the narrow coastal plain of Sa'avaka (Map J. Garcia Sanchez, I. Grau Mira and H. Goudiaby).

the side of a 32 m long alignment of slabs holding a large raised low platform with an oval *Fale*-basis. To the north of this *Mala'e* stands a 13 m long *Fale*-platform, reaching over 40 cm high, a very rare case in Sa'avaka. Although at first sight comparable to the two previous sites, the most unique structure of Sa'avaka is located at the eastern end of the coastal plain, in Poutasi-Lupetu'u. It consists of an alignment of over 46 coral and beach-rock slabs forming a line 40 m long facing the seashore on a northeast/south-west axis and looking towards the *Mala'e* (fig. 8). The largest slabs reach a length of 130 cm and 90 cm above ground, while the smallest do not exceed 40 cm wide and 20 cm above ground. These slabs evidently do not hold any upper platform and their function was overall to mark the limit of the meeting ground, possibly with a set of backrest stones used by high-ranking people during customary/religious ceremonies.

One of the other main results of the intensive survey of the coastal plain of Sa'avaka was the recording of only three wells, two of them filled with sediments for an undetermined but long period. Access to fresh water must have been more challenging in Sa'avaka than elsewhere on Alofi, no major water sources appearing to exit along the seashore. Water had to be collected mainly in rock-shelters and caves along the cliff faces. The absence of major water-resources, alongside the dangerous exposure of the narrow Sa'avaka plain to tsunamis (Lamarche *et al.* 2013, fig. 5), help explain the apparent scarce occupation of the seashore area during most of the cultural chronology, as already identified in the excavations completed in the 1980s. Our

preliminary archaeological surveys confirm oral traditions, which state that the main settlements of the southeastern part of Alofi were located on the fertile plateaux surrounding Sa'avaka's beach area. This is for example the case of the plateau of Poufatu, to the immediate northeast of Sa'avaka, known in the oral traditions as the first occupation-area of the Tuisa'avaka title holder. A major creek trench crosses Poufatu and a number of permanent water-sources are present in the surrounding cliff-faces, the most important being the water-cave of Titilivai. The preliminary survey of Poufatu highlighted the presence of a number of cemeteries, some with large tombs, as well as a central *Mala'e*, organised in a larger settlement pattern formed by a succession of artificial horizontal flats built in steps, with the use of massive basalt boulders to maintain their downward side. Poufatu has also one of the most unique burials of Alofi, built for the daughter of a Tuisa'avaka on a 5 m high karstic outcrop by filling the summit with a cairn of massive blocks comprising a space in which the body was placed. The burial was then closed with a fill of basalt pebbles and the tombs' surface limit marked by an oval arrangement of basalt blocks.

Selected surveys on the inner plateaux of Alofi

In order to gain a first general understanding of the diversity and density of remains present on the different plateaux of Alofi, a set of selected surveys were undertaken, targeting the different ecological landscapes of the inland parts of the island. The main transect, from 30 m to 70 m



Figure 8. Partial view of the standing slabs alignment of Poutasi-Lupetu'u in Sa'avaka (Picture C. Sand).

