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New ‘mysterious mounds’ in Southern Melanesia: An archaeological study of the Tivoli plateau (Lifou, Loyalty Islands, New Caledonia) and regional comparisons

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Abstract

The identification of numerous earthen mounds on the central plateau of the Isle of Pines in the south of New Caledonia has led, over the past 70 years, to a number of hypotheses about their origin and possible uses. As an appreciation to the long-lasting work of Glenn Summerhayes on the Melanesian past, we report here on the first discovery of a large group of tumuli in the Loyalty Archipelago, on Lifou Island, unknown to the local inhabitants. The mapping of the site and subsequent excavation of some structures allows us to characterise these remains and propose a first set of hypotheses about their uses, by confronting our results with the larger corpus of interpretations proposed for New Caledonia’s ‘mysterious mounds’.

Introduction

Early studies of the past of the Pacific have in some archipelagos made abundant use of the idea of ‘population replacements’ to build temporal frames, each ‘archaeological culture’ being supposedly associated to a different ‘race’. This approach was especially popular in the colonial context of New Caledonia, where during most of the twentieth century, amateur archaeologists repeatedly published supposed proofs of the existence of ‘pre-Papuan’ inhabitants, eradicated by later arrivals from Northern Melanesia (see Archambault 1901; Avias 1949; summary in Sand 2020:274–276). Aside from the long-held claim of a Polynesian ancestry of the producers of the Lapita tradition in New Caledonia, culturally and ethnically distinct from the Melanesian ancestry of the producers of Manga’asi-affiliated pottery traditions (Brou 1977), one of the central archaeological site-types used to demonstrate the presence of a pre-Kanak ‘white population’, has been ‘mysterious mounds’.

Hundreds of rounded tumuli of various sizes, the largest reaching nearly 4 m high and over 30 m in diameter, have especially been surveyed on the central sterile ferralitic plateau and along the calcareous seashores of the Isle of Pines, at the southern extremity of the archipelago (Frimigacci 1986). Some large tumuli are also recorded in different plains on the west coast of nearby Grande Terre (Chevalier 1959–62). Salvage excavations identified the presence of a central column of lime in some of these mounds, but aside from human remains discovered in seashore tumuli, these structures appear to be devoid of archaeological items.

Until recently, tumuli had only been recorded in the western half of the archipelago. Here we report on the discovery of a large site of mounds on the calcareous plateau of Lifou Island in the Loyalties, east of Grande Terre. The mapping of the numerous mounds and excavation of some of the structures allow for the comparison of Lifou's tumuli to the corpus of data known for the Isle of Pines and Grande Terre, and to reconsider the chronological timeframes and the possible uses of New Caledonia's tumuli.

Location of the Tivoli site (LWT085), description of the tumuli and excavations

Lifou Island (1200 km^2), in the centre of the Loyalty chain, is formed from a series of uplifted karstic plateaux reaching 100 m high, resting on a deep volcanic cone (Figure 15.1). As part of an archaeological mapping program centred on the north-western region of the Island (Wetr chiefdom), in November 2012 we surveyed along a new path reaching the seashore west of the tribe of Mucaweng. This led us to cross an area in the forest, halfway between Mucaweng and the abandoned seashore of Nonime, characterised by an environment of numerous karst outcrops, resulting in a chaotic landscape with very little arable soil. Where soil can be identified, it appears of limited thickness, although a set of abandoned fields can be identified in the surrounding areas, where karst outcrops are all but absent. Along this section of the trail we identified mounds in a land-plot called Tivoli (Kofias land, archaeological code LWT085). Although the human origin of these tumuli appeared unquestionable at the time of the discovery, no knowledge of them appeared present in the local community.

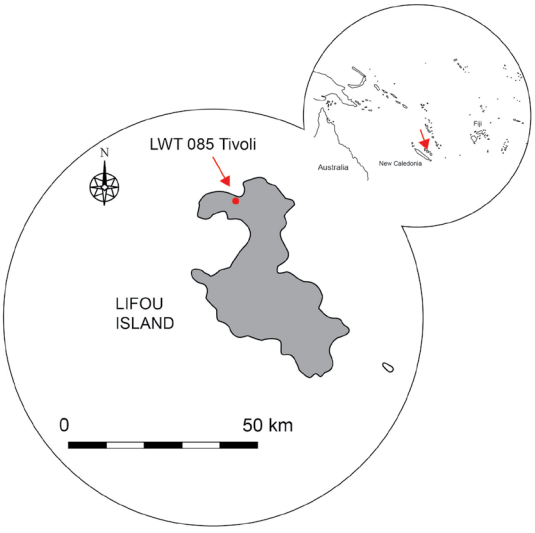

Figure 15.1: Location of Lifou Island in the western Pacific and positioning of site LWT085 of Tivoli.

Source: Figure prepared by D. Baret.

