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The Pleistocene Human Remains Collection from the Willandra Lakes World Heritage Area, Australia, and Its Role in Understanding Modern Human Origins

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Abstract The fossil human remains from the Willandra Lakes World Heritage Area have played a major role in defining the origins of Aboriginal Australians. The Willandra record has also contributed significantly to our understanding of modern human origins in Australasia. They are amongst the earliest modern human remains in the region, Lake Mungo 1 and 3 dating sometime before 40,000 years ago, while over one hundred other individuals date to the time around the Last Glacial Maximum. Many burials are still eroding from the Willandra, and present an opportunity to learn more about the region. The erosion of burials and the potential for further research also presents a challenge in a social environment where repatriation is a key social and political issue. Collaborative research is perhaps one key to developing a practical solution to some of these issues. In this paper I provide a summary of the history of discovery at the Willandra and discuss how the human fossil record fits into current models of human evolution. The paper will also include a brief discussion on recent research and how this has proceeded with support from the Three Traditional Tribal Groups of the Willandra Lakes World Heritage Area. Finally I shall discuss the future of the collection in an environment where repatriation has become the main practice of many Australian museums.

Key words: Willandra Lakes, Lake Mungo, biological anthropology, pathology, robust morphology, repatriation, keeping place.

Introduction

The Willandra Lakes World Heritage Area in South East Australia (Fig. 1) consists of a chain of 13 fossil lakes that were last filled prior to the Last Glacial Maximum (before 18,000 years ago). Researchers have referred to the Willandra as Australia's Rift Valley, as it contains an extensive archaeological and palaeontological record documenting the occupation of Australia over the past 46,000 years. The archaeological record provides an unparalleled record within the region of modern human behaviour and adaptation to dramatic climatic and environmental shifts as characterised by the late Pleistocene period. Evidence of complex human behaviour, such as the World's earliest cremation (Bowler *et al.*, 2003), predates the material evidence for complex modern behaviour in Europe. The site also contains the largest documented fossil human trackway (Webb *et al.*, in press).

The fossil human remains record from the region is extensive. It has not only played a major role in defining the origins of Aboriginal Australians, but has helped define our understanding of modern human origins in Australasia. The human fossil record is amongst the earliest fully mod-

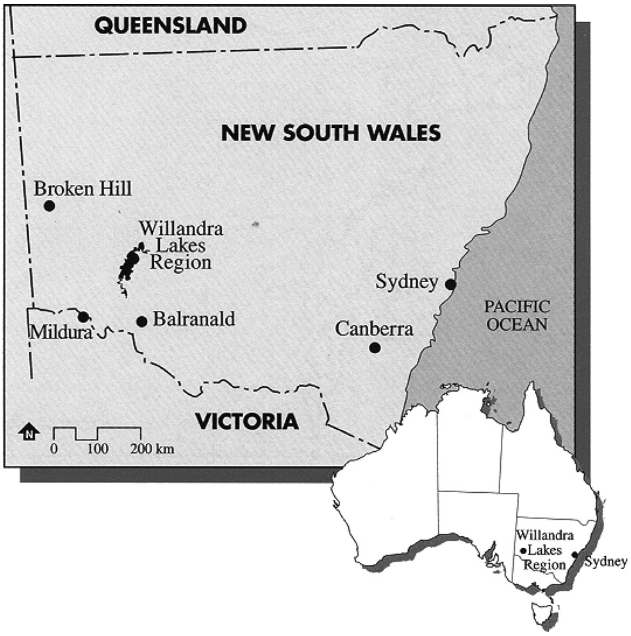

Fig. 1. Location of the Willandra Lakes Region.

ern human remains sequence in the region, Lake Mungo 1 and 3 (also known as WLH 1 and WLH 3, or Mungo Lady and Mungo Man) dating to around 40,000 years ago (Bowler *et al.*, 2003). Over 100 other fossilised individuals are known from the area, and it is generally thought that most of the series likely dates to the Late Pleistocene.