wide, was carried out from west to east parallel to the traditional multi-secular west-east road *Alalasi* that leads from Alofitai to Lokā across the three lower plateaux. A total of 21 successive zones were surveyed, covering a length of about 4300 m, with a total of over 80 features recorded. A significant diversity in feature-density is apparent, mainly related to the absence or presence of cultivable soil. In the forested zones where the karstic outcrops compose the main surface fill, the only structures identified were coarse mounds raised with karst boulders, whose uses have not been defined at this stage. Aside from their form, the artificial nature of these mounds is demonstrated by the presence of bivalve shell remains amongst the rubble. The zones where surface soil was sufficient to allow the inhabitants to undertake plantations, appear to have gone through a multi-generational process of progressive clearing of the coral pebbles, boulders and rocks, that were placed on the sides of the fields. Over time, this material was used to build lateral platforms, the largest rocks being incorporated into low wall-enclosures. A few very small potsherds were collected during the surveys of some of these fields, as well as at Katuene on the fourth plateau overlooking the *Alalasi* and at Sologa on the second plateau of the north coast. Their presence indicates that the first deforestation of these marginal areas of Alofi took place at least at the end of the first millennium BC, before the abandonment of ceramic production on the Island (Sand 1990). Isolated *Fale*-base have been recorded in some fields, and have been interpreted at this stage as mainly associated to former field shelters and not to permanent housing. No tombs or graveyards were recorded in most of the zones. The only area containing indications of dense former occupations is the Salafa-Mamalu'a plateau, forming the eastern end of the third plateau. Previous surveys had identified some walled enclosures (Kirch 1994, fig. 98), as well as clusters of house-mounds, burials and meeting-grounds in Mamalu'a (Frimigacci 1990, fig. 13). Due to severe liana coverage, the main structural remains identified during the 2019 survey have been successions of walled enclosures and some burial grounds. A significant rise in potsherd frequency is apparent on this eastern plateau, known by the Futunans to be highly fertile.

That the control of the access to the central plateaux was a major security issue in the past of Alofi, is highlighted by the discovery of a previously unknown fort on top of the third plateau when coming from the sheltered north-west coast. The *Alalasi* road climbs the abrupt 45° slope of the 23 m high cliff, on top of which it is flanked on each side by an artificial platform about 180 cm high and 7 m by 3 m wide, which overlook the road and control access to the plateau. The upper edge of the plateau was protected on each side of the two platforms by a defensive wall, today severely damaged. On its northern side, the wall stopped at a vertical cliff edge, while on its southern side, it diverted inland to follow a semi-circular trajectory enclosing the *Alalasi*. In its best preserved parts, the collapsed wall is

today over 220 cm high and 5 m wide. Evidently, this construction was not intended to be a permanent settlement, but as a military defence helping to prevent any party of intruders landing on Alofitai's coast, to progress inland. This site is not related to any oral tradition and has no name, preventing any suggestion of its age at this stage.

The fertile plateau of Lokā (eastern Alofi)

One of Alofi's most important political centres known through oral traditions was Lokā, positioned at the eastern tip of the island, on the second plateau. The *Mala'e* of Ma'uifa is about 55 m long by 30 m wide and faces an upper platform holding some *Fale*-foundations and the burial of the first Ma'uifa. The site was mapped by ethnographer E. Burrows as early as the 1930s (Burrows 1936, fig. 6, see also Kirch 1994, fig. 99 and Frimigacci 1990, fig. 23) and is surrounded by a set of graveyards and *Fale*-foundations. No complete spatial study was fulfilled in Lokā in 2019, the main surveys concentrating on the open fields in order to identify the diversity of the archaeological structures and to evaluate the density of potsherds on the surface. Targeted visits have shown that the Loka plateau has a number of previously unrecorded large cemeteries, containing some elaborate tombs. A set of large high platforms are positioned near some of these cemeteries. Furthermore, the whole plateau appears to have been remodelled over time into a series of artificial flat terraces, whose lower limits are systematically retained by a low wall made with massive basaltic boulders. Settlements extended into the slopes overlooking the main plateau, with the construction of artificial house-mounds in close vicinity one to the other. This pattern is typologically significantly different from the traditional Polynesian settlements still visible on Futuna, characterized by alignments of *Fale* on flat surfaces. One of these hamlets, called Pipi, is located on a slope of 10° to 25° angle and is composed of a total of 15 mapped artificial platforms carved in the slope's sides (fig. 9). Impressive retaining walls made with large basalt boulders support the downward side of some platforms, which have an average surface of 60–90 square metres and can be up to 120 cm high. In some instances, the remains of the base of the *Fale* can still be identified, marked by upright slabs. The surface of one platform has a total of 4 pits, known by Futunans to be water containers. The artificial remodelling of parts of the slope was done up to the upper limit of the site, where the continuous presence of karstic outcrops prevented further development. In other instances, the inhabitants of Lokā used part of the soil-fill from slope modification as building material to raise large artificial *Fale*-mounds reaching between 50 cm and 70 cm high in some instances. As in Sa'avaka, some of the largest ceremonial platforms, like the terrace facing the *Mala'e* of Ma'uifa in Filisia or the platform holding the large *Faleuvō* (Bachelor's house) of Lokā, were retained by an alignment of sometimes massive cut beach-rock slabs. The largest of