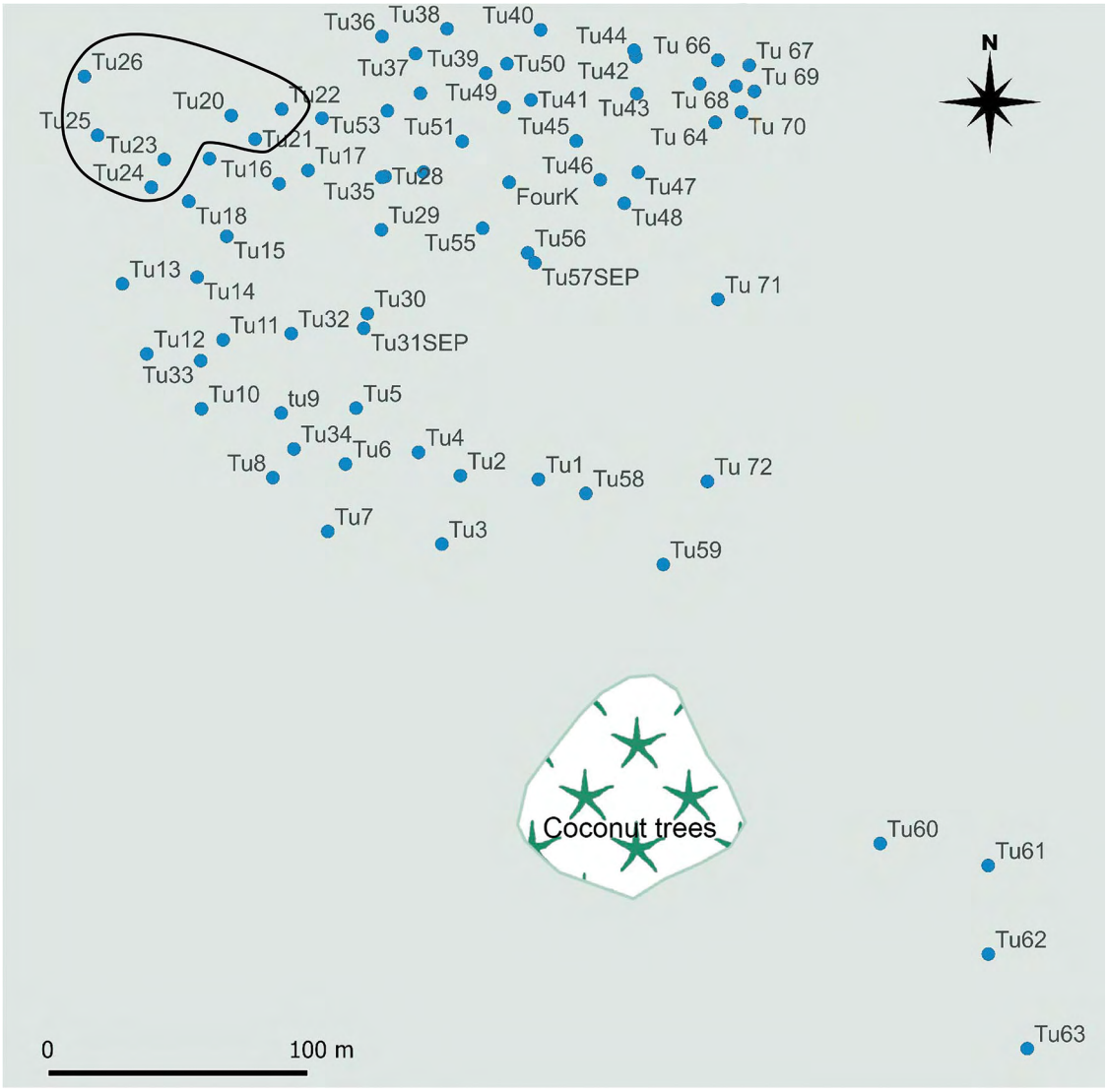

Figure 15.2: GPS map of the location of the tumuli recorded in Tivoli. The group of low flat mounds is highlighted.

Source: Figure prepared by D. Baret.

A general map of the site, displaying every individual mound, was fulfilled by recording their location with GPS and their size and height. A total of 67 structures (recorded as Tu.+number), mainly constituted of fossil coral gravels and karst blocks of different sizes mixed with soil, have been recorded to date for site LWT085, along with three burial areas and two large stone-oven mounds (Figure 15.2). This count does not represent the total number of raised structures present on this site, as other mounds remain to be recorded in the vicinity of the mapped area. A grouping of most of the recorded structures in an area of about 5 ha can be identified; a second group of four large tumuli are located about 200 m to the south-east of this central core, near a cultivable plot free of karstic outcrops. No clear organisation pattern can be identified for the main grouping at this stage, aside from an empty zone in the eastern area. The partial clearing of the dense fern cover has, however, allowed for the identification of what appear to be a set of rough low raised paths, some connecting various tumuli. Future studies should highlight the presence of a more structured pattern.

Analysis of the mounds' morphology and surroundings

The fern cover on the site was such that we refrained from clearing each mound before measurement, as we considered that the natural erosion of the top and sides of the structures prevented any possibility to record their precise original morphology (Table 15.1). The study of the recorded sizes shows that the diameter of the tumuli varies significantly, ranging from 4.5 m for the smallest to 15 m for the largest. The mean diameter is 9 m when amalgamating the data of the 60 mounds. The height of the mounds varies between 40 cm and 240 cm, with the indication of a positive correlation between diameter and height (Figure 15.3). A set of seven low mounds (Tu.20–26) appear typologically unrelated to the rest of the corpus, with a height not exceeding about 20 cm and a large flat top formed of small to medium-sized gravel. These mounds group in the north-west corner of the site, on less rocky soil.

The study of the tumuli's morphology has shown that, aside from the seven low mounds just mentioned, a great number of the higher structures also have a flattened top. The repetition of this pattern appears to exclude the hypothesis that the flat summits result from a natural erosional process. The partial erosion of some mound sides has also highlighted repeatedly the existence of a circle of large karst blocks forming the partly buried basis of the structures, invalidating the possibility that the tumuli are simple cleaning heaps of horticultural fields or refuse piles of coral-stone ovens. Only two of the mounds, Tu.42 and Tu.72, have been identified as cooking areas. These mounds were built from the accumulation of burnt coral blocks and ashes, the last oven used on the mounds being still identifiable in the centre of the two structures. A natural cavity containing human remains was located near Tu.19 and Tu.36. The only visible modification observed on one of the mounds was a small depression, 100 cm deep, arranged in the wall of the large tumulus Tu.62, inside which were seen human remains. No bone samples were collected for analysis or dating.

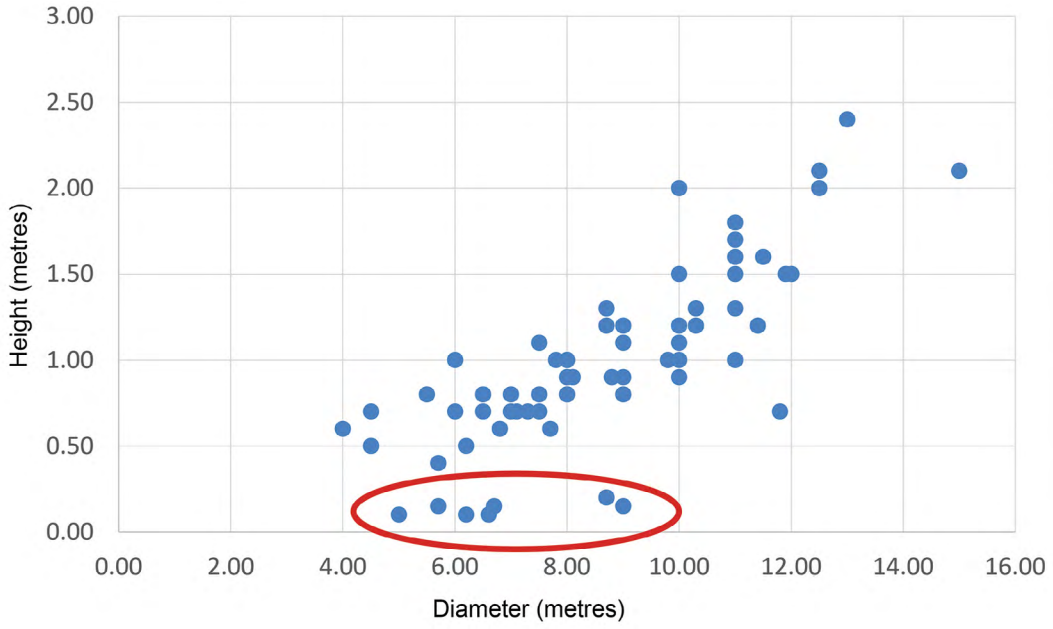

Figure 15.3: Graph of the diameter/height of the tumuli recorded at Tivoli, differentiating the group of low flat mounds.

