

PRELIMINARY REPORT OF EXCAVATIONS AT NOMBE ROCKSHELTER, SIMBU
PROVINCE, PAPUA NEW GUINEA

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HISTORY OF EXCAVATION

Excavation began at this site in 1964 during the fieldwork of J.P.White (published as NIOBE in White 1972). Considerable stratigraphic complexity persuaded him to divide the finds into only two broad groups: that above substantial sheets of flowstone, and that from below and outside (to the east) of those sheets. White's work had produced large amounts of animal bone and stone, but detailed analysis and dating were not possible without further understanding of the stratigraphy. The present researcher was directed towards Nombe and other sites in the Kundiawa/Chuave area, in what was then the Chimbu District, in 1971 (Figure 1). The aim at that time was to investigate further some complex but potentially interesting sites. The research was intended to take only a short time. The aim of the work at Nombe in 1971 was to test another area of the site to see whether more sense could be made of the stratigraphy and chronology in order to allow further analysis of a potentially interesting and productive site.

New excavations by the author in late 1971 revealed a depth of Pleistocene deposits, under the base of White's excavations, that contained considerable amounts of both animal bone (including extinct fauna) and stone artifacts. Even larger quantities of more recent materials were also recovered but the stratigraphy seemed to have little connection with that shown in White's excavation drawings of 1964.

The author then became based in Port Moresby, but teaching and administrative duties at the University of Papua New Guinea prevented much progress being made on the detailed analysis of the large quantity of material. Further fieldwork and excavation was undertaken with students in 1974/5. By 1979 the author had become a Ph.D. student and the final phase of fieldwork was undertaken in 1979/80. The aim of the work by this time was to explore the impact that was made on the Elimbari region by the combined actions of human and animal predators and natural forces of change, especially during the Late Pleistocene and early Holocene periods. This report summarises the work to date (May 1983). Further analysis will facilitate the complete publication of this rich, interesting and complex site and area.

Relationship to other archaeological sites within the
highlands(Figure 1)

The number of sites (both open and caves or rock shelters) that have been examined for archaeological evidence in the central highlands of Papua New Guinea is growing steadily (i.e. P.Gorecki,