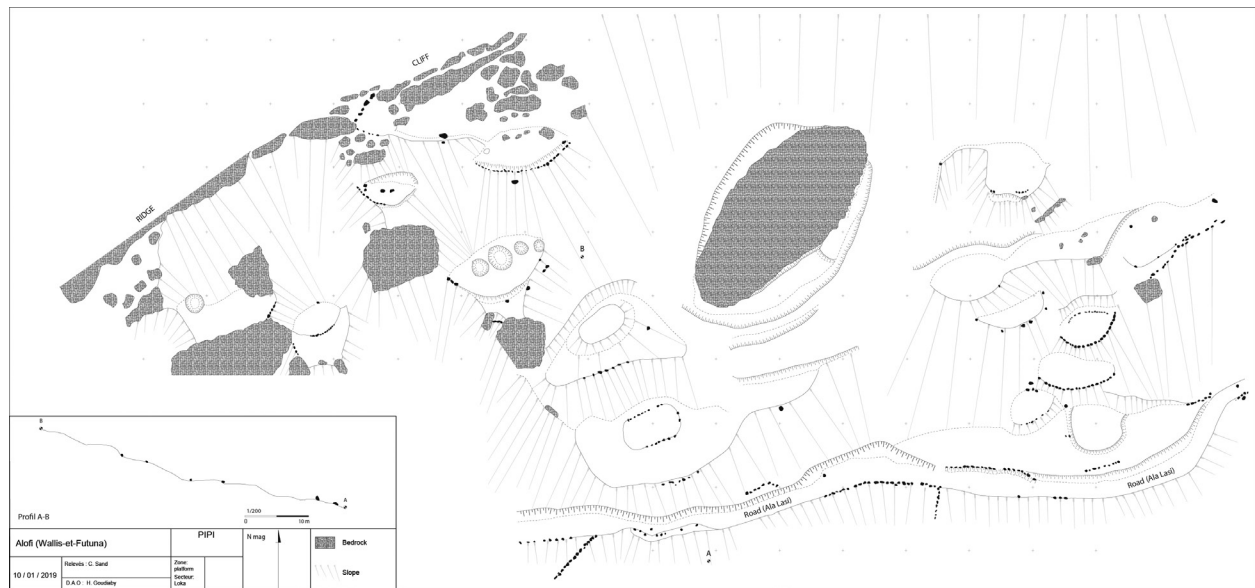


Figure 9. Map of the different platforms of the site of Pipi on the edge of Lokā (Map C. Sand).

these slabs in Filisia was about 200 cm long and at least 100 cm high (Kirch 1994, fig. 100), and was surrounded with smaller-size blocks. These are identified by oral traditions as the 'backrest stones for (high chief) Ma'uifa and his body of chiefs (*kau-aliki*)' (Burrows 1936:123).

The occupants of Lokā had no shortage of water, as a number of natural pools and water-sources are present in the coastal caves along the north coast up to Ganiu. This is the case of the largest rock-shelter of Alofi (700 square metres), called *Fakasiliga Kumete* ('to collect leaking water into a wooden bowl'), where water drips from the sealing through massive stalactites. The Ganiu bay to the west of Lokā, was the main seashore access of this part of the island, possibly explaining the known rivalry between the Ma'uifa chiefdom and the Faletolu polity that occupied the fertile first plateau around Anatale and the seashore area of Ganiu (Frimigacci 1990: 113–116). The former connection between the two spatial areas is marked by the presence of an old road along the first plateau. Its limits are materialized by two parallel walls, the road being enclosed in some parts by a succession of field walls (Frimigacci 1990, fig. 31). After Ganiu this road winds mostly through unfertile areas covered by forest to reach the tip of Alofitai by following the first plateau.

