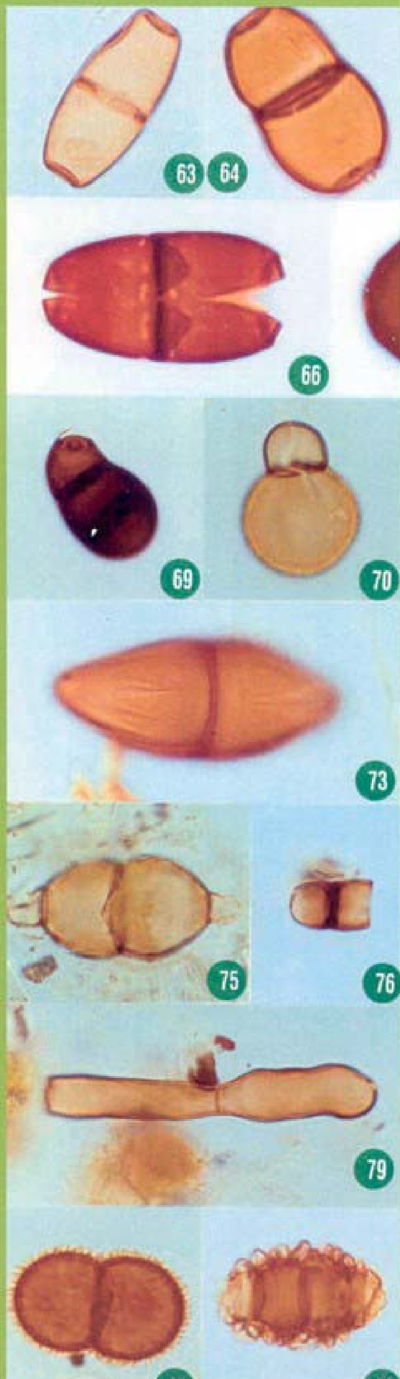

FUNGAL SPORES IN ARCHAEOLOGICAL CONTEXTS:

PART 1: BACKGROUND EVIDENCE

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PREAMBLE

In 2003 I was awarded a CAR New Initiatives Grant to investigate whether fungal spores associated with animal dung, and commonly found in the sediments of palaeoenvironmental and archaeological sites, are a useful proxy for the presence of people and their animals in Pacific island landscapes. The absence of a significant native mammal fauna for most of these islands them makes them highly suitable for such an exploration. The project aims were to analyze material from a range of archaeological and natural sites from four island locations within the southwest Pacific region. The intention was to use material from sites where research had already been undertaken, adding interpretive value to these sites while exploring this proxy for the first time in the region.

Podospora and *Sporormiella* are the two most common types of dung (coprophilous0 fungi and are regularly looked for in sites from northern Europe where there is an established prehistoric relationship between humans and cattle (van Geel, 2001). They have also been used successfully in North America as a proxy for herbivore biomass (Davis, 1987) reflecting the late Pleistocene extinction of megafauna and the recent introduction of livestock.

Our project was inspired by a study undertaken on the island of Madagascar that examined the question of megafauna extinction through the analysis of coprophilous fungi found in Pleistocene/Holocene sediment cores (Burney *et al*., 2003). The study found that *Sporormiella* Type spores, associated primarily with herbivores were abundant until around 1700 yrs ago, several centuries after the time people first settled the island. Microscopic charcoal values also dramatically increased well above background during this period and it has been inferred that this signals the use of fire by people. Later in the record, at around 960 yr BP, *Sporormiella* Type spores dramatically increase and this rise is thought to be associated with the introduction of livestock.

Charcoal records associated with pollen records across the Pacific are still considered to be contentious indicators of human presence in the absence of material culture. The intention of this study was to investigate an alternative proxy, namely coprophilous fungi, that should only be present in large numbers once people and their domestic animals have arrived. Given the poor understanding of the pig in Pacific prehistory it was felt that such a project had the potential to provide an important proxy for its appearance.

Primarily the study has tried to establish the appropriateness of this technique in the study of Pacific prehistory. One of the more fundamental questions to be explored was whether or not these coprophilous fungi are present in sites across the Pacific, and if they are, do the ratios and quantities of these change through time. It was felt that assembling this base knowledge would place us in a better position to expand such work further into regions where the relationship between people, fauna and the landscape have a greater time depth and greater complexity. For example the Pleistocene extinction of megafauna and the introduction of pig in the highlands of New Guinea; the Pleistocene extinction of the Australian megafauna; aspects of cultural movement including the introduction or development of agricultural in island Southeast Asia.

