Metal detection: an essential aid in maritime archaeology

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Metal detection has proven itself to be an essential adjunct to the human eye in the non-disturbance location and assessment of archaeological deposits where metals exist. It can also assist greatly during excavation and in post excavation management strategies. Relating experiences in Australia over the course of several decades helps explain why the method has been slow in being more broadly accepted as an archaeological tool and in some instances misunderstood by many archaeologists. These experiences illustrate why it is essential for historical and maritime archaeologists to avail themselves of the tool.

Keywords: Magnetometer, metal detection, remote sensing, *Vergulde Draeck*, *Zuytdorp*.

Introduction

HAVING conducted a number of remote sensing operations in a maritime archaeological context and being exposed to arguments both for and against the use of metal detection, the author is in a position to comment on its use in archaeology and to present it as an essential tool. To do so in these pages is especially appropriate given this journal's scientific focus and title, for where 'best practice' is strictly adhered to, expert metal detection should be placed on an equal footing with other archaeological remote sensing techniques, such as magnetometer survey, side scan and multibeam sonar, sub-bottom profiling and ground penetrating radar.

Not all agree with this assertion however, and metal detection is especially vulnerable to criticism (often justifiably so), for there is one fundamental difference between it and all other remote sensing methods. The operator is normally the excavator. Therein lies the method's 'Achilles Heel', for no other form of remote sensing links the searcher and the excavator so directly. This is especially so given that, compared to all other forms of remote sensing, excavation generally takes place immediately after detection. Thus, any failure to apply 'best practice' in any of the search, excavation, recording and artefact management phases serves to negate the validity and worth of the entire process. Additionally, metal detectors are also relatively cheap, ubiquitous and portable, rendering them readily accessible to the public compared to most other forms of remote sensing equipment. As a result, and because little skill or experience is needed to operate metal detection equipment (albeit in a rudimentary fashion) the method has, in some circles, become inextricably linked to uncontrolled and destructive excavation. News items such as 'Amateur archaeologist unearths hidden finds' (*West Australian*, 25 June 2018) abound. Such press further prejudices many professionals against the metal detecting causing them to be subjective in their assessment of both the method and its results. In what follows, the Western Australian case study is used to examine, understand and perhaps clear the way amongst those still jaundiced against its use.

The Western Australian case study

When British remote sensing specialist Jeremy Green joined the Western Australian Museum, Department of Maritime Archaeology in 1971, an expectant press reported thus:

> 'He will bring with him underwater electronic detectors which he has developed at the archaeological research laboratory at Oxford University. They include a proton magnetometer and a metal detector, which can be used to study in detail the distribution of metal relics beneath seaweed, sand and coral' (*The Sunday Times*, 25 April 1971).

Soon after, the magnetometer and metal detector were deployed underwater to assist in locating and delineating buried wreck sites and/or following wreckage 'plumes' away from the main site. While metal detectors were used underwater with relative frequency and with some degree of success, their deployment in terrestrial contexts met with decidedly mixed results. The first such application was a search for the remains of a silver deposit believed to have been brought ashore by survivors of the *Vergulde Draeck* (1656 CE) on the mid-west coast, while the second was in response to an indigenous legend indicating a place on the south coast where survivors from what appeared to be a burning vessel had landed. While the former was unsuccessful, small boat fastenings consistent

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with a rowing boat were found in the latter case. The location of large iron deck knees lying buried in the intertidal zone, indicated that the parent ship (an early 19th century CE vessel) or a large part of it had also come ashore. This corroborated the Aboriginal legend and linked it to a hitherto discredited European account of a shipwreck sailor who lived with them for many years[1].

Later, in searching for wrecks buried in the shore sands at Bunbury on the south-west coast, the author employed metal detectors in concert with hand-held magnetometers, again using transits and tapes for position fixing in the pre-GPS era (Figures 1 and 2). The results were mixed[2].

Despite these and other instances of the use of the technology, terrestrial archaeologists in Western Australia did not follow their maritime archaeological counterparts and deploy metal detecting as valid means of prospection and site survey. There was good reason at the time. Being, with very few exceptions, students of indigenous prehistory (a discipline where metals did not occur, or if present typically represented 'modern' contamination), most had no call for the method. Further, in its formative years, maritime archaeology was struggling for credibility against a hostile archaeological 'mainstream'. Many rightly pointed to a lack of qualified personnel, and a paucity of maritime archaeological theory, thereby damning the discipline, its practitioners and their methods in mainstream eyes[3]. Further, even after historical archaeology and industrial archaeology eventually became established in Australian universities, there were few avenues for training and proficiency on which emerging mainstream terrestrial archaeologists could build in order to become familiar with remote sensing as an archaeological aid. Having learnt that surface deposits were a reliable pointer to what lay beneath, a generation of terrestrial archaeologists (even those emerging from the prehistory mainstream into historical archaeology) placed their faith almost entirely on these indicators in deciding where to conduct archaeological interventions. Thus metal detection was seen to be unnecessary, with its operators superfluous in an archaeological sense. This situation was especially pronounced in Australia, as observed by historical archaeologist Adam Ford