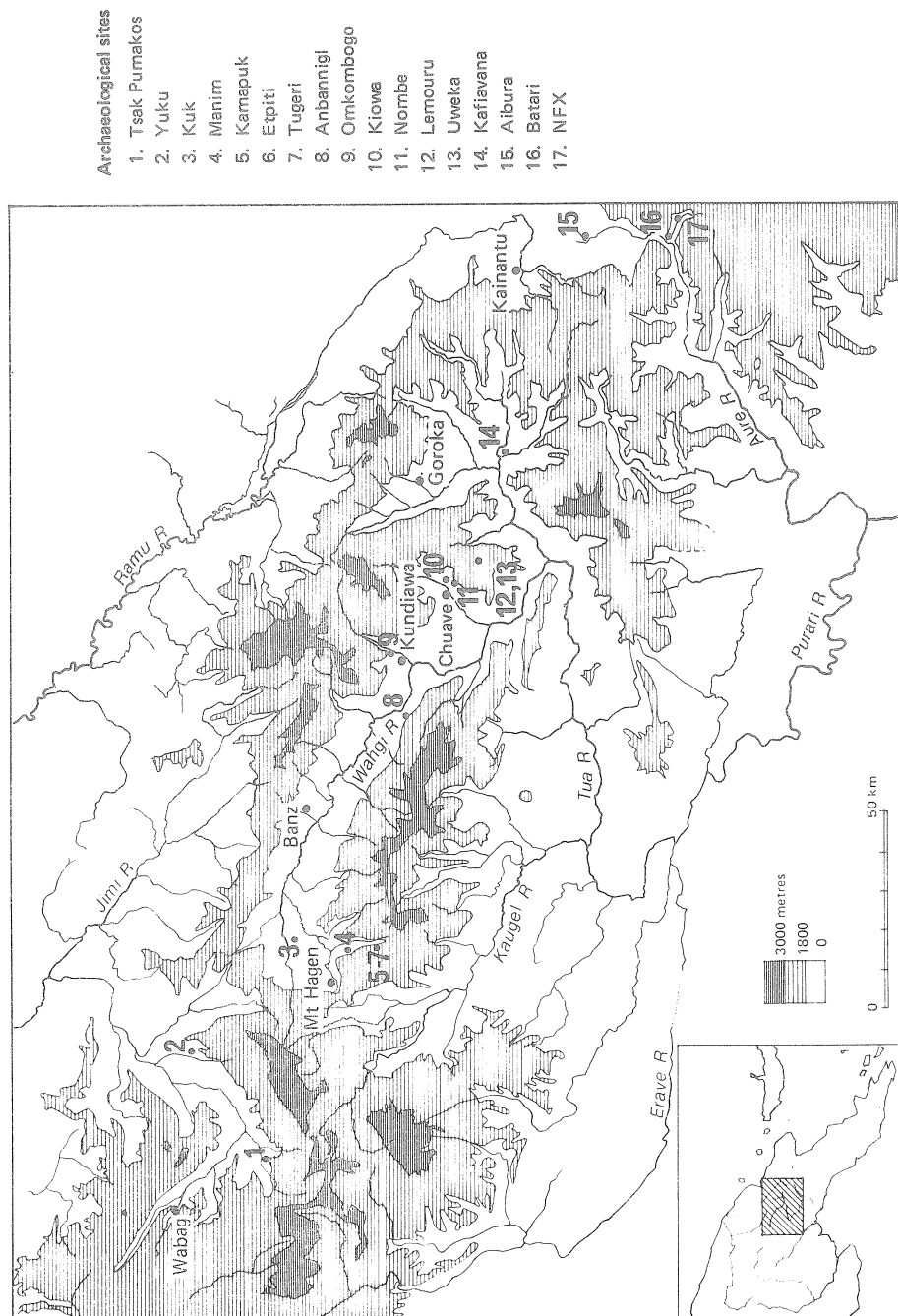


Figure 1. Archaeological Sites in the Central Highlands of Papua New Guinea. (Nombe is No. 11)

Dept. of Prehistory, R.S.Pac.S., A.N.U.) is at present excavating in the vicinity of the Jimi river valley, Western Highlands Province). However, there are very few fully published and well documented archaeological sites from which general theories of the development of human economic and cultural change, and the impact of these on the area, can be deduced. Most sites contain little or no useful information about sediment history, and too often there are only lists of cultural artifacts which cannot be closely related to the deposits of the site. Much of this lack of information is, of course, due to the standards that were normal at the time of excavation. Techniques have changed a great deal over twenty years and increased understanding of the processes of sedimentation and erosion has changed the way in which the archaeologist collects cultural material and often needs to solicit assistance in the analysis of site deposits. Figure 1 includes two little known sites (Tsak Pumakos and Anbannigl) excavated in the 1960's by a team of Japanese archaeologists lead by T.Kobayashi and J.Hayakawa. This work has never been published in English and the Japanese report gives no detail of analysis of data. The site of Kiowa is only 3km to the north of Nombe, but both J.P.White and the author have had little success in attempting to compare the two sites from published records. The sites of Uweka and Lemouru were both excavated in 1979 by the author and will be included in the final report. Sediment analysis at Lemouru is being undertaken by David Gillieson (1983). These sites provide a contrast to Nombe as they are both at higher altitudes and are small sites of limited occupation span, used within the last few thousand years. Omkombogo is a site first excavated by J.P.White in 1964 (White 1967) with further work by the author in 1971. NFX (National Antiquities File of Papua New Guinea registration, the records of which are held and administered by staff in the National Museum of Papua New Guinea) is an open site, excavated by D.Cole and analysed by V.Watson (Watson and Cole 1978), which provides evidence that human beings were using open sites as well as caves and rock shelters about 18000 years ago. Evidence from Yuku, Kiowa and Kafiavana may also suggest that these sites were utilised periodically by human visitors during the Late Pleistocene period.

SITE DESCRIPTION (Figure2)

Nombe is an overhanging rock shelter with a small cave at the rear, situated on the dip slope of a limestone escarpment, at the foot of a steep cliff, facing east over a deep doline into which a tributary of the River Mai sinks underground. The site lies at about 1720m.asl., the bottom of the doline at about 1660m.asl, and the top of the ridge above the shelter at about 1950m.asl. The limestone ridge runs generally S-N continuing on the other side of the River Mai in the Porol Range to Kundiawa and the Chimbu Gorge. The region is dominated by the massive triangular peak of Mt. Elimbari (2850m.asl.) from which can be seen the entire Wahgi Valley running NW to Mt.Hagen. The scarp face of the Elimbari limestone is very steep and practically unscaleable but modern roads penetrate through