Source: Figure prepared by D. Baret.

Table 15.1: Morphological data of the tumuli recorded at Tivoli.

Number/Location	Base diameter	Top diameter	Height
Tu.1-723007/7705646	7.50 m	2.50 m	1.10 m
Tu.2-722977/7705647	9 m	4.50 m	1.20 m
Tu.3-722970/7705621	5.50 m	2 m	80 cm
Tu.5-722936/7705673	11 m	4.80 m	1.50 m
Tu.6-722933/7705652	12 m	4.70 m	1.50 m
Tu.7-722926/7705626	12.50 m	4.90 m	2.10 m
Tu.8-722905/7705646	11.90 m	4.40 m	1.50 m
Tu.9-722908/7705671	8.70 m	2.60 m	1.30 m
Tu.10-722878/7705673	10 m	3 m	2 m
Tu.11-722885/7705699	11.40 m	5 m	1.20 m
Tu.12-722857/7705694	7.80 m	2.70 m	1 m
Tu.13-722847/7705721	8.10 m	2.70 m	90 cm
Tu.14-722876/7705724	10.30 m	1.90 m	1.30 m
Tu.15-722887/7705739	10.30 m	4.30 m	1.20 m
Tu.16-722908/7705759	8 m	3.30 m	1 m
Tu.17-722919/7705765	8.80 m	5 m	90 cm
Tu.18-722873/7705753	7.70 m	2.10 m	60 cm
Tu.19-722881/7705769	7.30 m	2.70 m	70 cm
Tu.20-722889/7705786	6.70 m	–	15 cm
Tu.21-722898/7705777	5.70 m	–	15 cm
Tu.22-722908/7705788	6.60 m	–	10 cm
Tu.23-722864/7705769	5 m	–	10 cm
Tu.24-722858/7705758	6.20 m	–	10 cm
Tu.25-722838/7705778	8.70 m	–	20 cm
Tu.26-722833/7705801	9 m	–	15 cm
Tu.27-722924/7705785	9.80 m	7.30 m	1 m
Tu.28-722947/7705762	9 m	3 m	1.10 m
Tu.29-722947/7705742	11.50 m	5 m	1.60 m
Tu.30-722941/7705710	11 m	3.70 m	1.80 m
Tu.31-722940/7705704	Burial cavity		
Tu.32-722913/7705702	11 m	3.60 m	1.70 m
Tu.33-722877/7705691	11.80 m	5.50 m	70 cm
Tu.34-722913/7705658	8.70 m	2.50 m	1.20 m
Tu.35-722947/7705762	10 m	4.30 m	1.20 m
Tu.36-722947/7705816	6.50 m	3 m	70 cm
Tu.37-722959/7705810	6 m	3.60 m	70 cm
Tu.38-722972/7705819	7.10 m	3.20 m	70 cm
Tu.39-722986/7705802	8 m	4 m	80 cm
Tu.40-723008/7705819	8 m	2.50 m	1 m
Tu.41-723005/7705792	8 m	2.70 m	1 m
Tu.42-723045/7705808	'*Hna sa zi*' oven mound		

Number/Location	Base diameter	Top diameter	Height
Tu.43-723045/7705794	4.50 m	2 m	70 cm
Tu.44-723043/7705811	7 m	3 m	70 cm
Tu.45-723022/7705776	7.50 m	3.30 m	70 cm
Tu.46-723031/7705761	8 m	3.90 m	90 cm
Tu.47-723046/7705764	7 m	2.50 m	80 cm
Tu.48-726304/7705752	8 m	3 m	90 cm
Tu.49-722993/7705789	8 m	2.20 m	80 cm
Tu.50-722995/7705806	10 m	4.70 m	1.10 m
Tu.51-722978/7705776	11 m	4.70 m	1.30 m
Tu.52-722962/7705794	10 m	3.90 m	1 m
Tu.53-722949/7705787	10 m	4.50 m	90 cm
Tu.54-722963/7705764	9 m	4.50 m	90 cm
Tu.55-722986/7705742	11 m	6 m	1.60 m
Tu.56-723003/7705733	10 m	4 m	1.50 m
Tu.57-723005/7705729	Burial cavity		
Tu.58-723026/7705640	7.50 m	4.50 m	80 cm
Tu.59-723055/7705613	9 m	6.70 m	80 cm
Tu.60-723139/7705506	11 m	6.50 m	1 m
Tu.61-723180/7705497	13 m	4.50 m	2.40 m
Tu.62-723180/7705463	12.50 m (with burial)	4.90 m	2 m
Tu.63-723195/7705427	15 m	2.70	2.10 m
Tu.64-723076/7705783	6.50 m	4.60 m	80 cm
Tu.65-723069/7757798	6.80 m	3.90 m	60 cm
Tu.66-723076/7705807	4 m	2.40 m	60 cm
Tu.67-723088/7705805	5.70 m	2.80 m	40 cm
Tu.68-723083/7705797	4.50 m	2.50 m	50 cm
Tu.69-723090/7705795	6.20 m	4.30 m	50 cm
Tu.70-723086/7705787	4.50 m	3 m	50 cm
Tu.71-723076/7705715	6 m	3.50 m	1 m
Tu.72-723073/7705645	'*Hna sa zi*' oven mound		

Source: Authors' summary.

Excavations

In order to understand more precisely the stratigraphic context of these mounds, four tumuli were selected for test pit excavations. The main scopes were to identify possible construction phases, to record the presence of archaeological items and to collect samples for dating.

