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## ARCHAEOLOGY IN NEW ZEALAND



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## **Sustaining New Zealand Archaeology's Digital Future**

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### **Introduction**

I started writing this paper after I got another phone call from a colleague about a story of woe relating to a failed hard disk in a computer. The news is not always bad: most people have at least some back-ups of most of their work and can usually get the data back onto a new and better computer. Our increasing dependence on computers for archaeological data offers a multitude of opportunities for collecting, analysing and distributing data and information (see e.g. Moore and Richards 2015). The cost is that the scale of loss for an individual and the archaeological community becomes greater when we collate this information into a single digital space. I am not an advocate of a return or even the long-term retention of paper-based recording; it has always been susceptible to destruction, filtering, and quality issues. The difference with digital is that we can do it better. We must ensure that we store and disseminate archaeological information in ways that enhance the heritage values we espouse. I also face this realisation as so much of my own personal information is stored on the various disks in my office. That storage reflects a chaotic forest of projects, good intentions and digital dumps that I promised to sort out one day but recognise that it is increasingly unlikely. In this paper, I discuss some of the challenges and opportunities we face as archaeologists working in New Zealand to create a digital record of our past.

Any remaining proponents of the paper and pen approach seem to quickly forget how often the papers get lost or crumpled, ink fades, pencil marks fade and old carbon copies are unreadable and get discarded. Stories from archaeologists involved with the rescue of the NZAA site record files during the Christchurch earthquakes in 2010 and 2011 demonstrate the vulnerabilities of our collective history. Is the best place for storing the NZAA's Central File in Wellington, our earthquake prone capital city, or is that too much of a risk? Indeed, going digital did not prevent NZAA's ArchSite itself ending up on a computer server that was at least temporarily physically inaccessible in an earthquake vulnerable building in 2014. Shifting the resource to a 'cloud-based' resource does much to mitigate this vulnerability but still relies on those service providers having robust backup and disaster recovery processes. Digital allows data to 'live' in a way that paper doesn't and that is the best way forward for heritage information.

## **Low, Slow and Lumpy Data**

It is fashionable to use terms such as ‘Big Data’ in describing the challenges to do with the management of heritage data in the New Zealand and wider Pacific archaeological context (see e.g., McCoy 2017). It is important, however, to appreciate that almost none of the data generated by archaeological research projects in New Zealand really meet the ‘Big Data’ approaches described for Information Science. Briefly summarised, definitions of ‘Big Data’ relate to the management of large databases based on the three and sometimes four V’s:

Volume,  
Variety,  
Velocity, and  
Veracity (see e.g., De Mauro et al. 2016, Gattaglia 2015: 114).

Archaeologists using ‘Big Data’ relating to New Zealand data usually only equate the term with the first dimension, volume, emphasising how much new data is being generated within the discipline compared with historical work. That data can relate to sites (e.g., NZAA ArchSite, McCoy 2017) or feature recording and artefact analyses (e.g., Holdaway et al. 2018, McCoy et al. 2019).

Despite the impressive achievements that those databases such as ArchSite represent, from a technological perspective, none of those databases are in fact ‘big.’ ArchSite manages the records for 70,000 sites and even though there are a lot of images, the full data can be stored easily, perhaps around 50gb maximum, on a single desktop computer. Even adding in all the HPTNZ Digital Library file (estimated less than ~50Gb of data), the Auckland Council CHI (~30Gb), *Archaeology in New Zealand* and associated journals (~5Gb), all of it could be stored on a single, albeit high-end, memory stick available from a local computer store for less than \$100. (The size data is only estimated based on rough calculations of numbers of reports, scanned images associated with site record forms. Database storage, optimisation and backups would all factor into the way in which this data is stored in the systems used. However, as disk storage is now mostly measured in the order of terabytes, there is significant room for expansion).

Archaeological data is also probably better described as ‘slow data’ (see e.g., Heitman et al. 2017, Kansa and Witcher Kansa 2016). Big Data approaches focus on managing data flowing in on a continuous or near continuous basis, whereas archaeological data can be very slow to create, sometimes taking years and decades, and is then delivered in large ‘lumps’ of complex contextualised information.