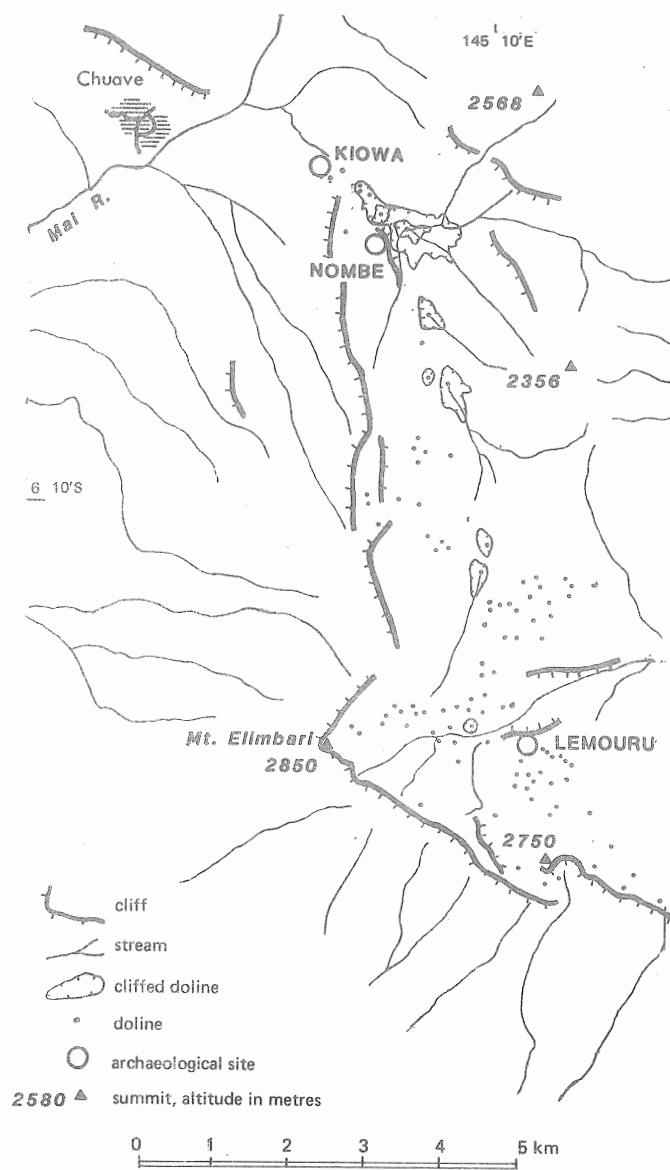


Figure 2. Topographic Features of the Mt. Elimbari Region.

the gaps, as for example the Highlands Highway, which follows the River Mai into the mountainous country to the NE of Nombe.

Geologically the site lies at the junction between the Chimbu limestone and the Movi Beds, which consist of calcareous sandstones, siltstones, shales and conglomerates (also containing chert which was frequently used for the manufacture of stone artifacts). The flat area at the foot of the cliff provides now, as it has done in the past, a routeway through the valley that contains a series of dolines at the junction between the two formations. The steep slopes of the valleys provide gardens for the present Siame speaking local inhabitants and there is little undisturbed bush remaining. However, some of the highest slopes (over 2000m.asl.) are not cleared for gardening but still provide foraging areas for nut pandanus, building and fencing materials and limited hunting zones. The population density today is fairly high considering the steep angle of much of the land (probably 40-50 persons per sq.km.) (Haantjens 1970,37). It is not unusual for the more precarious gardens to get swept away in very heavy rains. When the author was last in the area (Feb.'80) local tribal fighting was having very deleterious effects on local settlement and gardening cycles.

Stratigraphy (See Figures 3-6)

J.P.White's excavations centred around an area (Figure 3: squares TT, A4, A5) in which thick flowstones have been laid down. Cracking of these sheets has caused some intrusion of fine soils and artifacts into lower deposits. However, these flowstones are not as thick or extensive elsewhere on the site and the stratigraphic sequence was found to be clearest in the southwest areas of the excavation where wet sieving was carried out in 1979/80 (Figure 3: Wetsieved strip). Extensive sediment analysis was undertaken by David Gillieson in 1979 (Gillieson 1983) to test the validity of the recorded stratigraphy (Gillieson & Mountain 1983). We have not attempted to subdivide the deposits into very fine divisions since such an approach is clearly unjustified both on archaeological and sedimentological grounds. However, the basic stratigraphy that is clearly visible in many parts of the site has been confirmed by sediment compositional analysis and chemistry backed up by scanning electron microscopy and thin section analysis. A brief description of the 4 basic strata follows:-

Stratum A - top deposits of fine ashey soils varying in texture and colour (10YR5/3, 7.5YR5/2 and 2/2, 5YR1/7). These contain much fireash and are present everywhere on the site although they are now very thin over the top flowstone in squares A4 and A5. Towards the front of the shelter, near the dripline, this stratum is less dusty and more loamy, with much greater depth of deposit (Figure 5: square Z7). In these eastern areas both J.P.White and the author found large numbers of artifacts and bone. The constant human and animal activity in the shelter in recent years has caused up to 40cm