Tumulus Tu.17

This structure is located in an area with numerous karstic outcrops and where the trees are not tall. The mound has an overall rounded structure about 10 m in diameter, with a height of about 90 cm. Its oval-shaped flat top is 6.5 m wide and 5.5 m long, covered with small coral pebbles, with the top of the karstic bedrock emerging in some places. The remains of an arrangement of large coral boulders half-buried at the base of the mound has been identified on the eroded slopes. A 5.5-m-long and 1-m-wide trench was excavated from the edge towards the centre of the tumulus, up to the bedrock. The stratigraphy can be divided into four levels (Figure 15.4):

- Level 1, 40–45 cm thick, is formed of a dark brown sediment incorporating numerous pebbles of coral, about 3–5 cm in diameter, along with a few larger blocks. The lower part of the level has more sediment, due to natural percolation.
- Level 2 is present irregularly at the interface between the upper fill and the karstic bedrock, and is formed of the decomposition of the fossil coral into an oxidised orange or white soft sediment.
- Level 3 is only present on the outer margin of the mound and is formed of a loose brown sediment rich in roots and enclosing small pebbles resulting from the mound's erosion.
- Level 4 is the in situ coral bedrock, of irregular morphology, on which the mound has been built.

No human-made items were recovered in the mound. A fragment of a *Cypraea* sp. and numerous shells of the local *Placostylus* sp. terrestrial gastropod were the only non-coral remains present in the fill. Considering the distance from the ocean and the height of the site above the sea, the *Cypraea* shell can only have been brought by human agency. It was dated to 2454+/–25 BP (Wk-38472), calibrated at two sigma to 2240–1990 cal. BP.

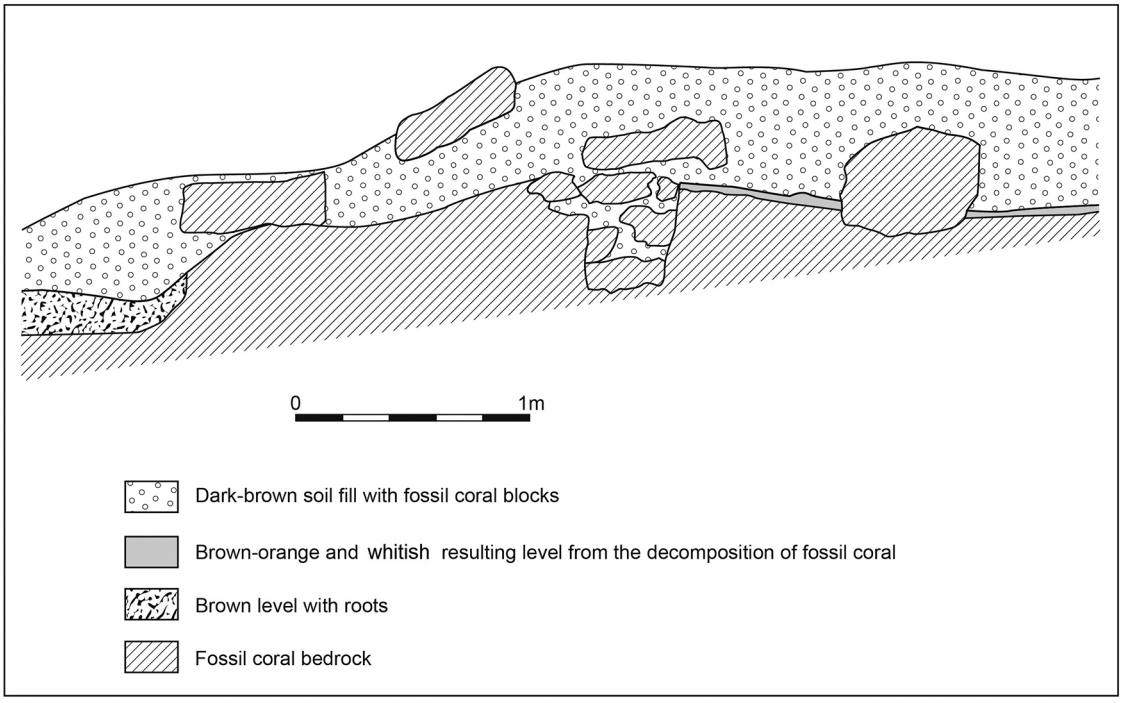

Figure 15.4: Stratigraphic profile of the trench excavated in mound Tu.17.
Source: Figure prepared by D. Baret.

Tumulus Tu.53

This structure, located close to the path leading to the seashore, has an overall rounded shape with a diameter of 10 m and a height of over 90 cm. The flat top, about 6 m wide, is mainly covered with medium-sized coral blocks about 20–30 cm wide, a pattern clearly different from Tu.17. The excavation of a one-square-metre test pit positioned in the centre of the mound identified a fill divided into four levels:

- Level 1, reaching over 110 cm depth, is formed of fossilised coral boulders, becoming larger in the lower half of the fill, with blocks reaching 40–50 cm width and weighing over 30 kg.
- Level 2 (110–135 cm) is irregular in shape and thickness due to the presence of outcrops of the karstic bedrock (Level 4). It is composed of infilled soil mixed with pebbles.
- At the interface between this level and the bedrock (Level 4), oxidation and decomposition of the fossil coral has created thin orange-coloured lenses (Level 3).

The excavation has shown that the build-up of tumulus Tu.53 was achieved in one chronological episode, with a pattern of accumulating the largest blocks in the basal rows and smaller blocks in the top rows. A charcoal sample was collected at 115 cm deep, and was dated to 373+/–20 BP (Wk-38473), calibrated at two sigma to 470–320 cal. BP. This recent result confirms the hypothesis reached during the excavation, that this isolated sample is an outlier infiltrated into the soil matrix, as from experience with Loyalty Islands excavations, recent layers are rich in charcoal remains due to poorly acidic soil characteristics.

Low mound Tu.20

This structure, about 7 m in diameter, is located 30 m to the west of Tu.17, in an area mainly composed of low mounds. The surrounding landscape is characterised by a floor of coral pebbles about 3–5 cm in diameter, in an area of small trees. The excavation of a one-square-metre test pit in the centre of the mound allowed for the differentiation of four stratigraphic levels (Figure 15.5):

- Level 1 is only about 10–15 cm thick and is formed entirely of a layer of fossil coral pebbles of different sizes, wrapped in a humiferous dark brown sediment.
- Level 2 (10–40 cm) is composed of a light brown loose soil, full of tree roots and pebbles as well as some larger coral blocks.
- Level 3 (40–45 cm) is the oxidised interface between the soil fill and the bedrock, with lenses of loose orange sediment.
- Level 4 is the natural coral bedrock.