This paper will concentrate on the history and significance of the collection and discuss the collection's potential to provide further important information about human evolutionary history in the Australasian region through a re-examination of the important specimen WLH 50. Finally it will provide an overview of efforts so far to give Aboriginal custodians a more direct role in the management of this important collection.

History and Significance of the Collection

One hundred and two individuals have been collected from the area (Webb, 1989: 4–5 and Johnston *et al.*, 2003). Most of these are currently under the curatorship of Dr Alan Thorne at the Australian National University, with the exception of WLH 1 (Mungo Lady) who was repatriated in 1991 and WLH 147, 152, and 153 who were salvaged in 2002 and are currently stored in the Mungo Visitors Information Centre. Each individual has a Willandra Lakes Hominid (WLH) number, a system devised by Webb (1989). The collection was largely recovered through the work of a number of archaeologists, foremost amongst these were Mike McIntyre and the late Peter Clarke (Clake, 1987). The locations of most fossilised human remains retaining valuable morphological details are identified and are associated with a site location number. There are some important exceptions, such as WLH 18 from the Garnpung-Leaghur interlake area. Unfortunately stratigraphic data for each recovered individual does not appear to be clearly recorded. Clark (1987) estimated from the stratigraphy the likely age of each individual. The problem with this approach is that the stratigraphic sequence established at Lake Mungo would appear to be quite specific to this lake, as all lakes seem to have had in the past their own unique hydrological regime. Certainly there is the likelihood of some environmental trends reflected in the stratigraphic sequence of the lakes, and some similarities are identified between the Lake Mungo lunette and the adjacent Lake Outer Arumpo (Bowler and Magee, 2000). Be that as it may, the lacustrine history of the system is quite complex, and if the age of the human fossil record is to be established it will require further field investigation in concert with the application of complex laboratory based dating techniques.

There are currently over 50 other individuals that remain *in situ* within the Willandra Lakes system. Erosion continues to play a major role in unearthing additional remains and the current heritage management protocol is to preserve fossilised remains *in situ* although there have been some exceptions, such as the rescue excavation of three individuals in 2001 (Johnston *et al.*, 2003). The Aboriginal Elders Council (incorporating the Paarkindji, Mutthi Mutthi and Ngyiampaa Tribal Groups) consider cases where salvage excavation of disturbed burials may provide important information from the past.

The Willandra Lakes Hominid collection has been at the centre of debate surrounding the origins of Aboriginal Australians since the discovery of Mungo Woman in 1969. For many years the prevailing view for human origins attempted to relate the *Homo erectus* specimens from Java, Indonesia, to Australians (Weidenreich, 1943). Alan Thorne (1975) in his PhD compared the gracile Mungo Woman and Man skeletons to the more robust individuals from Kow Swamp located along the Murray River. The more gracile Willandra individuals predated the more robust people from Kow Swamp which led Thorne to suggest that two different populations had migrated to Australia (Thorne and Wilson, 1977). The Willandra people, he argues, were likely derived from mainland South East Asian populations, while the people represented from the fossil remains at Kow Swamp, were considered to be derived from Javan *Homo erectus*. Proponents of the Out of Africa origins view suggested that the variation between the two populations was a result of microevolutionary change (Abbie, 1975; Macintosh and Larnach, 1976; Brown, 1989; Habgood, 1989).

In 1981 the discovery of the Willandra Lakes Hominid 50 specimen (WLH 50) generated considerable excitement. Initially it was considered that the individual represented the ancestral form of Aboriginal Australians, and due to its robust morphology would likely date to well before WLH 1 and 3 (Flood, 1983). More recent work has revealed that the age of WLH 50 postdates the Last Glacial Maximum (Simpson and Grün, 1998), around 30,000 years after the first arrival of Aboriginal Australian.