We could, for instance, imagine tracking the activities of all the archaeologists working in New Zealand to see how many sites they were recording, artefacts they were analysing, lectures being given or reports they were writing or reviewing. Even then it would be hard to match the flow of data generated by a social media platform on an hourly basis. Archaeological data in New Zealand does not change that fast.

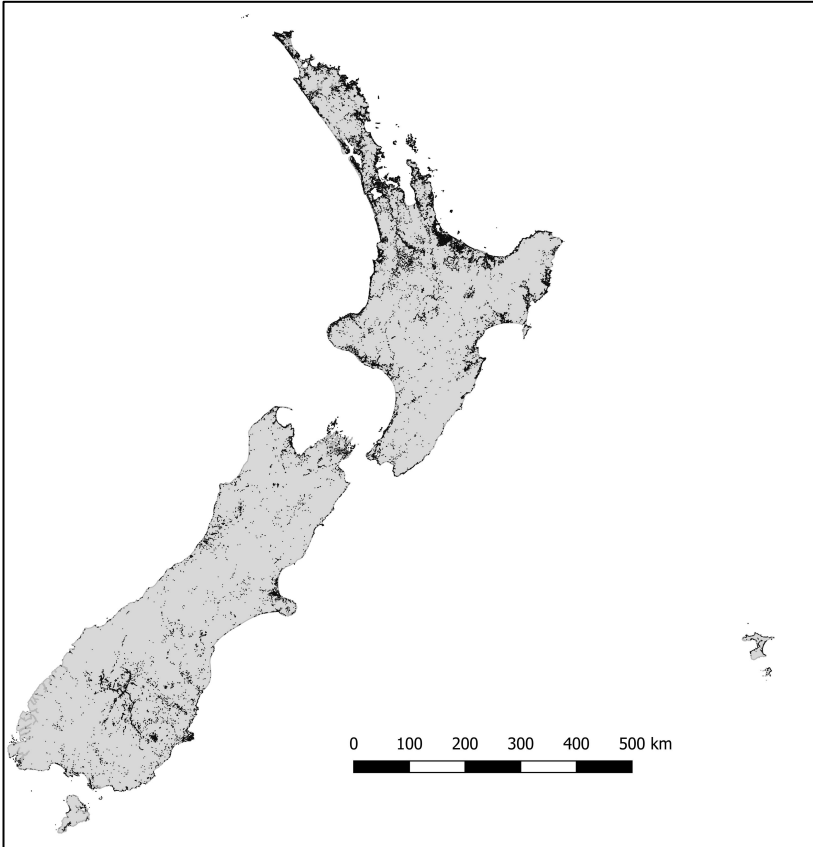
The difficulties associated with ‘veracity’ are not unknown to archaeologists, and do not relate to whether archaeologists are being ‘truthful.’ Several aspects of archaeological recording such as using point location data to represent site extents, site typologies that encapsulate a range of features (see e.g., Bickler 2018: 55ff for discussion on New Zealand cases), single dates for temporal phases, in fact any data classification process relate to the applicability or the ‘veracity’ of data for any analytical purpose. Many sites, for instance, are classified by modifiers such as ‘?’ indicating a lack of certainty regarding the reliability of observation e.g., a possible terrace.

The implications of that uncertainty can have quite different consequences depending on the purpose of the information. From a research modelling perspective, the information can be included or discarded depending on the research objectives. With large databases, the consequences of either decision can be tested and evaluated to determine whether such a decision is warranted. In contrast, during a statutory process, that possibility may become very ‘real’ indicating the presence or likely presence of archaeological features requiring potential major financial outlay for works associated with that place and thereby a major ‘risk’ associated with projects (Bickler 2018: 138ff).

