

Huaqueros and remote sensing imagery: assessing looting damage in the Virú Valley, Peru

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This article presents a new initiative in combating looting from the air, building on previous work in Iraq and Jordan. Looted sites in the Virú Valley, Peru, are visible as pit clusters on dated versions of Google Earth. Compare these with earlier air photographs and Gordon Willey's famous survey of the 1940s, and we have a dated chronicle of looting events. This makes it possible to demonstrate that modern looting is certainly taking place and linked to an upsurge in the antiquities trade. As well as being a new instrument for managing heritage, the author shows that the looting survey offers an important research dividend: the location of cemeteries not previously systematically

documented, with potential for more thorough investigation even of already looted areas.

Keywords: Peru, Virú, looting, aerial survey, Google Earth

Introduction

Archaeologists, conservationists, and a variety of other stakeholders, now recognise the market-driven looting of archaeological sites as a global problem, but solutions remain elusive and even describing the problem in detail is notoriously difficult (Brodie *et al.* 2001; Brodie & Renfrew 2005). However, a handful of studies (e.g. Van Ess *et al.* 2006; Hritz 2008; Stone 2008a & b) have demonstrated that descriptive information about looting damage can be obtained from high-resolution remote sensing imagery, which offers a means of identifying and quantifying site damage without time-consuming and expensive site visits. In a recent application in Jordan, Neil Brodie and I have argued that Google Earth represents a potent new tool, useful for addressing the scale of looting damage to archaeological sites

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(Contreras & Brodie in press), though problems of coverage, appropriate resolution and surface visibility remain (see Beck 2006; Ur 2006; Scollar & Palmer 2008; Parcak 2009). In the case of Peru, addressed here, I will show that the use of Google Earth imagery to locate and quantify looting damage can both address the difficulty of describing the looting of archaeological sites and contribute to the improved interpretation of archaeological settlement patterns. Using the Virú Valley as a case study, this paper demonstrates that attention to looting is important for archaeologists both as an ethical imperative of stewardship and as a practical imperative of research into past lifeways.

The Virú Valley, on Peru's north coast, entered the archaeological lexicon as a result of the pioneering work of the Virú Valley Survey in 1946-47. Inspired by Julian Steward's vision of research that could encompass cultural adaptation to a particular ecological setting over the long term, the members of the project chose the Virú Valley as their analytical unit and divided the investigative responsibilities, focusing primarily but not exclusively on Virú's archaeological aspects. The valley was selected due to its manageable scale for intensive study and existing framework of archaeological research (Willey 1953; Billman & Feinman 1999).

Three key contributions result from revisiting the Virú Valley in the present study. Firstly, the quantification of damage from looting allows the first reliable estimates of the extent of such damage, as well as making the assessment of patterns of looting behaviour possible (e.g. preferential targeting of certain kinds of sites). Secondly, the availability of Peruvian Servicio Aerográfico Nacional aerial photographs of much of the Virú Valley, dating to the 1950s and 1990s, makes it possible to estimate the time period in which looting occurred, shedding light on the antiquity and growth of looting behaviour in Virú. Thirdly, the extents and locations of looted areas in Virú provide a valuable comparator for the settlement pattern data generated by the Virú Valley Survey, enabling an analysis of the thoroughness with which the survey was able to locate and describe sites. In addition, they suggest that looting damage may have significant potential as an archaeological research resource as well as a heritage management necessity.

Background

Looting – known locally as *huaqueo*, after the Quechua term *huaca*, meaning (loosely) sacred place or object – is a widespread problem in Peru and one which has a long history. Huaqueo has resulted in extensive damage to Peruvian archaeological sites (Shimada 1981; Alva 2001; Church & Morales Gamarra 2004; Atwood 2007) and is clearly tied to the international market in illicit antiquities (Nagin 1990; Elia 1997; Atwood 2003, 2004). Many accounts make it abundantly clear that looting is pervasive in Peru generally (e.g. Nagin 1990; Kirkpatrick 1992; Alva 2001; Silverman 2006; Higuera 2008), and has a long history (e.g. Zevallos Quiñones 1994; Ramírez 1996). Looting dates at least as far back as the Spanish colonial grants of mining concessions for exploitation of the precious metals associated with elite burials in coastal huacas and continued throughout the colonial period (Fernández Villegas 1990; Ramírez 1996: 121-51) and up through the twentieth century (Zevallos Quiñones 1994). Ramírez encapsulates the institutionalisation of the practice in the colonial period, quoting an anonymous document from the Archivo General de

las Indias: *After the Spanish came to this realm, it has been and is the usual custom. . . that the Spanish, with license of the Justice [and] with an inspector. . . present and appointed by royal officials, have, quietly, pacifically, and publicly and without contradiction, excavated and excavate many guacas and enjoyed and enjoy what they find except what belongs to His Majesty, and this has been and is customary, as it has been and is for more than 20 and 30 years [since 1529-39]*' (Ramírez 1996: 137). In the Virú Valley specifically, colonial period looting is attested by a handful of colonial documents (Zevallos Quiñones 1994: 68-9). Subsequent history of looting is not as well documented, making the scale of looting in the eighteenth and nineteenth centuries difficult to assess, but it is generally agreed that when the international market in antiquities took an interest in pre-Columbian artefacts in the twentieth century the scale of looting increased dramatically (Coe 1993; Elia 1997; Atwood 2004).