Revisiting the Question of WLH 50's Peculiar Morphology

I would like to discuss an investigation into the nature of the morphology of the important individual WLH 50. What is striking about WLH 50 is its heavily built features, foremost its great cranial vault thickness. The robust nature of this individual has been the point of much contention in arguments over the origins of the first Australians. WLH 50's large cranial superstructures are not unique to the Willandra series, a number of other individuals also exhibit similarly robust characters. Indeed some individuals, such as WLH 19, have characters that exceed those of WLH 50. WLH 50, however, is unique to the Willandra in two regards, it is a relatively complete vault that exhibits extreme robustness in all these characters (we are quite limited in our understanding of the other robust individuals as the remains are so fragmentary) and it has incredibly thick and uniform diploë. When compared to the remainder of the series the diploë in WLH

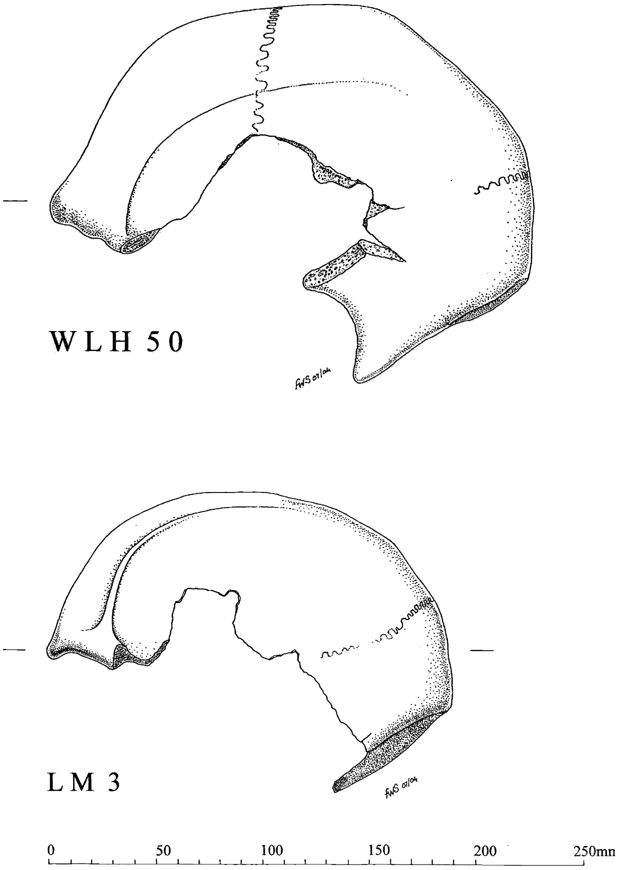

Fig. 2. A comparison between Mungo Man (LM 3 or WLH 3) and WLH 50. Both would appear to be male crania but represent, quite dramatically, the extreme variation within cranial shape from the region. Approximately 30,000 years separate the two individuals and within this time frame dramatic climatic change was documented within the Willandra Lakes system, the behavioural ecology of people in the landscape gradually transformed from a lacustrine environment to a semi-arid one. (Illustrations are by Mr F. Wilfred Shawcross who was aided by Ms Catherine Pye-Zita).

50 does appear abnormal. Webb (1989, 1995) has examined this aspect in some detail, and considered in his differential diagnosis a number of pathological conditions that may have distorted the vault thickness.

CT guided examination of the crania has considerable advantages as it enables one to examine the internal structures to provide a closer insight into the nature of external character traits. It is of course a non-destructive investigative technique. One condition that was considered in some detail in this study was Paget's disease. In the CT scan there appeared to be some features preserved within the vault that looked similar in appearance to the sclerotic remodelling in the diploëic space often accredited to Paget's disease (see Fig. 3b). The remodelling would appear to be the result of diagenesis, with soil infiltrating the diploë space and mimicking sclerosis. Close examination of two clinical cases (383810 and 383811) with Paget's disease from the Huntington Collection, Smithsonian Institution, confirmed that the remodelling within WLH 50's diploë was not abnormal bone formation and most likely taphonomic in origin. CT guided thin sectioning of the vault and mineralogical analysis could resolve the nature of the structures within the diploë,

Fig. 3a. CT scan of WLH 50 in *norma lateralis*. Characters that have been at the centre of discussion include the supraorbital torus, temporal line, angular torus, occipital torus, and receding frontal. The image is not in the Frankfurt Horizontal, and therefore gives an exaggerated perspective of frontal recession. CT scan courtesy of Dr Ross O'Neil, Canberra Hospital.