ANALYSIS

The first set of results obtained from the spatial analysis of the archaeological structures recorded, mapped and described on Alofi in 2019, highlight the following characteristics:

1. Although no direct dating has been started at this stage for these surface sites, the data from previous excavations on the coastal plains of Alofitai and Sa'avaka provide

an initial periodization, in which the structures recorded along these seashores date to the very last centuries before the Christianisation of the archipelago in the mid-19th century. The sedimentation-rate appears to have been far less important on some inner plateaux like Lokā (see Sand, Frimigacci *et al.* 2020a: 98) than on the coasts, allowing us to postulate that some of the structures visible in this area could be older. This might be the case of the walled fortification discovered on top of the third plateau edge facing Alofitai. Another potential example is the hill-top of Alofi, Mount Kolofau, comprising house platforms, ditches and some raised fortification walls, but whose last known use in oral traditions relate to the Tongan warrior Ga'atialili about 500 years ago (Frimigacci 1990: 63–64; Sand 2008).

2. Aside from the Alofitai area, the high density of archaeological remains in ecologically less attractive coastal plains like Ganiu and Sa'avaka could be related to increasing population density on Alofi during the last centuries before first European contact and to the development of stronger territorial organizations on the island. A dense occupation is also clearly observed in some inland areas like Lokā and Salafa-Mamalu'a, evidently related to local soil fertility. Elsewhere, areas with less fertile soil also show a lower density of archaeological features, especially burial grounds. This is probably reflective of a sparse settlement density in these tracks of the island. So far, archaeological features are nearly absent in the karstic outcrop surfaces, where the tall forest dominates today. A clinal occupation pattern though emerges, showing a dense settlement of the most favourable areas of the island, sparse occupation of the less productive soil spaces and the apparent multi-millennia preservation of large tracks of tall natural forests in the unfertile portions of Alofi. Since the recolonization of the forest during the last centuries is however demon-

strated for significant parts of Alofi, the chronological fluctuation of inland forests cover remains to be investigated.

3. Although sometimes difficult to differentiate from more recent pig-walls, the impressive extent of former field-enclosures, with 1 m to 1.5 m high successive walls cumulating tens of kilometres of length, is testimony of a clear intensification process at play in some of the rocky parts of Alofi on the 'longue durée'. This data is in accordance with the presence of remains of degraded landscapes covered by fern growth (*Toafa*) on some of the top-hills near Mount Kolofau, which are indicative of the potential massive environmental transformation that parts of Alofi experienced over the course of human history. These data definitely invalidate the idea that Alofi was sparsely occupied in the past, as a large number of Futunans believe today.

4. On this karstic island without permanent streams, unlike Futuna, water access must always have been an important constraint for the inhabitants. Four main supply sources appear to be identifiable: collecting dripping water from the karstic outcrops in caves and rock-shelters, retrieving fresh water flows at the foot of some beaches, digging of artificial pools on platforms to collect rainwater or fill-in these reservoirs from elsewhere, and building of deep artificial wells. The presence of large pieces of pottery in one of the shelters of Poufatu characterized by water dripping from the ceiling is probably testimony that during the first millennium BC, the inhabitants of Alofi had explored all the potential water-sources along the edges of the karstic cliffs and used ceramic containers to collect the water. The chronology of the seven different wells that have been recorded to date in Alofitai and Sa'avaka is for the moment unknown. Oral traditions link their appearance to a group of foreigners, the Agaifo, who also introduced the tradition of taro pond-fields on Futuna (Burrows 1936: 54–55; Frimigacci 1990: 49–50, 79). The oldest pond-fields being dated to around 700–800 AD in Asipani (Sand 1993: 124–125), it is possible that the tradition of digging wells on Alofi gets back to over 1000 years. The location of the Mala'emalu and Sokisoki wells at the foot of the high central dune of Alofitai, give credit to the hypothesis of a recent development for this tradition.