> 'The use of remote sensing, specifically metal detection survey on terrestrial archaeological sites, while common in Europe is still rare in Australia.'[4]

Figure 1. Transit poles mark grid lines for the combined magnetometer (operators' foreground) and metal detector survey (operators in the distance) at the Bunbury wrecks (B. Richards).

Figure 2. Close-up of the metal detector team proceeding along the grid. 'Strikes' were called out, recorded and staked (B. Richards).

A new era: the *Zuytdorp* site

The catalyst for change occurred at the *Zuytdorp* (1712 CE) site after attention swung to the interior in an effort to track the movement of survivors and materials away from the wreck. This new research direction, which commenced in 1986 when the author assumed command of the programme, included the possibility that the survivors had interacted, or even intermarried with Aboriginal groups resident in the area. Though archaeologists and prehistorians subsequently conducted surveys in areas identified as having potential to be associated with shipwreck survivor material (as identified on the basis of past inspections and oral histories), little, if any, of such material was identified. In part, this could be attributed to a range of taphonomic factors (such as the activities of dingoes and white ants in dispersing or otherwise destroying organic materials) and past collection activities that involved uncontrolled metal detection and highly destructing excavation practices, used[5].

In attempting to use metal detection equipment where metallic remains were very sparse – particularly in the very heavily wooded and rough terrain adjacent to the wreck – it was soon realized that a greater level of expertise than that available to the museum was required. Clearly without access to it, definitive answers about the movement of survivors away from the wreck would not be forthcoming.

That situation changed in April 1990 when Robert (Bob) Sheppard joined the author's team. One of Australia's best known and most highly skilled metal detector operators, Sheppard was a prolific gold prospector and was then head of the Amalgamated Prospectors and Leaseholders Association of Western Australia. Though holding this influential post (often advising government on mining and prospecting matters), ironically Sheppard had earlier made contact in order to obtain information for the purposes of writing a historical fiction. Nonetheless soon after he joined the Museum in the field, a mutual appreciation of the expertise he could bring to the *Zuytdorp* 'Indigenous interaction' programme steadily grew.

The importance of utilizing the services of highly skilled metal detector operators in shipwreck survivor studies first became manifest at a major Aboriginal encampment around 70 km north of the wreck. There prominent *Zuytdorp* researcher and geologist Phillip Playford had found Aboriginal grindstones emanating from a river bed around 40 km south of the site, there by proving that their owners were moving between these two places via a line of waterholes in the hinterland of the wreck. On arrival, Sheppard tutored all present in the use of metal detectors and, after marking out a series of systematic survey transects, a brass tobacco box lid marked 'Leyden' was soon found. Being indisputably from the wreck, to Playford this was a clear indication that survivors from *Zuytdorp* had joined a local Aboriginal group and had travelled with them to the well[5]. The find was of such import that news appeared in Australia and around the world under headlines such as 'Whites may have settled 70 years. Before First Fleet' (*Weekend Australian*, 8–9 September 1990) and 'Evidence has been found that a lost European community settled in Western Australia more than 70 years before the British landed at Botany Bay in 1788' (*Daily Telegraph*, London, 11 July 1990). These pronouncements were, however, premature, as subsequent investigations showed[6].

Sheppard then accompanied staff, historical archaeologists and prehistorians whenever indigenous encampments were examined for possible wreck-related materials. In all cases the sites were found to be contaminated with post 18th century CE material, including spent munitions, fencing wire and the like, revealing little if any evidence of the *Zuytdorp* survivors (although in one instance a possible cache of material from the *Zuytdorp* wreck was found in association with a 20th century station worker camp). In that pre-GPS era, when traversing thickly wooded country, it is difficult to mark out by traditional means such as tapes, or transit markers (as shown above). Sheppard marked progress by the simple expedient of 'chaining'. This involved attaching a bicycle chain attached to his belt, which would trail behind, leaving a distinct line in the sand. This not only allowed progress to be marked, but also ensured that the required detection overlap in each lane was maintained, and that the 'sweep' was effective to within the limits of the machine and its operator. That method is best illustrated in the following image at a site associated with the infamous massacre following the wreck of the ship *Batavia* in 1629 CE (Figure 3).