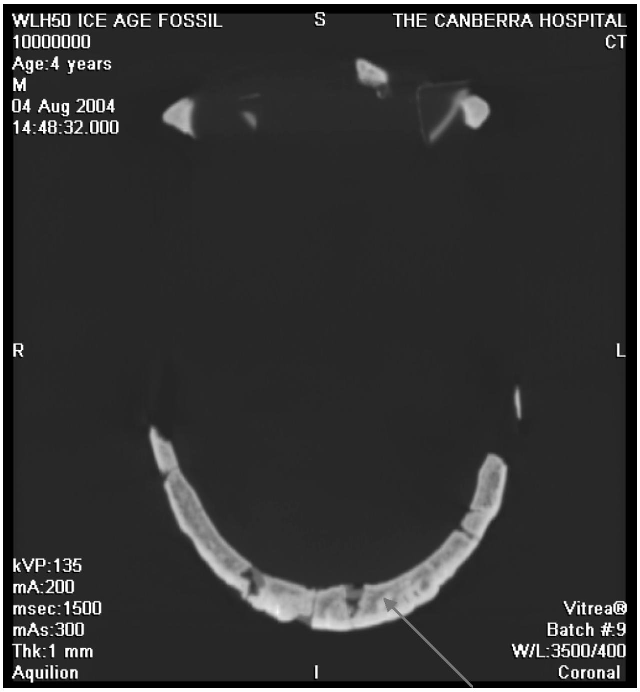

Fig. 3b. CT section through WLH 50. Within the diploë at the posterior of the vault are a number of areas that simulated sclerotic bone formation (arrow indicates one of these centres). These abnormalities are more likely to be taphonomic in origin. CT scan courtesy of Dr Ross O'Neil, Canberra Hospital.

identifying if they are, for example, silicate infiltrates or calcium phosphate (Ortner, personal communication).

Initially it was thought that the pathological condition may have distorted some of the characters and, therefore, lead to the more robust appearance of WLH 50 (Westaway, 2004). Closer consideration of the CT examination established that the thickening around the temporal line and occipital torus did not involve diploë, and as such it may be possible that *some* of the characters have been influenced by environmental factors, eg. biomechanically induced expansion of the cortical bone. Lieberman *et al.*, (2004) has identified through animal experiments the changes to bone as a result of environmental differences. Significant changes in diet, such as consuming softer foods, requires much less muscle recruitment and reduces biomechanical strain. When biomechanical strain is higher systematic cortical bone growth seems to be one result (Lieberman, 1996). It is possible that some robust characters in the Willandra series may be a result of dietary changes. Sexual dimorphism also plays a role (Brown, 1987) as males generally have larger cranial structures than females. It is important to note that there are likely robust females in the Willandra series, and this is demonstrated with the individual WLH 45 (Webb, 1989). Independent sex determination has been possible in this individual, as sexually dimorphic characters of the pelvis are present. The sciatic notch and preauricular sulcus both indicate female status for WLH 45 (Webb, 1989).

While this study has not identified the specific pathological agent responsible for the expansion of diploëic space in WLH 50, it has provided further documentation of the individual that agrees with the generalised diagnosis of Webb that suggests there was some need for haeomopoetic reinforcement. The pattern of expansion in the diploë of WLH 50 is unique in the Willandra series. The pattern of robust cranial characters, however, is not. The CT scan indicates that these traits, by and large, contain compact bone and have not been exaggerated by expansion of the diploë. It would not appear, however, that the Ngandong specimens have contributed to the genes of the Willandra people. A number of studies have identified the influence of biomechanical stress on morphology and the confusion within the literature when these studies attach phylogenetic status to traits often influenced by functions (Lieberman, 1995; Brauer *et al.*, 2004) Other traits often cited in papers drawing similarities between WLH 50 and Ngandong (Hawks *et al.*, 2000) have employed characters such as the zygomatic trigone which bear little resemblance to that in Javan *Homo erectus* (Brown, 2001; Larnach and Macintosh, 1974).