A *Tridacna* sp. bivalve fragment was collected from the mound's surface, and dated to 2229+/–24 BP (Wk-38471), calibrated at two sigma to 1920–1740 cal. BP. An operculum from a *Trochus* sp. gastropod was recovered at 20–35 cm, underneath the mound's base, and dated to 2249+/–29 BP (Wk-38470), calibrated at two sigma to 1950–1760 cal. BP. The bivalve and the operculum cannot have reached Tivoli by a natural process like crab activity, and must have been deposited by human agency.

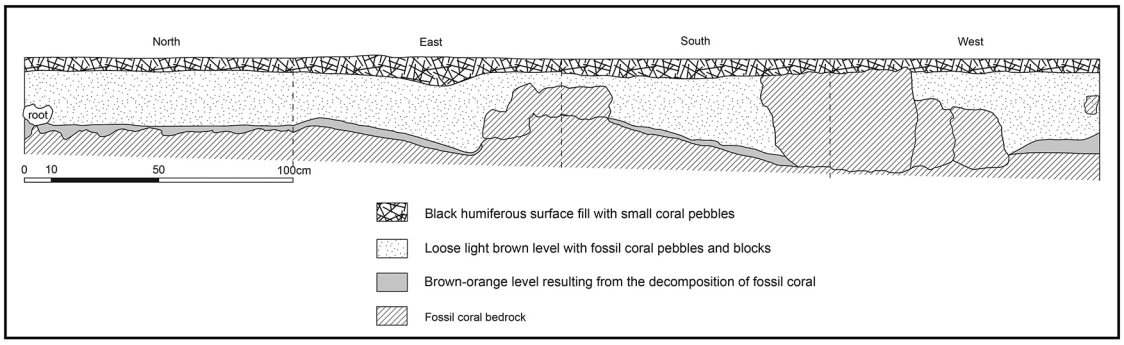

Figure 15.5: Stratigraphic profile of Test pit 1 in mound Tu.20.
Source: Figure prepared by D. Baret.

Oven mound Tu.42

This mound is located at the north-eastern limit of the tumuli area, in an environment of rugged karstic outcrops. Surveys further east did not discover other tumuli. Tu.42 has a unique typology only identified on one other structure of the Tivoli site (Tu.72, diameter 7.5 m, height 0.7 m). The centre of the 6.5-m-wide and 1-m-high rounded mound has a 2.6-m-wide pit containing the remains of a stone oven. The basis of the mound is surrounded by a ring of burnt coral fragments about 1.5–3 m wide, with two higher heaps in the north-west and south-west corners, indicating an original larger size of the cooking mound and successive cleaning episodes of the coral stones. A one-square-metre test pit was positioned in the southern part of the oven pit, and encompassed part of the remaining stone-oven structure as well as the flat summit of the mound. The main objective was to recover dating material and see if any chronological phasing of the build-up of the mound was identifiable. A total of four different levels were identified (Figure 15.6):

- After a thin topsoil, Level 1 is a loose soil fill about 35 cm thick, with numerous roots, mainly formed of the oven’s ashes and soil. It encloses the infill of stones from the remaining oven in the northern profile. The lower half of the level, after 20 cm depth, is harder, probably due to the progressive compaction of the sediment.
- Level 2 (35–45 cm) is a loose reddish fill of burnt coral enclosing large charcoal fragments.
- Level 3 (45–70 cm) is a succession of ash lenses, mixed in some cases with charcoal fragments.
- Level 4 is the fossil coral bedrock, which has a smooth surface, possibly related to the severe heating process that led to partial decomposition of the bedrock’s upper surface. It can be concluded that the first burning was probably made directly on the coral outcrop surface.

Two charcoal fragments were sent for dating. The first, from Level 2 (35 cm), returned a date of 155+/–21 BP (Wk-38474), calibrated to the last two centuries. The second sample, from Level 3 (60 cm), returned a date of 174+/–21 BP (Wk-38475), also calibrated to the last two centuries.