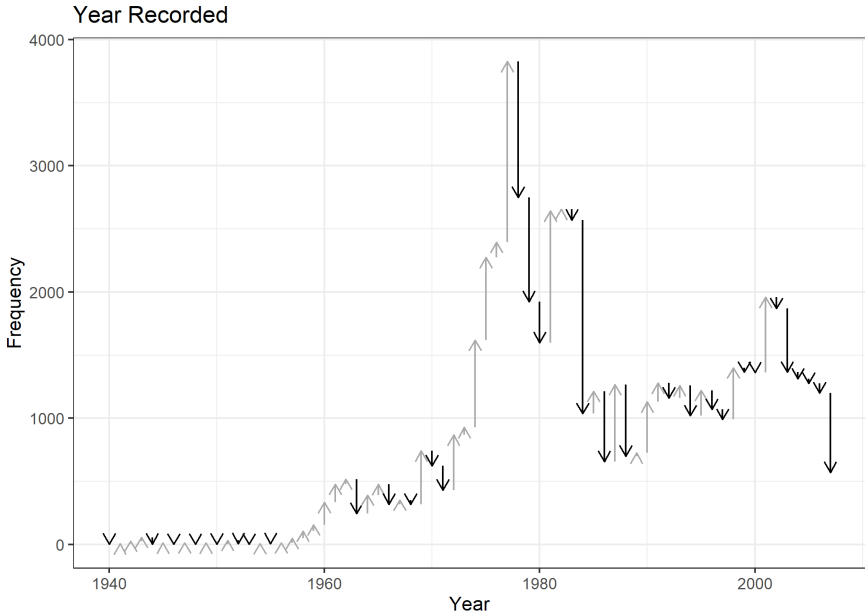
That the archaeological data does not really fit the criteria of ‘Big Data’ does not mean that the types of analysis such an approach encourages are not useful. Maps such as Figure 1 show the typical form of site distribution – the location of recorded sites, but it can be useful to work out how that distribution came about. Figure 2 shows a ‘waterfall’ type chart showing the annual rise and fall of new sites being recorded from 1940-2005 (although really only fully reliable from the 1950s with the NZAA Site File). The overall trend of new sites being recorded shows a clear peak in the early 1980s as a range of recording projects around the country significantly improved both the numbers and overall national coverage of sites. The growth of the NZAA Site Recording Scheme early on and the drop-off following the end of the major work schemes is apparent.

Figure 3 shows that data in a series of 5-yearly maps of the density of sites recorded by map grid based on the CINZAS data from 1955-2005. A few patterns stand-out, but noticeably the initial relatively widespread nature of the recording

of archaeological sites throughout both the North and South Islands, peaking in the 1980s. From then on, the North Island sites continue to be increase but new sites from the centre of the South Island diminish.



*Figure 1. Map of archaeological sites recorded in New Zealand (source ArchSite)*