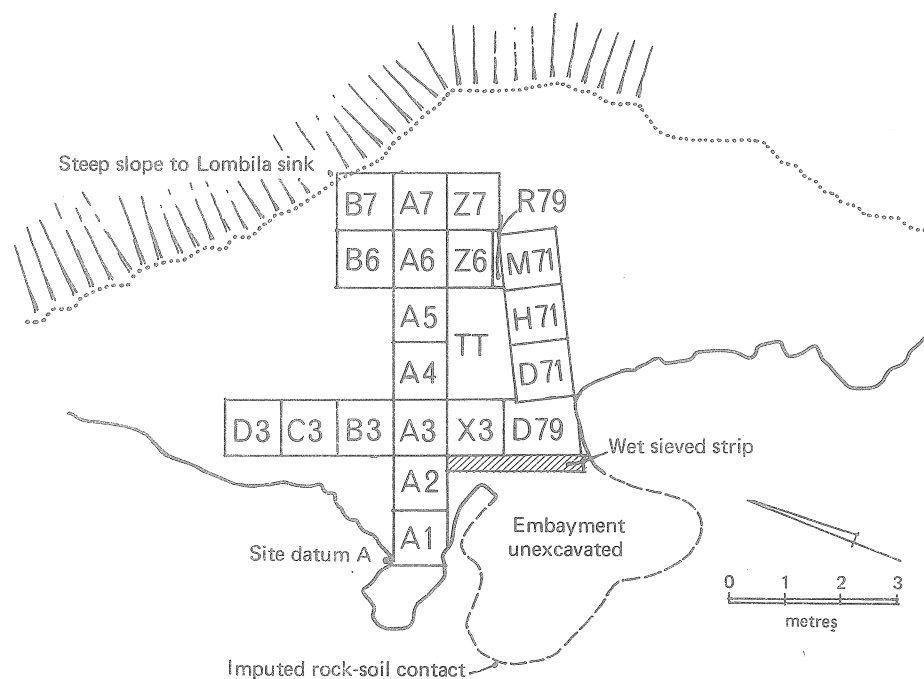


Figure 3. Plan of Nombe Rockshelter, Simbu Province, Papua New Guinea. (Squares opened by J.P. White: A3-7, B6-7, Z6-7)

variation in the level of the recorded ground surface (Figure 5: squares X3 and TT). In one place subsidence has left cultural deposits attached to a rock wall some 15cm above the present top of stratum A, probably largely due to the settling of replaced excavation deposits.

Stratum B - consists largely of dark brown silty soils (5YR3/2) which are densely packed with human artifacts and bone, most of which is extremely heavily burnt. Organic carbon, phosphorus and potassium values are high and it is obvious that intense human activity was responsible for much of this deposit. In the areas towards the back of the cave (west) the distinction between stratum A and B is clearly visible, largely in the massive increase in the density of artifacts (Figure 6 and square X3 in Figures 4 and 5), but this becomes more difficult to see in the more easterly parts of the site.

Stratum C - contains mixed deposits which underlie the thick bone-rich stratum B. It includes the flowstone sheets (Figure 4: squares X3, A3, B3, Figure 5: X3) and, more widespread, evidence of tephra pellets or massive blocks of tephra and fireash (Figure 4: squares A3, B3, D79) set in brown or redbrown soils. In places (ie. square X3) there are blocks of cemented deposits containing tephra, cultural material and sometimes charcoal. The tephra vary in colour from greenish grey (5Y4/2) through bright yellowish brown