While the initial intention was to analyse samples from a range of sites, both natural (ie swamp sites) and archaeological, so far we have only examined archived pollen preparations from swamp sites. Archaeological sediment samples are in the process of being sent to us and will now form a second phase of the study.

With his considerable expertise in fungal taxonomy Dr. Mike Macphail was an obvious choice as collaborator for this project and has carried out the bulk of the work associated it. In particular he has produced a beautiful set of micrographs that document all the fungal types seen and will be an invaluable reference guide as well as writing the extensive written report that follows.

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van Geel, B. (2001) Non-pollen palynomorphs. In J. P. Smol, H. J. B. Birks and W. M. Last (eds) *Tracking Environmental Change Using Lake Sediments. Volume 3: Terrestrial, Algal and Siliceous Indicators.* Kluwer Academic Publishers, Dordrecht, Netherlands, pp 99-119.

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PLATE 4

Two cell fungal spores with varying ornamentation (Figs. 63-70, 72, 77)

***Dicellaesporites* Elsik 1968**

Fig. 63 Medium spore with invaginated pores. Bonata 295 cm.

Fig. 64 Medium spore with invaginated pores. Bonata 295 cm.

Fig, 65 Large spore with strongly tapering apices. Bonata 295 cm.

Fig. 66 Large spore with splits at the apices [*Apischizosporonites*?]. Bonata 295 cm

Fig. 67 Large thick-walled spore with blunt apices. Voli Voli 150 cm.

Fig. 68 Medium spore consisting of two shell-like cells. Yacatha 290 cm.

Fig. 69 Medium spore consisting of two different sized cells [*Atrophosporonites*]. Rapa 40 cm.

Fig. 70 Medium spore consisting of two different sized cells [*Atrophosporonites*]. Voli Voli 85 cm.

Fig. 72 Medium spore with verrucate-granulate ornamentation. Voli Voli 185 cm.

Fig. 77 Medium spore with truncated apices. Bonata 295 cm.

Two-cell spores with striate ornamentation (Figs. 71, 73, 74)

***Fusiformisporites* Rouse 1962]**

Fig. 71 Medium spore with granulate-striate ornamentation. Bonata 295 cm.

Fig. 73 Large spore with weakly developed striate ornamentation. Bonata 265 cm.

Fig. 74 Large spore with weakly developed striate ornamentation. Rapa 30 cm.

Two-cell spores with complex apertures and/or ornamentation (Figs. 75, 76, 78-84)

***Dyadosporites* van der Hammen ex Clarke 1965**

Fig. 75 Two-cell spore each terminating in a pore chamber. Rapa 145 cm.

Fig. 76 Two cell spore with slit-like apertures on the thin end walls. Rapa 30 cm.

Fig. 78 Two -cell spore ornamented with granules. Yacatha 290 cm.

Fig. 79 Two cell spore resembling a fragmented hyphae. Rapa 30 cm.

Unassigned two-cell spores

Fig. 80 Two-cell spore covered with a thin perine. Each cell possesses a well-defined pore [cf *Ornasporonites* Ramanujam & Rao 1978]. Voli Voli 185 cm.

Fig. 81 Two cell spore with spinose ornamentation. Yacatha 290 cm.

Figs. 82 Two cell spore enveloped in thin plicate perine. Bonata 265 cm.