Revisiting significant collections can provide new information and from a scientific viewpoint it is important for collections to remain accessible for this key reason. Researcher bias can provide a restricted interpretation of data. Indeed it is possible that in the future Aboriginal researchers will be interested in interpreting the biological evidence of their people, just as has been the case with African American archaeologists and biological anthropologists working on salvage projects of slave cemetery sites in Manhattan. The work of Aboriginal bioarchaeologist Mark Dugay-Grist along the Murray River provides another relevant example. Dugay-Grist has argued for a culturally sensitive scientific practice that enables indigenous Australians to maintain involvement in the universal story of human evolution (Pardoe, 2005). The development of new investigative techniques will always hold the potential to bring out new insights from archaeological data. Fossilised human remains are, of course, no exception, although the social and political environment in Australia does make research on human skeletal remains difficult. Working closely with Aboriginal custodians, and holding regular meetings and providing plain language scientific reports is one means of developing a strong working partnership with community groups.

Collection Management

The future of the fossil human remains collection is uncertain. There is currently still a great deal of debate to be had over the eventual fate of the collection. Many members of the Three Traditional Tribal Groups agree that the collection holds much information about their past. The repatriation context in Australia has a heavy emphasis on reburial. On occasion Aboriginal people, who are supportive of research, are the subject of criticism from other Aboriginal people, and this can have an influence on the decision making process. Erosion is an ongoing issue in the area with enormous quantities of cultural material being exposed each year. The reburial argument at the Willandra is complicated by the fact that many of the original burial site locations have been lost as a result of erosive processes.

From a scientific perspective, there is no doubt that the ancient people from the Willandra still have a great deal to contribute to our understanding of the past and the first Australians. When fossilised human remains were first discovered in the Willandra very few investigative techniques were available to biological anthropologists. In terms of absolute dating techniques, the only investigative tool available was Carbon 14 dating which had extremely limited application to the Willandra human remains collection due to the loss of organic material in bone (Gillespie, 1998; Gillespie and Roberts, 2000). A more diverse range of dating techniques can now be found in the arsenal of the archaeologist and biological anthropologist. These include luminescence techniques such as OSL, Uranium series (which is still in an early stage of development), Electron Spin Resonance and AMS dating. Much smaller samples of bone are now required for dating, with only a few grams being required in many instances. Establishing the age of the collection will help resolve some current arguments such as the proposal that cranial robusticity may coincide with the onset of glacial aridity (Bulbeck, 2001; Stone and Cupper, 2003).

Other investigative techniques such as ancient DNA (Adcock *et al.*, 2001), isotope analysis (Pate, 1998), computerised tomography to investigate pathology (Westaway, 2005) and replicate fragile material (e.g. Brown *et al.*, 2004) are available and have been applied with success to establish further information about the past of people in Australia. Many of these studies are being incorporated into data sets acquired from recent populations to resolve questions of human origins (van Holst Pellekaan *et al.*, 1998), and others have been employed to assist with forensic investigations (Westaway and Burns, 2001) and determine the provenance of skeletal remains (Pate *et al.*, 2002; Westaway *et al.*, 2005). Further development of techniques in biological anthropology will result in a better understanding of not only the antiquity of remains, but migrational history of groups, past health, diet, and adaptation to environmental change. Techniques are becoming increasingly less invasive, e.g. digital scanning will record measurements and enable crania to be replicated without the need for casting.

These scientific advances have coincided with the development of a significant repatriation industry in Australia. With the reburial of the Coobool Creek and Kow Swamp people, the Willandra human remains collection stands as the only significant fossil sample representing Aboriginal people from the Pleistocene. Unfortunately the communication of the types of histories that can be reconstructed from ancient human remains is seldom passed onto Aboriginal people by the cultural institutions that hold large osteological collections. Although, perhaps not by choice, the Three Traditional Tribal Groups have been dealing with the scientific community for longer than most other Aboriginal groups in Australia. There has been a history of good communication between archaeologists/biological anthropologist and the Three Traditional Tribal Groups of the Willandra Lakes World Heritage Area, although there are instances where press releases have caused much anxiety between the groups. As part of the World Heritage structure, the development of management committees dealing with the interests of all stakeholders has created a professional environment conducive to clear and open dialogue.