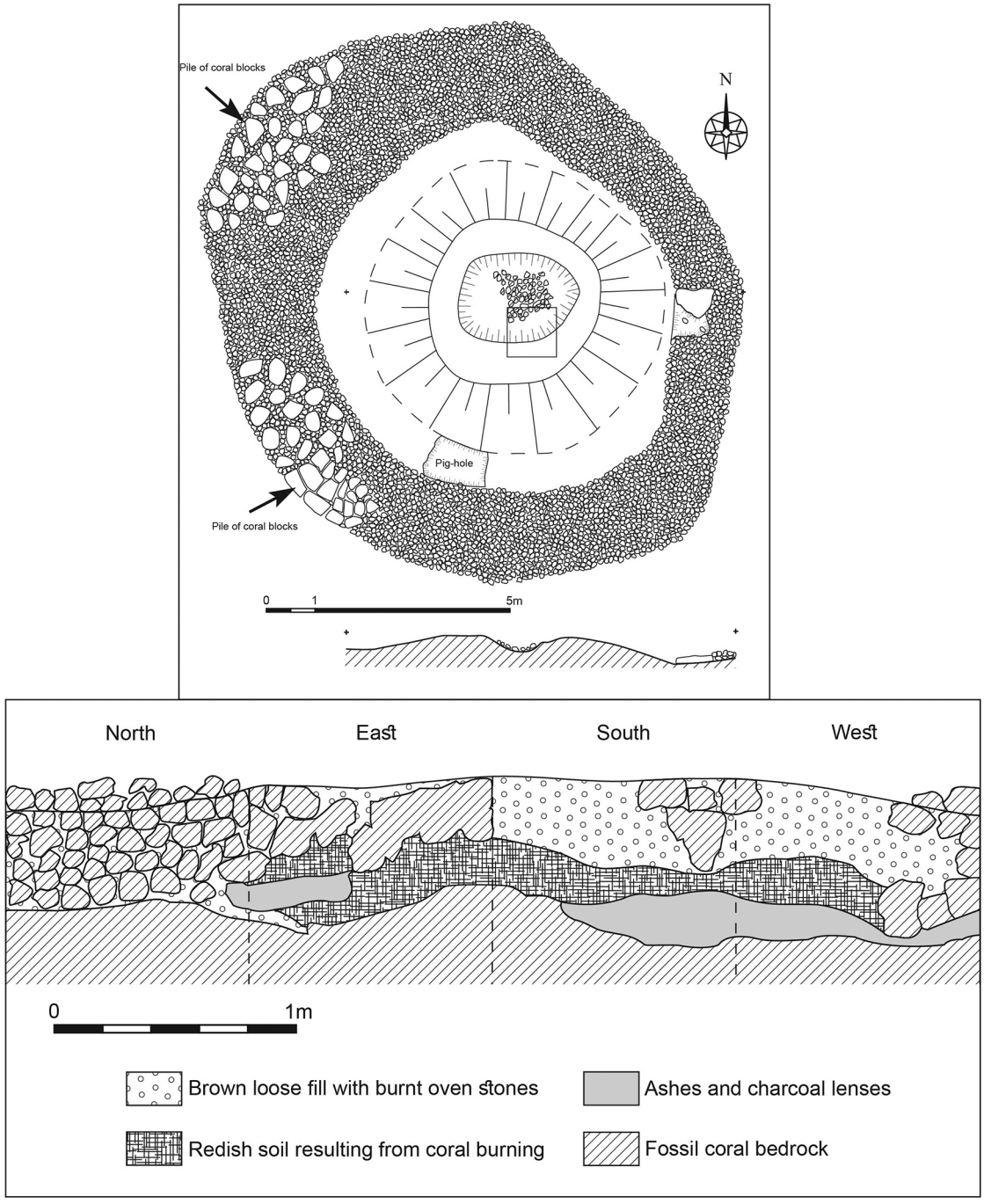

Figure 15.6: Map of mound Tu.42 and stratigraphic profile of Test Pit 1.
Source: Figure prepared by D. Baret.

Summary on the tumuli of the Tivoli site

The mapping of about 70 tumuli on the site of Tivoli, and the partial excavation of four structures, has added new information about New Caledonia's unique mounds. All the mounds were man-made through the piling-up of karstic material retrieved from the immediate surroundings; the site appears to have been chosen because of its rugged environment. Although we concentrated our study on only one location, the diversity of sizes and forms has nonetheless differentiated three types of tumuli:

- Type A, the most represented in our sample (61/70), is characterised by a large diversity of sizes and heights, with an estimated total volume infill ranging from five to over 70 cubic metres above ground. The excavations fulfilled in two of these structures appear to indicate only one main building episode, with a fill of diverse sizes of karst blocks and pebbles on top of the bedrock substratum, often placed inside a circular layout of large coral blocks (Figure 15.7). Most of the tumuli less than 10 m in diameter have a flattened top, while the largest and highest mounds, located closer to productive planting grounds, have a more rounded summit (Figure 15.8). The absence of archaeological items and pit structures prevents at this stage any definitive conclusion about their use(s). It can only be said that they are not waste stone piles of horticultural gardening.
- Type B mounds, characterised by a total of seven low rounded flat structures of an overall smaller diameter than Type A, have tentatively been interpreted as the floors of simple house-structures or as the remains of deconstructed mounds.[1]
- Type C has only two occurrences, with the oven mounds Tu.42 and Tu.72. The elders of Mucaweng tribe identified these structures as a cooking area (*Hna sa zi*) for *Cordyline fruticosa* or *terminalis* (*zi* in Drehu language), a root supposed to have been used by the inhabitants of Lifou well before the arrival of yams on the Island, and eaten especially during times of food shortage.[2] The contact-period dating of *Hna sa zi* Tu.42 was anticipated, as the preserved remains of the stone oven on the surface of the mound indicated a recent use of the structure. While the oral tradition specifies that this type of mound was used only once, the two dates from Tu.42 do not allow us to confirm this, although the stratigraphy appears to point to a single use of the oven.

Significantly, the three C14 dates of Tivoli completed on shell all pool in a chronological bracket just before (two samples, Type B mound) or around (one sample, Type A mound) 2000 cal. BP. That the two samples of mound Tu.20 returned near-identical dates strengthens the conclusion that these results indicate the use of Tivoli and the building of at least some of the tumuli about 2000 years ago.

1 It must be acknowledged that these two hypotheses are at this stage a first tentative explanation. Elevated house-mounds are uncommon in the Loyalty Islands, as the draining karstic subsoil of the Islands does not necessitate the raising of the house floors above ground. Clear cases of 'deconstruction' of mounds, allowing for the reuse of the raw material to build other mounds, has been identified in sites on Grande Terre.

2 Several days of cooking are needed to ensure the preparation of the mature *Cordyline fruticosa* or *terminalis* and especially to melt the toxic fibres and oxalic crystals contained in the root (Carson 2002; Guillaumin et al. 1946). In Lifou, a set of rituals had to be followed before consumption, the first *zi* eaten being collected from the outer side of the oven. Once cooked, the roots of *Cordyline* could be kept over a month inside the cooking mound.

Figure 15.7: Profile of the fill of large coral blocks forming mound Tu.53.
Source: Figure prepared by D. Baret.

Figure 15.8: Example of mound Tu.61, a large tumulus at the south-east edge of the site of Tivoli.
Source: Figure prepared by D. Baret.

Moving forward on New Caledonia's 'mysterious mounds': Unsustainable hypotheses and possible interpretations

The presence of tumuli in New Caledonia has led to a rich array of interpretations over the last century. A geological origin for these structures was proposed by some authors (Brou 1977:102; Golson 1996:314), although the concentration of mounds in some unique locations like the central ferralitic plateau of the Isle of Pines, and their total absence in similar geological settings on Grande Terre, invalidates this explanation for the vast majority of them. After the discovery of the remains of extinct flightless birds of megapode affiliation (Poplin et al. 1985), R.C. Green proposed to interpret these raised structures as megapode nests, comparable to what is still observable in Northern Melanesia and Western Micronesia with living megapodes (Green 1988). But this non-human interpretation is today weakened by the new classification of the large flightless bird *Sylviornis neocaledoniae* in the galliform family (Worthy et al. 2016). Remains of a true megapode, *Megapodius molistructor*, have been discovered on the Isle of Pines (Balouet and Olson 1989:9–11), but also in the Pindai region on the north-west coast of Grande Terre (cf. Anderson et al. 2010:Table 3-4), where not a single tumulus has been recorded during archaeological surveys so far. It can therefore be concluded that most of the tumuli in New Caledonia do not have a natural origin and are thus anthropogenic.

To disentangle the histories behind this specific type of structure, it is necessary to challenge previous assumptions, which all searched for a single explanation. We need to change our analytical paradigm by taking into account that there appears to have been different periods of construction and different uses of the mounds around the archipelago over time. The hypothesis that the tumuli were built by Palaeolithic or early pre-ceramic occupants appeared, in the 1970s and 1980s, to be sustained by the dating of *Placostylus* sp. terrestrial shells or fragments of 'mortar' collected in the central column of a number of excavated or partly destroyed mounds. Dates ranking from nearly 13000 BP to the fourth millennium BP were obtained by several researchers (Table 15.2). Unfortunately, the exact nature of the 'mortar/concrete' column remains unresolved (see Golson 1996:311–313; Green and Mitchell 1983:22–31). Likewise, the dating of land snails is made hazardous by carbonate contamination and has been shown to be useless for archaeology (see Golson 1996:312). Finally, the last 30 years of research in Central and Southern Melanesia have definitely confirmed that first settlement of this region was linked to the arrival of Lapita sailors, and it appears today that all these early results, although they potentially inform on geological and pedological processes, cannot be used as proof of any remote settlement of New Caledonia.