After extensive operations over a number of years, often in cooperation with indigenous-European informants who had lived and worked on the sheep stations in the hinterland of the *Zuytdorp* wreck, and who were descendants of those who had moved objects from it, it was concluded that:

> 'No further archaeological works need to be attempted on the land, in the foreseeable future, as all of the above indicates that those who have gone before have been very thorough in locating all surface sites and in removing all visible (shipwreck materials) … we have continually found evidence of Dutch encampments that have been 'worked' in the 20th century … the metal detector finds mirror this last point' (McCarthy, M., *Zuytdorp Day Book*, Vol. 1, pp. 100–101).

It was at that point metal detection operations ceased at *Zuytdorp* and other potentially linked terrestrial sites, such as indigenous wells and soaks, to which survivors and their materials might have travelled. Any future investigations on these sites would necessarily be predicated on changes in ground surface visibility (including removal of detection-limiting ground cover following bushfires) and/or through advances in detection technology.

The French annexation site

Nothing confirmed the value of having an expert metal detector operator using state-of-the-art equipment more

Figure 3. Chaining in progress, showing the 'lanes' generated (M. McCarthy).

than archaeological work at the site of the 1772 CE annexation of New Holland (as Western Australia was then known) for France. There the French explorer Louis de St Alloüarn left bottles, each with a coin affixed to its top as proof. One contained a parchment advising of their actions.

As the French clearly marked the location of their annexation ceremony, many researchers and enthusiasts searched for these iconic items over the years, using metal detectors and by extensive digging at promising locations[4]. It was not until 1998 that one of the coins was finally found, however. When the museum was alerted to the find, the author, then the museum's Wreck Inspector responsible for examining reports of wrecks and historic relics and helping manage the sites from which they came, conducted an official inspection of the site. This inspection confirmed the significance and location of the find. As recommended in the ensuing report, a large museum-based expedition including historical archaeologists ensued in 1998. Assisting them was a metal detector team comprising the author (as coordinator and recorder) and Sheppard, who had as his assistant Robert (Bob) Creasy, another highly-experienced operator.

As per an agreed research design, a surface examination preceded the laying of grid lines with tape over the area of the original find. This was followed by marking each 'strike', some with colour-coded pegs that were used to differentiate between detritus (corroded iron fragments, aluminium cans, pull tabs and other invasive material) and items of potentially greater significance (Figure 4).

As some indication of the then prevailing attitudes, the archaeologist, though presented with an array of tags denoting each metal detection strike, ignored the metal detecting survey in deciding on the placement of controlled test excavations. The three test pits excavated ultimately proved to be archaeologically sterile. Though advised that coloured tags indicated items of possible significance, the entire archaeological team considered their work complete and departed for the base camp. Also ignored was advice that others would follow in search of the relics and that leaving significant strikes untested would undoubtedly place what remained of the French annexation materials at risk.

The metal detector team then continued its work albeit on the understanding that the terrestrial archaeologists would be recalled from the base camp if anything of import was found. Soon, evidence of a metallic object fixed to curved glass was found by the detection team; the archaeologists were recalled and they excavated what proved to be one of the annexation bottles (Figure 5).

Though a spectacular and much-publicized success, providing concrete evidence of the validity of a French claim to New Holland effected the year after James Cook (RN) had claimed New South Wales for Britain, there was considerable debate about the probity of the find. Some years later, for example, on the occasion of a re-excavation of a much-wider area for the purposes of finding the remaining bottle, the surprising decision not to take into account the metal detector survey findings were examined by one of the original archaeologist's peers[7]. There the decision was considered the result of philosophical tensions between the ethos of 'problem oriented', 'result oriented' and cultural resource management approaches to archaeology. In hindsight it also appears that the then raging 'particularist', 'processual' and 'post-processual' philosophical debates underpinning terrestrial and maritime archaeology were another factor.

This debate failed to find resolution over the course of the next decades, for the discovery of the French bottle

Figure 4. The annexation site showing Cape Inscription in the background and the place where the tree under which the original coin (Coin Tree) was found. Metal detection 'strikes' appear marked in white or with coloured flags indicating items thought to be of significance (M. Stanbury).