5. At this stage, no site on the island appears to characterize an overarching centralized power-centre, allowing us to hypothesize that there has probably never been a unique chiefdom controlling the whole of Alofi during any period of its history. This conclusion concurs with the data of the oral traditions, which identify four major titles in the past of the island: Faletolu, Ma'uifa, Tuisa'avaka and Vakalasi. This conclusion can explain the presence of architectural variance between areas of Alofi and amongst political centres. One of these differences appears in the use of beach-rock slabs to retain platforms in the eastern half of the island (fig. 10a), while this architectural feature appears absent in the western half of Alofi, although the raw material is readily available there. Different levels of

collective working-input are also identifiable through the size of the slabs or boulders that were moved, as well as the surface area of the *Fale*-foundations between compounds (fig. 10b). These variations reflect a hierarchically inscribed landscape, with the highest concentrations of features evidently located in the most ecologically rich environments. This is the case of the northeastern half of Alofitai, which has the best seashore access of the island, and of the most fertile inland plateaux, around Anatale, Lokā, Mamalu'a, Salafa, Poufatu and Kolofau.

6. Compared to Futuna, Alofi stands out as an island with an unparalleled number of graveyards with architecture. A total of 66 burial areas have been recorded over a stretch of over 1000 m in Alofitai, with the cemetery of Mala'emalu exceeding 4000 square metres. On the less densely occupied coastal strip of Sa'avaka, a total of 29 burial areas were nonetheless surveyed. Although not recorded in detail at this stage, burials are also present in numerous places in the fertile zones of the plateaux. In every case, the burial tradition practiced on Alofi at the end of the occupation period appears to be that of individual graves, grouped in a cluster or organized in parallel rows in larger cemeteries. No definitive indication of collective burial mounds has been identified for the moment. The vast majority of the tombs are identifiable by a surrounding of upright beach-rock, coral slabs, and/or large basaltic blocks (fig. 10c). Significantly, large tombs with complex architecture, associated in some cases in the oral traditions to members of the customary elite whose names are often still remembered, are isolated or found within clusters of a few tombs, but are sometimes also present in extensive cemeteries. Two graveyard patterns emerge, the older being probably linked to the former customary tradition of burying socially prominent elites in isolated tombs with complex architecture, and commoners in low-class cemeteries. It can be hypothesized that the presence of elite burials placed in close spatial association with commoner burials in some cemeteries, is related to changes in the social organisations during the last phase of Alofi's occupation. This observation opens an important field of analysis in relation to our research-topic. Could demographic collapse have led to a reordering of social and political hierarchy, high-status person being forced to intermarry with lower status individuals because of a deficit of high status partners, linked to population decline? This could have generated more egalitarian and mixed burial-customs in the generations preceding the final abandonment of Alofi.

CONCLUSION

While the possibility that 16th and 17th century European contacts could have impacted the demography of Southwest Pacific Islanders has been raised previously (e.g. Spriggs 1997: 234; Flexner and Spriggs 2017: 63), only research in Guam has so far paid attention to early demographic collapses, mainly driven by historical accounts (e.g.



Figure 10. a) Example of an alignment of cut beach-rock slabs facing the *Mala'e* of Asau (Sa'avaka); b) Large *Fale*-structure of Mala'emalu, bordered by up-right beach-rock slabs; c) Example of a rectangular tomb at Asau (Sa'avaka), with the characteristic standing slabs of the Futunan burial tradition (Pictures C. Sand).