Figs. 83-84 Two cell spore enveloped in thin plicate perine. Rapa 145 cm

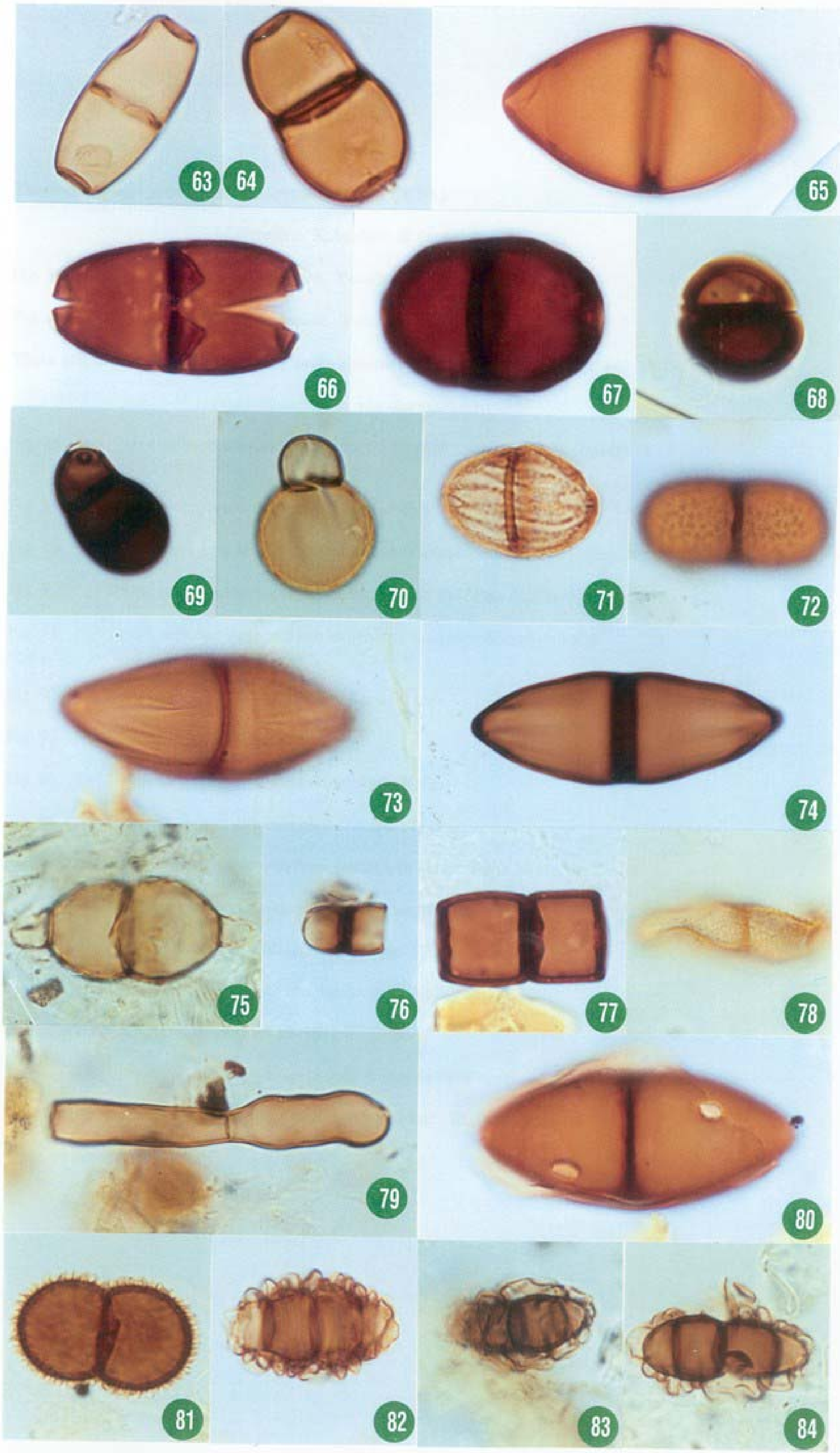

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PLATE 8

Fungal propagules characterised by transverse septa (Figs. 130-139, 140-141)

cf *Staphlosporonites* Sheffy & Dilcher 1971

Fig. 130 Five cell spore with one transverse septum. Bonata 295 cm.

Fig. 131 Multicellular body made up of irregularly-packed cells. Rapa 295 cm.

Fig. 132 Multicellular body made up of irregularly-packed cells. Bonata 265 cm.

Fig. 133 Multicellular body made up of irregularly-packed cells covered with a reticulate thin perine. Yacatha 290 cm

Fig. 140 Multicellular cluster of monoporate cells. Voli Voli 185 cm.

Fig. 141 Multicellular cluster of monoporate? cells. Bonata 295 cm.

***Dictyosporites* Felix 1984**

Fig. 134 Multicellular globular body of thin wall cells. Rapa 30 cm.

Fig. 135 Multicellular laterally flattened body comprising two rows of cells with thickened inner walls. Bonata 295 cm

Fig. 136 Multicellular globular body of thin wall cells with remnants of attachment cell. Bonata 265 cm.

Fig. 137 Multicellular globular body of thin wall cells. Yacatha 500 cm.

Fig. 138 Multicellular laterally flattened body comprising two rows of cells with thickened inner walls. Yacatha 340 cm.

Fig. 139 Multicellular laterally flattened body comprising four rows of cells with thickened inner walls. Voli Voli 185 cm.