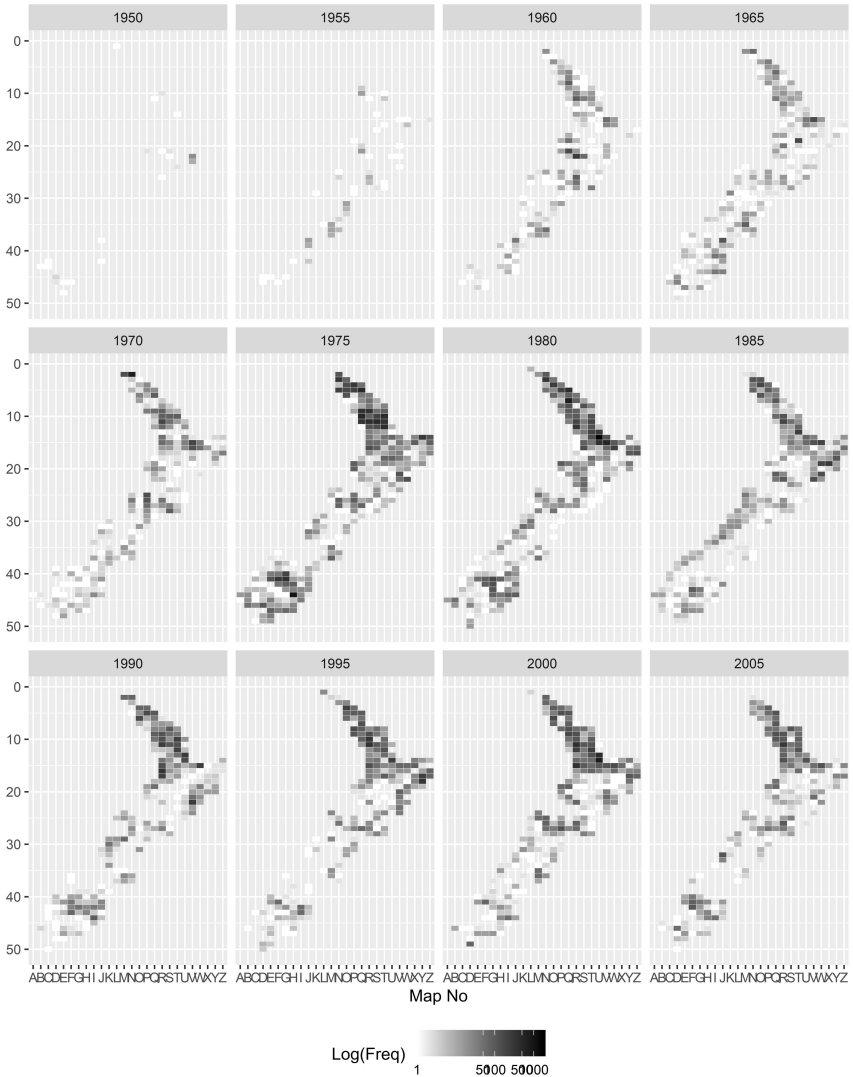


*Figure 2. Waterfall plot showing new sites added by year to NZAA Site Record database*

These figures show major changes to the nature of archaeological practice in New Zealand from the 1950s to the early 2000s (see Walton and O’Keeffe 2004). Law (2007) describes the pressures on the site record scheme in the early 2000s and laid out the justification for the establishment of ArchSite. We can also expect a major shift in site recording practices in the 2000s as land development, the RMA, and HNZPT processes have kicked in, as well as the results of the work around Christchurch in response to the earthquakes. However, that remains for a future paper.

The data here focuses on recording of ‘new’ sites, which continues but not at the pace that occurred in the late 1980s. Updates to site records are as important and probably increasingly important and have been the focus of much of NZAA’s efforts over the part twenty years (see e.g, Walton 1986, Walton and O’Keeffe 2004). Issues such as changing fashions of site recording have also influenced the site distribution (see e.g., Bickler 2018: 55ff).

*Bickler – Digital Future*



*Figure 3. archaeological sites recorded from 1950-2008 by NZMG mapsheet (Source Data CINZAS. Note 2005 only covers up to 2008 when CINZAS was no longer maintained)*

## **Lumping and Splitting**

The ‘lumpiness’ of archaeological data is more difficult to illustrate. Some of the lumpiness relates to the data itself such as the greater density of sites associated with the landscapes, whether of pre-European or historic origin. There is great variety in the archaeological data available given the range of contextual, historical, technical and theoretical approaches used by archaeologists in New Zealand and this very much contributes to the lumpiness of the information used. Briefly, while NZ Archaeological data may not be big, there is a lot of information generated that is being under-utilised in respect to both research and heritage management practice.

## **Shades or Blinkers**

The problems associated with data management are hardly new and pre-date the main digital revolutions. I have written elsewhere (Bickler 2018: 304ff) on the importance of retiring the notion of the ‘grey literature’ in New Zealand archaeology and many of the negative associations that have accumulated around this information. Roger Green’s talk at the NZAA Conference in 1987 on the archaeological grey literature in New Zealand embedded it in the minds of New Zealand archaeologists (NZAA 1987), although it was used by Schiffer (1979: 5) in relation to the American CRM literature in his introduction to the publication of papers from the 49th ANZAAS Congress held in Auckland in 1979. The topic of Green’s talk would be familiar today, with recognition of the growing corpus of unpublished reports and the need for ‘proper publication in a more scholarly or at least accessible form’ (Green reported in NZAA 1987: 65). Egloff (2019: 117ff) has recently discussed the growth of concerns over the grey literature in archaeology on a more international scale but at least initially much of what occurred overseas, happened in New Zealand, although on a smaller scale compared with Australia, the USA and the UK.