Quimby 2017). This paper is a first archaeological step to understand the importance of demographic impact that early European encounters may have had in such regions as the southeast Solomon Islands, Northern Vanuatu, and Western Polynesia. Alofi stands out in the region as a high extended island without permanent population present from the end of the 1830s. Likewise, Futuna's demographic curve shows the very unique trend in Polynesia of a population rise from the 1840s onwards (Rallu 1989), after Christian conversion and notwithstanding the departure of the inhabitants who refused the new religion (Druet-Manufekai *et al.* 2009). Our first phase of intensive archaeological survey and mapping in 2019 on Alofi, has allowed us to highlight the significant density of surface

sites observable on this abandoned island facing Futuna. Alofi had clearly been occupied permanently since first Lapita settlement of the archipelago about 2800 years ago. At this stage of research, its recent abandonment cannot be explained simply by environmental constraints, by a massive (and non-explained) out-migration nor by socio-political stress like cannibalism, all of them implausible or at least non-parsimonious hypotheses. It is more rational to hypothesize that population declined due to a combination of factors, strongly influenced by to 1616 contact.

The unique case of a first European contact on Futuna in 1616 is clearly a key to understand the depopulation of Alofi. First contact potentially allowed the introduction of foreign pathogens in the Central Pacific, responsible for the development of epidemics and severe population decline on the two islands from the early 17th century onwards, which could have triggered a destructive political dynamic. Thus, different factors would have played a role in the demise of the population of Alofi, through a historical process different from what has been identified for Guam and its neighbouring islands, which witnessed repeated intercourse with Europeans after first contact with Magellan's crew in 1521 (Quimby 2017). It is now necessary to find archaeological corroboration, through excavations, skeleton analysis and sediment studies, of the proposal that dynamic demographic changes were an important driver of the turmoil of the recent pre-Christian past of the archipelago.

The introduction of a more complex scenario for the historical development of Futuna and Alofi since the 17th century has potential consequences not only for a better understanding of the recent past of the Hoorn Archipelago, but more widely for the culture-history of the whole region (cf. Cruz Berrocal & Tsang 2017; Cruz Berrocal & Sand 2020). It is today necessary to reanalyse the oral traditions as well as the cultural changes identifiable through archaeology for the last centuries in the Polynesian homeland region, in order to identify possible impacts related to the earliest understudied phase of European contacts, as has been clearly demonstrated for the Mariana Islands (Hezel 1982). When James Cook stopped for the first time in Tonga in 1773, the region had been crossed by Western ships for over 200 years and some of its inhabitants had been in direct physical contact with European sailors since over 150 years. It is time to reconsider how these early encounters, these 'non-events', indeed influenced the history of Oceania.

Acknowledgments

The research project on the archaeology of Alofi Island was allowed by the Tuiagaifo of Alo Kingdom in Futuna, with the blessing of the title-holders of Alofi, the Tuisa'avaka, the Tuiasoa and the Vakalasi. The research-permit was delivered by the Préfet of the Territory of Wallis and Futuna, Mr Thierry Queffelec. We present our sincere thanks for these

customary and administrative authorisations. We also thank the Territorial Service of Cultural Affairs of Wallis and Futuna (STAC) for its invaluable help in organizing our stay. The Alofi 2019 fieldwork was made possible through a Research Grant from the *Deutsche Forschungsgemeinschaft* (DFG) to M. Cruz Berrocal. The Zukunftscolleg and the Universität Konstanz kindly host this grant. M. Cruz Berrocal acknowledges the program STAR2-Santander Universidades and Ministry of Education, Culture and Sports, in the frame of the Program Campus de Excelencia Internacional, call CEI 2015 of the project Cantabria Campus Internacional. The STAC nominated Futunan archaeologist I. Masei as the local member of the group. The New Caledonia Government allowed C. Sand to come to Futuna and lead the mission. C. Sand wrote the manuscript of this paper as part of his research position at the IRD Centre in Nouméa (UMR-GRED). I. Grau Mira was given permission by the University of Alicante (Spain) to take part in the project. H. Goudiaby was on a post-doc position and J. Garcia Sanchez on a research position, both paid by the DFG Grant. In the field, we had the help of Lafaele Faua, Tiele Tufele and Kevin Savea, to whom we are most grateful for their work and camaraderie.

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