Table 15.2: Radiocarbon dates obtained from samples collected in tumuli from the plateau of the Isle of Pines (IoP) and from Païta (south-west Grande Terre).

Location	Sample type	Uncalibrated date	Reference number
Païta (date I)	*Placostylus*	12900+/–450 BP	Gif 298
Païta (date III)	Mortar	9600+/–400 BP	Gif 300
Tumulus 5 (IoP)	Land snail shells	8180+/–75 BP	NZ3347
Tumulus 5 (IoP)	Coral aggregate	7710+/–70 BP	NZ3348
Tumulus 5 (IoP)	Land snail shells	7590+/–180 BP	NZ3589
Tumulus 5 (IoP)	Land snail shells	7540+/–160 BP	NZ3587
Tumulus 5 (IoP)	Land snail shells	7090+/–110 BP	NZ3588
Païta (date II)	Mortar/*Placostylus*	7070+/–350 BP	Gif 299
Tumulus 5 (IoP)	Old concrete	5090+/–130 BP	NZ3585

Location	Sample type	Uncalibrated date	Reference number
Tumulus 5 (IoP)	New concrete	4120+/–90 BP	NZ3584
Païta (WPT102)	Mortar	3450+/–70 BP	Beta-66643
Tumulus 121 (IoP)	Concrete	3380+/–80 BP	NZ3593
Tumulus (IoP)	Mortar	3380+/–70 BP	Beta-67061
Tumulus 121 (IoP)	Concrete	3370+/–80 BP	NZ3590
Tumulus 121 (IoP)	*Placostylus*	3150+/–80 BP	NZ3591
Tumulus 121 (IoP)	*Placostylus*	3070+/–80 BP	NZ3592

Source: Authors' summary.

At the other end of the chronological spectrum, the antiquity of some of the tumuli recorded on the south-west coast of Grande Terre need also to be questioned. Indeed, artificial mounds continue to be created today when cleaning large wooded plains with heavy machinery, as the compacting of burnt *Melaleuca* tree (*Myrtaceae* family) remains and soil in piles creates in a few years 'perfect tumuli'. Another set of distinctive tumuli has been recorded in some peridotite regions of Grande Terre, dotting some high-altitude plateaux of tens or hundreds of large and high mounds made by accumulating chrome and iron blocks (Avias 1949:18–21). Recent studies have shown that these mounds were mainly raised during the second millennium AD (Sand et al. 2012:33–38; Sand in preparation). On the Bogota peninsula near Canala (south-east coast of Grande Terre), oral traditions describe these mounds as memorials of exchange ceremonies between seashore and inland communities (Gony 2014). On Maré Island south of Lifou, oral traditions relate to a number of massive tumuli built possibly during the last few centuries as boundary markers between chiefdoms or as a memorial to old alliances (Dubois 1981:32; Sarasin 2009 [1929]:Fig. 3(1)). The case of the *Cordyline* oven mounds of Tivoli, probably built by refugees during the wars of the middle of the nineteenth century, parallel larger mounds used for the same purpose discovered on the Isle of Pines.

While a diversity of mound uses must be highlighted for the archipelago, it would be a mistake to conclude that there are no identifiable patterns that may connect a significant set of these tumuli. This appears to be especially the case between the Isle of Pines and the new discovery on Lifou presented in this paper. Since the first publication of the Tivoli report in 2013, a number of other sites around Lifou containing mounds have been reported to archaeologists, indicating that this type of structure has a wider incidence than just one isolated site. On the Isle of Pines, following pioneering work by J. Golson, archaeologist D. Frimigacci recorded over 300 tumuli (*Pure* in Kwenyi language), in two distinct geological settings. About 160 tumuli are located on the flat central ferralitic plateau of the Island (Frimigacci 1986:Fig. 3; Lagarde 2020:Fig. 2). Two main types of mounds were distinguished by J. Golson:

> (d)imensions of the bowl-shaped category (including the conical) are diameter 12.3 to 28.3 m, height 0.9 to 3.8 m; of the saucer-shaped, diameter 13 to 37 m, height 0.6 to 1.7 m. (Golson 1996:311)

Detailed mapping of some of them has revealed the presence of simple path constructions or stone alignments at the base of the mounds (Figure 15.9) (Lagarde 2020:Figs. 6, 8).

Figure 15.9: Tumulus KTU049 on the central plateau of the Isle of Pines, showing the double alignment of pebbles of the path leading to the top of the mound.
Source: Figure prepared by D. Baret.

No intelligible pattern has however been identified in the spatial layout of these tumuli. Studies on a number of partly destroyed mounds, and three proper archaeological excavations, have shown that the fill is mainly composed of chromite gravel. An important number of mounds appear to have a central cylinder of carbonaceous material whose origin is still debated. Remains of basin/post-hole depressions were observed during excavations, but their exact origin and use is unclear (Golson 1959–62:20-22, 1961:171). No archaeological remains have to date been discovered inside these plateau mounds, although some potsherds have been collected in the immediate vicinity.

A minimum number of 185 tumuli have also been recorded in different parts of the karstic seashore edge that completely encircles the Isle of Pines’ central plateau (Frimigacci 1986:Fig. 3; Lagarde 2020:Fig. 2). In the coastal areas, the mounds are mainly made of sand, coral gravel and coral blocks, and appear to be overall of lower height than those recorded on the plateau. Local inhabitants have repeatedly reported that human bones are systematically uncovered during the quarrying of these seashore tumuli (Frimigacci 1986:31; Golson 1959–62:22; Lagarde 2020:215). Archaeological excavation of one of these partly destroyed mounds by D. Frimigacci at Tü’ü (Wi Mwa, KVO005), on the south-west coast of the Isle of Pines, confirmed the presence of human burials incorporated in the fill. The original mound would have been about 30 m in diameter and 2 m high, with a buried ‘concrete’ column in its centre. In a basal layer a complete skeleton, broken up in three parts (sample 5, level III), was dated to 1845+/–35 BP (Seattle 766), calibrated at two sigma to 1860–1630 cal. BP. In a layer above (level II), the disturbed remains of a number of skeletons were retrieved, among which was one apparently still positioned in its original elongated layout. One of the human bones was dated to 1845+/–65 BP (Seattle 765), calibrated at two sigma to 1925–1590 cal. BP. A charcoal collected about 40 cm under the surface, in the upper part of level II, was

dated to 1930+/–70 BP (Seattle 655), calibrated at two sigma to 2040–1645 cal. BP (Frimigacci 1986:29–31). Recently, L. Lagarde has dated a human bone retrieved from a seashore tumulus (KGJ003) at Gadji on the north coast of the Isle of Pines, to 2208+/–39 BP (Wk 20880), calibrated at two sigma to 2309–2003 cal. BP (Lagarde 2020:214).