A major development that will ensure that the Three Traditional Tribal Groups play a more direct role in the management of archaeological, palaeontological and geological collections taken from the area is the development of a keeping place (see Fig. 4). A keeping place is a collection management facility, or perhaps more accurately, a repository for collections (that may or may not contain human skeletal remains). The function of a keeping place can be varied, for example a small keeping place established in Central Queensland was developed with the specific purpose of protecting bundle burials from the Carnarvon Gorge region which have been under threat from visitors and looters for over a century (Robbins and Walsh, 1980). Keeping places

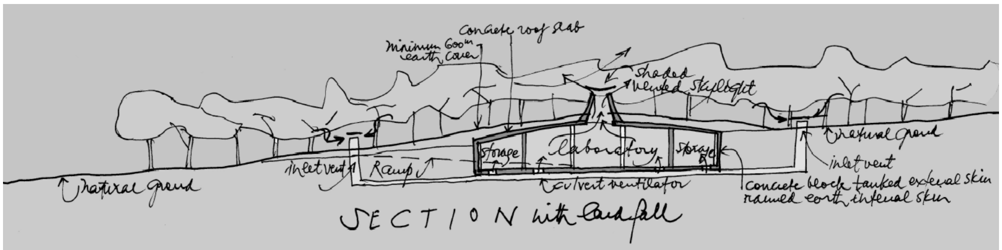

Fig. 4a. Section drawing of concept plan for the Joulni Keeping Place, Willandra Lakes World Heritage Area. The facility is constructed below the ground surface, to enable the remains to be interred into the earth and also to retain a climate suitable for curating sensitive collections.

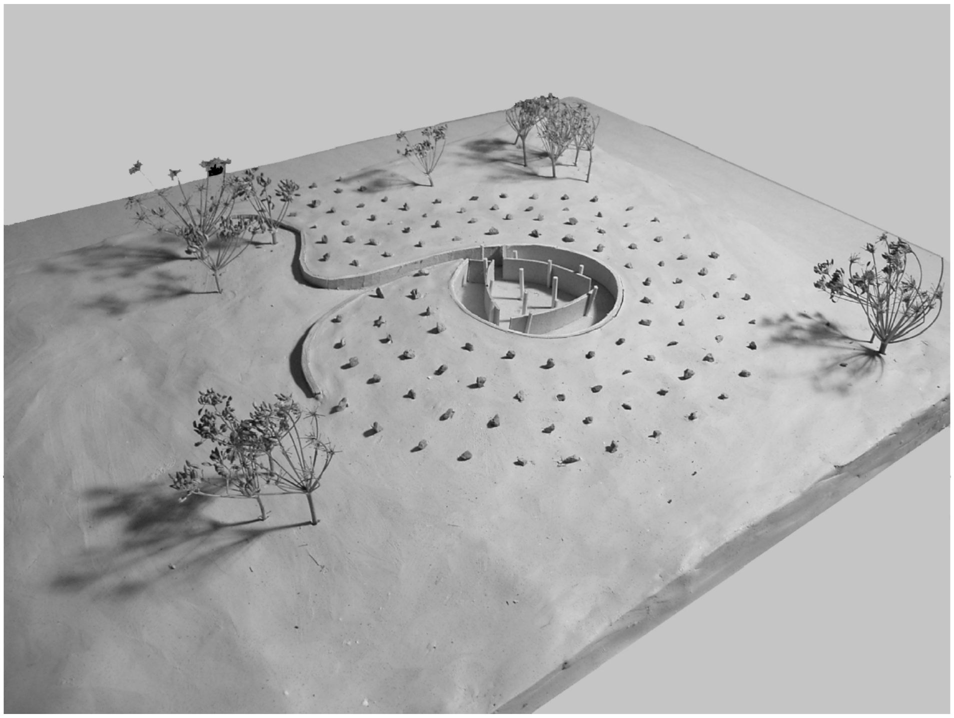

Fig. 4b. Model of the proposed keeping place (with the roof removed). The centre of the facility contains a laboratory space.