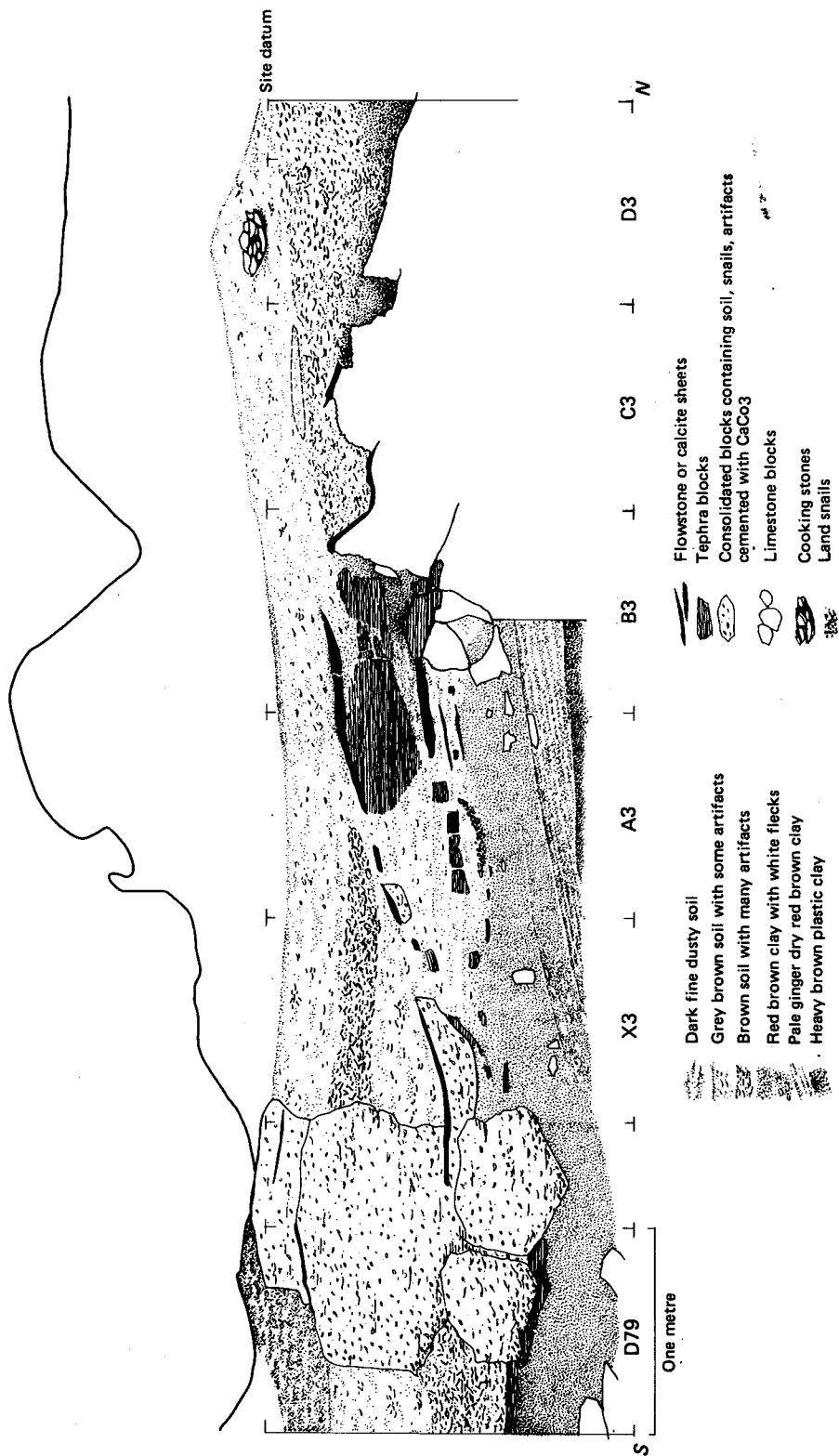


Figure 4. South-North Section Across the East Face of Squares D79, X3, A3, B3, C3 & D3.

Information from J.P. White's 1964 field notes

1. Top soil with humus
2. Grey brown ashy dusty soil

- 3, 4, 5 Brown soil with bones and stones
- 6, 7, 8 Yellowish brown clayey soil
9. Red brown clay with snails