Morphologically complex spores with distinctive ornamentation (Figs. 142-144)

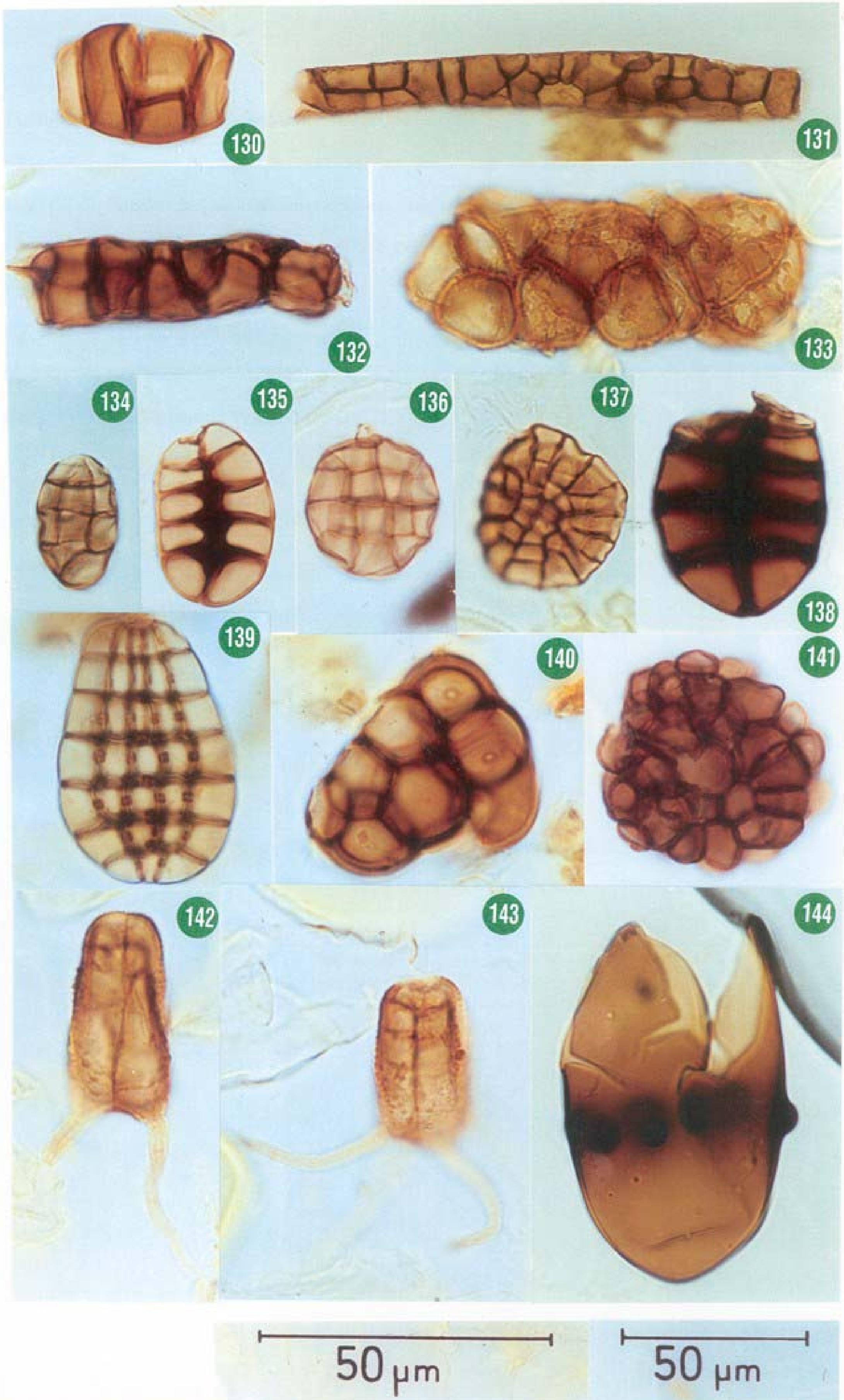
***Frasnacritetrus* Taugourdeau 1968**

Fig. 142 Multicellular granulate spore characterised by four septate arms [*Tetraploa*]. Rapa 30 cm.

Fig. 143 Multicellular granulate spore characterised by four septate arms [*Tetraploa*]. Bonata 265 cm.

[*Mediaverrusporonites*]

Fig. 144 Single cell spore characterised by a band of large verrucae around the equator. Yacatha 340 cm.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