Fig. 5. Members of the Three Traditional Tribal Groups cataloguing archaeological collections as part of a collection management workshop conducted by the National Museum of Australia at Mungo National Park. The collection had not been systematically catalogued and in this image members are laying stone artefacts out for numbering and entering into a catalogue.

may also play a role in allowing ongoing research on collections, and such an example is provided by the keeping place for a historical European collection located at St. Mary's Anglican Church where an ethically acceptable agreement has been reached between the church, community and scientists (Anson and Henneberg, 2004).

Award winning Australian architect Dr Gregory Burgess has been selected by the Three Traditional Tribal Groups to develop a keeping place within the Willandra Lakes World Heritage Area. The Burgess design consists of a subterranean structure that will operate as an archive, meeting space, collection facility, and laboratory space (Fig. 4). Research will be undertaken under the guidance of the Three Traditional Tribal Groups, maximising information exchange between Aboriginal custodians and researchers. Results of research will ideally feed directly into interpretative displays and other information to be distributed to the general public as part of a future education and learning centre to be established at the Willandra and managed by the Three Traditional Tribal Groups.

In preparation for the development of the keeping place members of the Three Traditional Tribal Groups have undertaken a number of workshops intended to provide them with experience in collection management (see Fig. 5). The first of these was conducted by David Kaus from the National Museum of Australia and focussed on the artefact collections currently stored in Mungo National Park. This has established a catalogue for those collections. The workshop was followed by another in Canberra focussing on the human remains collection. The workshop coincided with a visit by palaeoanthropologist, Dr Arthur Durband, who had applied to investigate the collection to make comparisons with *Homo erectus* from Java, Indonesia. After consultation by the author with the Elders it was suggested to Durband that he provide basic instruction to Aboriginal trainees in skeletal analysis so that his visit may also serve as a training exercise. This was undertaken with the intention of providing the trainees with not only hands on experience with the collection but also the opportunity to learn more about their own past, directly from the collection.

Conclusion

The Willandra Lakes human remains collection has high cultural and scientific significance and was a central element in the inscription of the Willandra as a World Heritage Area. The collection still holds a great deal of information that is relevant to our understanding of modern human origins in the region. Perhaps one of the most striking aspects of the collection is the large range of variation exhibited in the population, far greater than that of any other Pleistocene population of *Homo sapiens*. Much of the collection is undated, and this needs to be a priority of future research to place the range of morphological variation in its correct chronological context. The Aboriginal custodians for the Willandra, from the Paarkindji, Ngyiampaa and Mutthi Mutthi language groups play a very important role in the management of these collections. The nature of their custodial role is soon to be enhanced, with the construction of a Keeping Place on Joulni Reserve at the southern end of Lake Mungo lunette. The collections will, at last, have a home back in the Willandra where they will be cared for by the Aboriginal custodians from the region.

Acknowledgment

I am very privileged to have been given permission to study and indeed continue to work on the Willandra Lakes human remains collection and would like to acknowledge the Elders of the Willandra Lakes World Heritage Area for their trust in allowing me to undertake such research. The Canberra Hospital, and in particular Dr Ross O'Neil undertook the CT scanning of WLH 50 and provided valuable comments and discussion on the nature of the pathology. Professor Don Ortner from the Smithsonian Institution provided further comments on the CT scans of WLH 50 and together with Dr David Hunt helped facilitate access to cases of Paget's disease within the Huntington Collection. Craddock Morton, Director of the National Museum of Australia, and David Kaus, Curator of the Ethnographic Collections, have provided ongoing training and support for members of the Three Traditional Tribal Groups and as a result have delivered a great deal to the development of the Aboriginal Community's capacity to manage their collections. John Tunn from the Heritage Services Branch of Aboriginal Affairs Victoria provided comments on an earlier draft of this paper. Finally I would like to thank the Department of Anthropology at the National Science Museum in Tokyo for their hospitality and enabling me to present this paper at the Seventh Symposium on Collection Building and Natural History Studies.

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