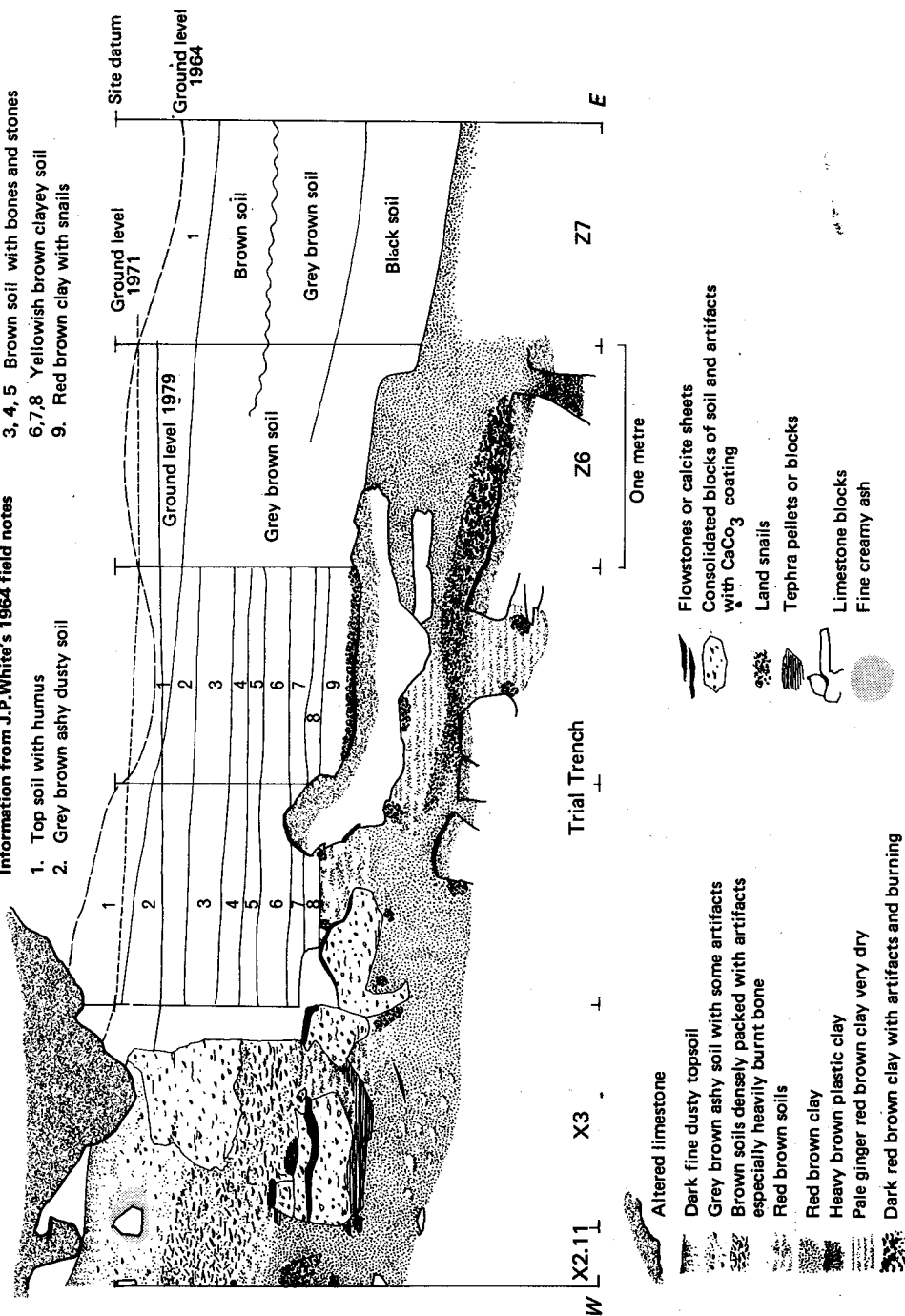


Figure 5. West-East Section Across the South Face of Squares X2.11, X3, Trial Trench, Z6 and Z7.

(10YR7/6) to bright brown (2.5YR5/8) or bluish grey (5BG5/1). In the more northerly areas of the site stratum C does not appear at all (Figure 4: squares C3, D3) and all such deposits seem also to be absent from the more easterly areas near the dripline (Figure 5: squares Z6, Z7). Artifacts do occur fairly frequently within stratum C although the density drops markedly from that of stratum B.

Stratum D - is essentially a group of clearly related redbrown clays. Towards the top they are less sticky and at the base in the central areas of the site is a very heavy plastic brown clay, which appears to be devoid of human artifacts (Figure 4: squares A3, B3. Figure 6: square X2). Most of stratum D is a redbrown clay (7.5YR4/6 or 5YR3/6) often containing blocks of fallen limestone, blocks of cemented clay, sometimes with thin sheets of calcite

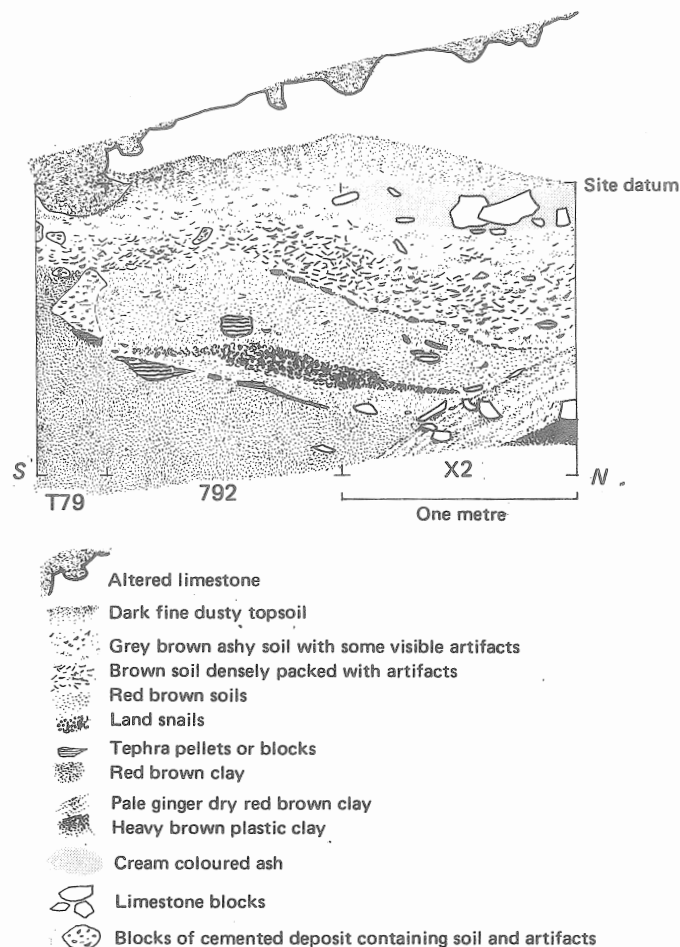


Figure 6. South-North Section Across the West Face of the Wetsieved Strip.

adhering to the top, patches containing soft white limestone flecks and many large lenses of landsnails. Sediment analysis indicates very clearly the close correlation of all these clays. The distribution of artifacts in stratum D is very variable, as is the quantity of animal bone.

Dating

One of the key factors in the interpretation of these deposits and their archaeological components is chronology. Dating at Nombe has, from the onset of archaeological work in 1964, been difficult due to the paucity of charcoal in the deposits. It has been noticed that the ash of the fires that were lit daily at the site during excavations produced practically no charcoal and that the constant movement of humans and animals soon dispersed and powdered even the little that had been produced. Other materials that have been submitted to the Radiocarbon Laboratory, A.N.U., include bone (often low in nitrogen so that large quantities have to be sacrificed), snail shell (abundant in the lower strata but uncertain as to the correction factors that have to be applied), and flowstone and calcite sheets (also requiring careful environmental interpretation).

Individual results will not be published in this paper since the process of interpretation and correction is still incomplete. Two samples were submitted for uranium-thorium dating also and a large number of bone samples have been tested for carbon, nitrogen and fluorine content.