The main question that confronts archaeologists is the link between the coastal tumuli of the Isle of Pines, evidently built up over time as burial mounds, and the plateau tumuli. The set of three dates on human bones point to a period around 2000–1500 BP for the main construction of the burial mounds. Considering the old age of these remains and the severe decomposition of the bones excavated at Tü'ü, although they were buried in alkaline sandy/coral fill, different researchers envision a similar burial finality for the plateau tumuli (Frimigacci 1986:32; Lagarde 2020; Sand 1995:50). The absence of bones in these upland structures is explained by the rapid decomposition of the bodies and skeletons in the acidic chromite and iron gravel used as cover, which has a pH over 4.5 (L'Huillier et al. 2010:39). Expanding our focus, we suggest a similar explanation for the majority of the mounds of Tivoli in Lifou presented in the first part of the paper, interpreted as a grouping of burials forming a cemetery. The absence of any remains (aside from the recently added bones of Tu.62) results in this case from the fossil coral blocks' acidity and permanent water drainage through the rain, which have since long decomposed any bone that would have been buried in the tumuli. But contrary to the coastal mounds of the Isle of Pines, most of Lifou's mounds might have only contained a single or a few bodies. To explain the flat top observed on numerous structures during the survey at Tivoli, it might be hypothesised that the raised burial ground was protected for some time by a vegetal roof cover.

The proposal of a similar use of the mounds on the Isle of Pines and Tivoli, mainly as burial repositories during what appears to be the same overall chronological period, questions the cultural processes that might have led to this specific burial ritual about 2000–1500 years ago. Interestingly, the chronological period which appears associated with the building of at least some of the tumuli studied on site LWT085 of Tivoli is known through other archaeological studies in the Loyalty Islands as a time of major cultural transformations in the region. Excavations have shown the rapid demise, after about 2000 BP, of regular contacts between the Loyalties and nearby Grande Terre. At about the same time period, a number of enclosures of megalithic size, incorporating massive karst boulders in the wall's constructions, started to be built on Maré, Lifou and Tiga Islands (Sand 1996). One of these enclosures (site LWT092) has been discovered on the coastal flat of Nonime, at the end of the trail crossing the site of Tivoli (Sand et al. 2013:12–15). This significant cultural change appears to have been concomitant with the emergence of stronger chiefdoms. The progressive hierarchical centralisation might be explained by a process of demographic growth during the last centuries of the first millennium BC in the Loyalty Islands, intensification of the landscape's occupation forcing settlements to expand towards marginal ecological areas, before a progressive reduction of relations between the Islands for centuries, due to inner tensions. Interestingly, archaeological data from the Isle of Pines has highlighted the similarity of cultural changes between this Island and the Loyalties at the end of the first millennium BC (Lagarde and Ouetcho 2015:Fig. 14), strengthening the suggestion of a connection between the tumuli of the two regions.

Conclusion

This paper has proposed to bring new archaeological data pertaining to the 'mysterious mounds' of New Caledonia, one of the long-held debates about Melanesia's past, as a tribute to the decades of work of Glenn Summerhayes on the Islands of the Southwestern Pacific. The topic remains

to this day far from simply a scientific question. In Southern Melanesia, some people still claim that these mounds were built by 'pre-indigenous' (possibly 'white') inhabitants. Others want to see them as natural features, considering that they are 'too numerous and too large' to be human constructions. A number of the tumuli located in south-western Grande Terre might have been built only during the last century as part of mechanised dryland forest clearing. Although partial at best, the restricted archaeological data at hand nonetheless point to a clear concentration around 2000 BP of the few valid C14 dates retrieved from the excavated structures. Our interpretation of the results gained from Tivoli, analysed in a broader context, led us to hypothesise that on Lifou Island, after about one millennium of human settlement, constraints imposed on some communities led them to sanctuarise some of the less cultivable zones, characterised by karstic outcrops, by transforming them into cemeteries. A similar process appears to have been at play at the same time period on the Isle of Pines, as has been suggested by different researchers over the last decades.[3]

This conclusion raises intriguing questions on the dynamics and reasons fostering the social, cultural and political changes at play at that time throughout a number of archipelagos of the south-western Pacific (see Sand 2018:192–194 for New Caledonia). Explanations ranging from inner changes (Bedford and Clark 2001) to the arrival of new populations (Burley 2013) and impacts of natural phenomena (Spriggs 1997:178) have been proposed. Although little acknowledged for Island Melanesia, the role of demographic pressure appears to us to be a central node to consider in our analysis of the changes witnessed throughout the region during the first millennium AD. Evidently the tradition of burying family members in a dedicated mound, generation after generation, was not sustained for long in New Caledonia. But archaeological studies on Grande Terre have shown that, up to the nineteenth century, some Kanak communities had the tradition of burying their relatives under a pile of stones, in marginal areas like rock shelters (Sand and Ouetcho 2010). This example demonstrates that there is no need to invoke a 'pre-Kanak' population to account for an old tradition of burial mounds in some regions of Southern Melanesia. Evidently, the way forward to definitively retrieve the 'mystery' out of New Caledonia's mounds, should be to dedicate a pluri-disciplinary research program on this specific topic. This sounds like a good collaborative project to envision with retired Emeritus Professor Glenn Summerhayes.

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3 Large artificial mounds are not unique to New Caledonia. They have also been uncovered on Erromango Island in Southern Vanuatu (Bedford 2006:36) and burial mounds are present in the Sigatoka dunes cemeteries dated to the first centuries of the first millennium AD (Best 1987; Marshall et al. 2000:Plate 10). Further east, Tongatapu saw, during the first millennium AD, the first repeated use of mounds to bury the dead, a tradition that led over the succeeding millennium to the building of thousands of tumuli (Freeland et al. 2016).

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