Figure 5. The French annexation bottle with the finders: (L–R) Bob Sheppard, M. McCarthy, Bob Creasy (M. Stanbury).

was latterly characterized by one archaeologist at the 2017 IKUWA conference on maritime archaeology as 'more by accident than design' (citation withheld). Clearly this was a subjective assessment, coloured by numerous factors, including a prejudice against metal detection and a certain blindness to the underlying research design, meticulous survey process and skill of individual metal detector operators. A later and somewhat objective assessment of the project is instructive:

> 'The aim of the (1998) geophysical survey was to detect and map all metal targets within the study area. Where possible this information was supplemented by a description of the character of the target. Based on the variation in tone and volume of the detection signal the operator was able to say if the hit was shallow or deep, large or small, a collection of items or a single piece and in some instances whether the target was ferrous or non ferrous … . The metal detection survey provided both a rapid and accurate method of establishing the parameters of the site by the location of metal objects. In this instance the picture created by the survey was, with few exceptions, also representative of the actual density, distribution and nature of the archaeological assemblage. Archaeological excavation showed that 99% of artefacts were metal and a similar percentage was found within the effective range of the metal detector. Excavation also tested the accuracy of the position and type of artefact recorded by the metal detector and interpreted by the operator. In the majority of the cases the artefact was found to be as described by the operator and within 50 mm of the flag.'[4]

This affirmation from Ford, a very well-known figure in Australian historical archaeology, has proved crucial and arguably marks a watershed, for his excavations have attracted very large academic, news and television audiences in Australia and overseas. Many of these have been collaborative projects with Sheppard, the most notable being the investigations at Glenrowan Inn, the site of Ned Kelly's famous last stand and later at other well-known bushranger's sites[8] and https://www.history-channel.com.au/shows/lawless-the-real-bushrangers. Given the range of high-level official clearances required to excavate at sites of such national import, it is evident that metal detection, where used as an integral part of an historical archaeological project with expert operators acting under the direction of a recognized archaeologist, was slowly becoming more widely accepted.

When reviewing the original decision to ignore the pre-disturbance metal detection study at the French annexation site, it must be observed that much has been learnt since then in applying 'heritage metal detection' techniques to historical archaeology on land. For example, Sheppard and Creasy's subjective discrimination of metallic signatures has now been replaced by instruments that accurately differentiate between metals. Informed archaeologists are also now more frequently employing metal detectors as an aid to the traditional pre-disturbance surface search, and are sometimes found interrogating the floors and walls of their excavations and then their spoil heaps during and post excavation, thereby allowing them to be far better informed on what might lie in those areas.

As a result of these learnings, this author is a strong advocate of what might now be termed 'archaeo-metal-detection', i.e. metal detection used *ab initio* as part of a bona fide archaeological programme, albeit recognizing (as Ford has also done) that 'metal detectors, as with all remote sensing techniques, have limitations and are dependent on the experience of the operator'[4].

Best practice in heritage metal detection

Recognized codes of 'best practice' for 'responsible metal detection' by avocational 'detectorists', including the *British Portable Antiquities Scheme Code of Practice for Responsible Metal Detecting*[9], and https://finds.org.uk/getinvolved/guides/codeofpractice exist. There, an avocational antiquarian finding significant objects according to a set of legal, conservation and other guidelines, reports the find and archaeologists can follow-up the find in a form of 'post-detection archaeology'. In contrast with this process, the author seeks to establish that 'best practice' in historical archaeology must involve metal detection as an integral part of any pre-disturbance research design and methodology.

Pointers towards what might constitute 'best practice' where archaeologists use metal detection *ab initio* have been gleaned from an objective assessment of its use in an archaeological context in the field; underwater; on land at *Zuytdorp*; at the French site; in working with the specialists mentioned above; from theoretical discourses including the comprehensive introduction to the method[10–12] and their presentation of the archaeological investigations at Little Big Horn (1998) as but one famous case study[9].

From these it is evident that to achieve 'best practice' in the search and survey phases of any archaeological programme entails utilizing state-of-the-art equipment, and experienced operators operating under archaeological direction, working as part of an archaeological process with an accepted research design and methodology. This in turn must include GPS tracking of progress and entail the non-disturbance 'differentiated' marking of the metals detected. This strictly non-disturbance regime needs then inform the decision whether to leave the site as is, make surface recoveries, and/or test the deposit. It has also been learnt from these various sources that the excavation process (if it occurs at all) needs also avail itself of metal detection in order to predict what might lie in the finished excavation walls, or under the trench or test pit floor, post excavation. Clearly management decisions are thereby better informed. A standard post disturbance remediation stage also needs to include a check of the spoil heaps.

Lastly metal detection can be valuable in checking unauthorized visitation to a site and is useful in limiting future disturbances. As often occurs in metal detecting on jealously-guarded gold prospects, the site can be 'salted' with marked metallic tokens, first to see if they are recovered, thereby indicating a subsequent visitation and also to alert those following to the fact that they are on previously 'worked' ground and are most likely going to prove unsuccessful.

Conclusion

Metal detection has proven itself to be an essential adjunct to the human eye in the non-disturbance location and assessment of archaeological deposits where metals exist. It can also assist greatly during excavation and in post excavation management strategies. It is essential for historical, industrial and maritime archaeologists to avail themselves of the tool.

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