The following outline of environmental and sedimentological chronology and cultural development has been constructed with the data available to the present (May 1983).

SITE USE AND DEVELOPMENT

The site appears to have been first used by human beings during the Late Pleistocene (probably earlier than 26,000 b.p.). At that stage a spring emerged at the site, flowing between banks of redbrown clay, and periodic floodings would bring further sediment pulses, probably involving some reworking of earlier deposits.

Many animals were probably using the site periodically; certainly the thylacine, the native New Guinea cat and some predatory birds are present in the bone of stratum D. Material became lodged amongst the limestone blocks, cemented clay blocks and calcite sheets and, along with any aestivating landsnails, was easily covered by the next deposit of clay. During this period there is evidence of two new species of Protemnodon (large extinct species of kangaroo) and one new large species of the smaller tree-kangaroo Dendrolagus (Flannery, Mountain & Aplin, in press). There are also bones that

must belong to a fairly small member of the diprotodontid family, but unfortunately no clearly diagnostic pieces have been recovered. The thylacine specimens vary in size and both larger and smaller specimens are present in this stratum. Dawson (1982) came to the conclusion that there was not enough evidence to justify more than one species of thylacine (*Thylacinus cynocephalus*) in the samples she had studied from eastern Australia and Papua New Guinea (this included one specimen from Nombe). The variation in the size range may be due to sexual dimorphism or other factors.

Human hunters were leaving occasional stone artifacts, including one complete waisted or stemmed axe/blade (Figure 7). These groups of artifacts are under study by L.Groube, following his finding on the terraces of the Huon Peninsula, Morobe Province, Papua New Guinea of a number of large specimens dated to the Pleistocene (unpublished paper given at ANZAAS 1981 in Brisbane and pers.comm). Stratum D also contained an edge-ground axe and many large, heavy, chunky tools, often with a flat, unretouched base and steep flaking on one or more facets of the remainder of the tool. These have considerable similarities with the early core and scraper tradition of Australia.



Figure 7. Waisted Axe/Blade from Stratum D, Square M71.

One important question, when trying to interpret the material found in stratum D, is how is it possible to differentiate between bone left by animal predators and bone left by human hunters or scavengers? At present no gross evidence can be seen to answer these questions. The bone does not show easily recognisable marks of butchering or animal teeth marks but it is hoped to try some study with a scanning electron microscope following the methods of Shipman (1981). There are other indicators of human activity in the clays; some areas contain heavily burnt bone, charcoal fragments, lumps of ochre and stone artifacts (Figure 5:square Z6), whereas other regions of identical matrix, such as much of the basal clays in the Wetsieved Strip, contain very little that would indicate a human presence.

The next definite chronological event on the site involves the laying down of the flowstones above the redbrown clays. The earliest of these substantial flowstones appears to have been laid down about 14,500 b.p. and the last one dates to about 10,000 b.p. The fact that the redbrown clays cease to accumulate is probably largely due to a change in the water flow on the site. The gradual process of solutional enlargement must have enabled the stream water, through time, to seep into lower drainage channels in the karst system leaving Nombe dry for substantial periods although probably liable to flood in heavy or very continuous rain. As the regular stream activity slowed down, pools of standing water began to accumulate on the site, often blocked by the impervious clay which was no longer being moved by constant flows of water. We have evidence for gour pool formation in the squares B3 and C3 (Figure 4). As well as flowstone formation, another thick deposit was forming in those standing pools of water; sandwiched between flowstones there is a deposit which is up to 15cms thick. It is gritty in texture and in places very vesicular. In other places it is very clearly laminated. We think that this deposit contains tephra probably mixed with fireash blown in from the occupation areas round the standing pools of water. From the dates of the enclosing flowstone it seems likely to be Ep Ash, found in the Western Highlands at the open site of Kuk and surrounding areas (pers.comm J.Golson and R.Blong), and is at present under examination by R.Blong (Macquarie University).

Although there is little cultural material from the flowstones or the tephra blocks in squares A4 and 5, stratum C in other areas, such as X3 and the Wetsieved Strip, contains considerable amounts of artifacts and bone (Table 1). Some specimens of extinct animals occur although not all the species that are found in stratum D recur in stratum C. Certainly the thylacine, one of the two new Protemnodon species and the extinct Dendrolagus are still present. The faunal material is not all analysed at present but it appears that there are more species present in Stratum C over the entire site than in any of the other three strata. There is also a great quantity of landsnails present, as there is in Stratum D. These are presently under study by J.Stanisic (Queensland Museum).