Other complications regarding the shades of grey associated with archaeological data have also been long recognised. Jacomb (1995) acting as the NZAA Site Recording Co-ordinator introduced the term ‘lighter shade-of-grey’ for those reports where there were no archaeological sites or no impact on sites so were never passed on to the statutory bodies for review and collection. This leaves major gaps in our understanding of the archaeological landscape as well as representing an element of wastage in the system. The availability of such data has improved in a patchy manner, with many assessments published online via local authority websites as part of their notification processes.



New Zealand archaeology has had little of what Egloff (2019: 117) describes as ‘opaque literature’ where commercial confidentiality has prevented information being available. It is not that it does not happen, but with most of the work being done for land development, there is a general awareness about the need to be transparent about heritage. Limitations relate more to available resource rather than active restriction or censorship. When data has been actively, albeit temporary restricted, on occasion that has fed long-standing conspiracy theories relating to New Zealand’s past such as at the Waipoua Forest (e.g., Taylor and Sutton 1988).

Restricting information relating to mana whenua sensitivities particularly associated with koiwi (burials) is not uncommon but is more about respecting tikanga than an attempt to hide information. Ethical considerations (see Bickler 2018: 284ff) do play a part in this debate and no doubt will remain contested. Some archaeologists have also looked at copyright statements (see Corbett 2011 on discussion of copyright on heritage items) on their work as a way of controlling usage although usually archaeological work follows the ‘fair-use’ approach with appropriate recognition in line with the NZAA’s Professional Code of Ethics (McGovern-Wilson and Walton 1999).

The ‘grey literature’ in New Zealand has become the *de facto* literature of New Zealand archaeology (Bickler 2018:307). It is generally freely and publicly available (*kudos* to the HNZPT, cf Egloff 2019: 57ff) and describes the primary excavation data available in the country. This is very much as a result of the shift to the digital technologies at all levels of production, copying of reports, and the ease of transfer of that information. In contrast, academic publications remain a much more refined communication between fellow academics, rarely providing details of the primary data and shared via networks and often restricted with access via paid academic databases. This is changing (Bickler 2018: 306).

The problem becomes more complex as the NZ archaeological community embraces social media. Recent blogs such as those covering Wairau Bar and Great Mercury Island provide entertaining insights into the excavations while they are happening. Underground-Overground’s blog on Christchurch archaeology has plenty of great commentary on historical research, artefacts and digs (see Watson and Garland 2019). The various Facebook forums and company websites are also useful. But a curation strategy for these internet locations is non-existent and although it may be good that some of that content is filtered out in the future, some of the highlights deserve an enduring lifespan.

The databases maintained by statutory bodies, academic publishing companies and organisations such as the NZAA are one aspect of the digital heritage

warehouse. The personal data held by heritage practitioners is another and rarely mentioned in the literature although occasionally discussed by colleagues. The disappearance of data, both digital and non-digital, when a colleague leaves the profession either by choice or death, raises important questions with little in the way of solution provided. Boxes or papers and artefacts once housed the lifetime achievements of an archaeologist and now are replaced with hard disks. Both have limited shelf-lives without appropriate care.

Major challenges related to the curation and accessibility of archaeological data therefore remain, as the objectives are no longer just about making final publications available for some future, largely vague, purpose. Now archaeological information is being generated as part of publicly accessible statutory processes associated with land development and heritage management, as well as rapidly altering the data available for research purposes and the shape of what research should be about. This is a major shift because it also means that the information is far more contestable, and potentially far more influential.

### **Intelligence and Sustainability**

This discussion on the scale and nature of archaeological data begs the question whether there may be too much data for archaeologists to easily incorporate into coherent and comprehensive models of the past and for tools for managing heritage. As I have argued elsewhere (Bickler 2018: 315ff), while Davidson's (1984) volume on New Zealand's prehistory used a listed 107 sites as its basis, today that amount of data is probably being generated every year, but heavily skewed to the areas where land development occurs (as shown in Figure 3). This leaves important areas of archaeological interest relatively unchanging but no less important from research and heritage management perspectives.

Davidson's (1984) volume focused on a relatively small number of specific sites which contained the richest contexts and artefacts. That approach still dominates in research programmes although always with a view to the broader landscape. These rich sites create the 'lumpiness' in archaeological data.