Stratum & no. of units	Volume in litres	Densities: expressed in grammes per litre					% of total bone burnt
		Bone	Artifactual Stone	Ochre	Snail Shell	Egg Shell	
A: 18	119	6.2	1.20	0.08	0.1	0.02	67
B: 25	146	44.0	19.10	1.70	1.3	0.40	91
C: 32	157	11.3	0.50	0.06	7.8	0.02	39
D: 62	320	4.5	0.04	0.03	7.2	Trace	9

Table 1: Archaeological components of all units in the Wetsieved strip

However, apart from the change in waterflow, there may well have been other factors which could partly account for the phenomena present in stratum C. David Gillieson has suggested that changes to the vegetation on the slopes above Nombe could lead to an increase in the amount of soil CO₂ available in the ground water percolating through the site (Gillieson 1983). Variations in soil CO₂ are known to be an important factor in cave drip hardness. Vegetation changes are likely at the end of the Late Pleistocene when it has been suggested by Hope that the upper tree limit might be about 2000 m.asl. (Hope and Hope 1976). Possibly with increased human activity in the area, the slope above the shelter may have been fired, either deliberately during hunting operations, or accidentally, causing immediate and purely local vegetation changes that could be responsible for altering the levels of soil CO₂. Increased human activity is clear from the rise in quantity per litre of artifactual stone, ochre, eggshell and animal bone. The proportion of the bone that is burnt also increases in stratum C from that found in the lower redbrown clay levels (Table 1).

After about 10,000 b.p. the thick flowstone sheets do not recur and neither do the extremely thick tephra blocks. However, there are small pieces and pellets of tephra in the Holocene deposits of Stratum B. Precise dates for this stratum only occur at present in one area at the back (west) of the site. Here, three bone dates indicate a rapid buildup of up to 50 cms within no more than 2000 years, beginning about 6500 b.p. Stratum B contains the highest quantities of artifacts per litre for the site; these include very heavily burnt bone, considerable quantities of various coloured ochre lumps, eggshell (both cassowary and megapode), polished stone axes and a wide variety of small flake tools. Also there are occasional fragments of marine shells, both small examples such as cowries that are sewn on to personal decorative bands and the larger shells such as pearl shells used in exchanges.

The analysis of the fauna shows heavy exploitation of the local faunal suite at this time. In about 150 litres of Stratum B deposit, which was wetsieved, there was approximately 6.5 kgs of bone. The range of species is not quite so wide as in stratum C and the hunters certainly concentrated on the medium to small species, especially brushtail and ringtail possums, medium and small macropods, fruit bats, large rats and bandicoots. Larger species such as the cassowary, the tree kangaroo and the zaglossus were still present but have subsequently disappeared from the locality. Increased clearance for new gardens and villages, causing consequent reduction in suitable environmental niches, may have played an even more important role in this decline than the pressures of increased hunting.

The end of this period of maximum human activity at Nombe was probably heralded by the growth of villages in the vicinity. Nombe would become too close to the garden activity to provide hunters with a refuge and they would have had to go to the higher zones above 2000m. to get good return for a night's hunting. The site would gradually become a resting place for people working in nearby gardens or walking from one village to another. Certainly, animal bone, artifactual stone and shell continued to accumulate in moderate amounts. In recent years at least one human burial took place in the site but the quantity of human bone is very low. In the top levels fragments of vegetable matter (pandanus husk or carbonised sweet potato) occur.

Accumulation of the stratum A deposits is greater towards the front (east) of the site, as would be expected. Very recent deposits overlie the eroded eastern edge of underlying clays (Figure 5) causing apparent stratigraphic disconformity. J.P.White found five joining fragments of one polished axe from different depths below the modern ground surface; 10cms in square A3, 10cms in square A4, 10 cms in square B6 and 62 and 69cms in square A7. These and other stratigraphic variations caused by factors such as cementation by CaCO_3 or dispersal of fine ashes by the kinetic force of a constant water drip, all reinforce the belief that depth below ground surface is a grossly misleading method of recording in many rock shelter or cave sites. A thorough understanding of the sedimentary processes and the chronology and composition of deposits is required. Also it was found necessary at Nombe to be fully aware of the limitations of stratigraphic interpretation. It was not possible to subdivide the deposits into small units representative of finer divisions of time merely by calling the upper part of some deposit "Later" and the bottom part "Earlier". The factors which cause variation in the speed of deposit accumulation or erosion are many and extremely various. On occasions archaeologists seem to be so keen on providing a close chronological framework for cultural changes that they can naively assume there is a general law of average deposit buildup on sites and interpret the cultural changes accordingly. Wetsieving of deposits in 1979 at Nombe has provided a most detailed suite of even the extremely small fauna (including

extremely important land snails), but it has not provided the information to subdivide deposits that were clearly built up quickly in a period of much human movement and activity. Nevertheless, the site is providing one of the first insights into the activities and impact of the first inhabitants in the Highlands of Papua New Guinea and the interaction of human beings, animals and natural physical forces over 30,000 years of time.

ACKNOWLEDGEMENTS

Although the views expressed in this paper are the responsibility of the author, and are largely based on her own fieldwork and analysis, she has also used results from data collected and analysed by David Gillieson during joint fieldwork on Mt. Elimbari in 1979. Discussions between us on many of the topics covered have contributed to the work.

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