Unsurprisingly in CRM work, much the same does happen. Rich sites deliver more complex results. The nature of the work, however, forces a lot of time to be spent looking at the less complex sites, which hopefully have avoided damage, and monitoring those areas where no archaeology was found. A lot of the data generated is Jacomb's 'lighter shade-of-grey' reports but we do not know yet how important that information may become as those landscapes change.

For individual archaeologists and smaller companies, the primary focus will remain on data curation. This includes good back-up practices and using relatively standard data formats for their work. It is also worth considering making sure that somebody is both able to and legally entitled to access the data and make it available to the community when and if something happens. Families of archaeologists are often not fully aware of what they have, and it is easy for that valuable archaeological material to be dumped without consideration. The NZAA has asked for provision to be made in wills and it may be worth doing that particularly if people would like to target that donation to assisting in archiving and preserving their own data.

On a community scale, the strategy is to make sure that we make use of the available resources for digital storage of reports such as ArchSite, Heritage NZ Digital Library and other locations like the Auckland Council CHI. ArchSite is a cloud-based system now and although it should not be used as a large scale ‘dump,’ enriching the site descriptions with images taken from excavations, surveys and other investigations is certainly something that is worthwhile. The main thing is to not overburden the ArchSite file-keepers and administrators, but expanding that capacity and functionality is a useful objective for the NZAA.

Crucially, we need better tools for accessing and maintaining the data and this involves more databases with more tools to analyse information rather than just data storage. We need more intelligent, computer assisted systems for using and distributing archaeological results. That will make our results sustainable.

## **Discussion**

The paper was finished just when my own centralised storage device decided it had reached the end of its life. Fortunately, I did have a backup and the transition to a new one was relatively painless except for the cost of new storage and a few hours work. I am conscious that this is only a band-aid for my own work and does not even begin to address the bigger issues. The real challenge is building a sustainable digital future for the results of the labours of New Zealand archaeologists and other heritage professionals.

The role of archaeology in the New Zealand context represents a much broader treatment than can be made here (but see e.g., Allen and Phillips 2010, Bickler 2018: 255ff, Solomon and Forbes 2010). However, the outcome of ‘shoeboxes and pdfs’ (Hutchings and La Salle 2015) in New Zealand is not without its successes and the central role that the NZAA’s site recording scheme (in file-boxes), its digital incarnation in ArchSite and the HNZPT’s digital library have been fundamental to the development of improving heritage management of

Maori sites for decades (e.g., Bickler 2010) and into the future (McCoy 2018). It is crucial for the process of decolonising archaeological practice (see O'Regan 2016: 214ff). ArchSite encapsulates more than 60 years hard labour of a passionate community and its value has long been recognised if not always supported sufficiently. It would naïve however to consider that the archive of archaeological reports is sufficient compensation of the loss of heritage places and landscapes.

Archaeology in New Zealand is generating ever-increasing amounts of data and information relating to all manner of the heritage, but it is not being systematically captured. All could benefit from expansion of the scope of current databases, creation of new databases and improved integration. As digital data are now the main outcome of many CRM projects, the curation and sustainability of that data is a major priority.

This way forward includes building up the CRM 'infrastructure' (see e.g., Kansa 2010) which will improve how archaeological work is undertaken. There is a track record of success to build on including the NZAA's ArchSite, HNZPT's Digital Library and Auckland Council's CHI. Organisations such as HNZPT, TLAs, NZAA and academic institutions must be funded to continue their engagement with the CRM community and focus on developing and improving a cultural knowledge 'infrastructure' rather than control the CRM output outside their compliance requirements. This could also include new tools to manage the HNZPT Authority process in an accessible manner.

Archaeologists must explore and expand on the notion that 'publication' is the endpoint to the objectives of archaeology in both academic and CRM-based archaeology in New Zealand. Even if all the reports were completed and published, the way in which that information should be used is by no means limited and certainly comes with a range of challenges both old and new. Those challenges are embedded in larger debates that cover technological change, the identities of the past, the embodiment of the present and the physical and social future of New Zealand places.

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