The publications of the Virú Valley Survey indicate that looting was present, and even extensive, in the Virú Valley at least half a century ago (Ford & Willey 1949; Strong & Evans 1952). While the Virú Valley Project was not explicitly concerned with looting, its members regularly, if informally, documented damage to archaeological sites, particularly cemeteries. Indeed, the location and identification of sites was apparently often facilitated by the visible detritus of past looting: *'Site V-66 would be indistinguishable from the rest of the desert border except for scattered sherds, bleached bones, and disturbed soil from more or less recent huaquero looting'* (Strong & Evans 1952: 47). A variety of published remarks make it clear that such damage was widespread and well known to the project archaeologists. Ford and Willey write, for instance, that, *'Literally thousands of graves have been opened in Virú by huaqueros, and the well-looted cemeteries, which resemble battlefields after heavy bombardment, are found in the valley at almost every point that could not be cultivated'* (1949: 34). In more specific terms, of 315 sites described in the various project publications, damage from looting is explicitly mentioned in 42 cases (Bennett 1939; Ford & Willey 1949; Strong & Evans 1952; Willey 1953; Collier 1955).

This clear history of looting damage in the Virú Valley is not atypical for the Peruvian coast, but in spite of such an abundance of evidence of damage from illicit excavation, the case of Peru is a particularly confounding one with regard to policy-level responses to looting. There is widespread documentation of the damage inflicted on archaeological sites by huaqueo, and of the entanglement of local looting with an international market in looted antiquities (e.g. Nagin 1990; Kirkpatrick 1992; Elia 1997; Alva 2001; Atwood 2004, 2007; Higuera 2008). However, the long tradition of huaqueo in Peru has made its simple prohibition difficult. Until the nineteenth century it was a legal activity, even encouraged due to its provision of tax revenue. Complicating matters further in the twenty-first century, the question of appropriate sovereignty over cultural heritage (that is, the relative merit claims of the nation-state *vs* claims of local communities) has been raised as a factor that must be considered in examining looting and considering strategies for its discouragement (e.g. Smith 2005). Thus, if estimating damage from looting is often difficult because much of the damage remains hidden (Brodie & Renfrew 2005; Bowman 2008), in Peru the damage is in plain view: the pitted expanses of looted cemeteries on the coast of Peru date back centuries, making it all too easy to dismiss damage from looting as endemic and even a *fait accompli*.

Objectives

The study of looting is complicated by the fact that it is an illicit activity, subject to legal sanction. As a result, reliable quantitative information about the extent and intensity of looting and the material damage being caused is difficult to obtain (see Bowman 2008: 228-9). Archaeological field surveys produce some relevant data, but these are very rarely focused on looting *per se*, and thus published surveys of looting damage are few in number and lack diachronic depth (see Brodie & Renfrew 2005: 345-7 for an overview). This scarcity of reliable information about damage from looting has a pernicious impact on policy-making in at least two ways. Firstly, it enables claims that the extent of looting damage is being exaggerated: most artefacts reaching the market, the argument goes, are either 'chance finds' (objects discovered through activities unrelated to systematic illicit digging), or are from pre-existing 'old collections' not linked to modern looting and, therefore, no strong policy responses are necessary (Bowman 2008). Secondly, it makes it difficult to monitor the effectiveness of any ameliorating policies, whether directed at demand (the market in illegally-trafficked antiquities) or supply (illicit digging itself).

Quantifiable estimates of damage from looting and estimates of the time periods in which looting has occurred can provide a means of assessing the damage still being done to archaeological sites and the chance of linking this damage to the trade in illicit antiquities. Given the proper conditions, publicly available remote sensing imagery can provide a basis for such quantification. For Peru, the sheer size of the country, limitations of visibility, resolution of available imagery and absence of a countrywide database of archaeological sites make it impossible to conduct a total survey. However, for certain areas, high-resolution imagery and settlement survey data are both available. The Virú Valley is one such; Google Earth imagery from 2002 and 2006 is readily accessible and the survey data from the Virú Valley Survey is well published (Ford & Willey 1949; Strong & Evans 1952; Willey 1953). These two elements make it possible to conduct a survey of looting damage in the Virú Valley, visually identifying areas extensively damaged by looting behaviour: the high-resolution imagery makes identification possible, and the survey data provides an initial guide as to where to look as well as providing invaluable information on the chronology and character of the looted sites.

Methods

Although the Virú Valley Survey did not claim complete coverage (Ford & Willey 1949: 20; Willey 1953: 6), the set of sites it located provided a basis for this study. The areas immediately surrounding each of these sites were visually inspected in Google Earth for signs of obvious and extensive looting, visible as pitting on aerial and/or satellite images. The correspondence between pitting identified on images and looting on the ground was established from areas known to be badly damaged by looting. These were identified both from the descriptions in the publications of the Virú Valley Survey (Ford & Willey 1949; Strong & Evans 1952; Willey 1953) and from a brief field visit in August 2007. Where looting was identified, the location was marked with a rough polygon and noted for later evaluation. In total, 68 areas with indications of looting, representing both discrete sites and

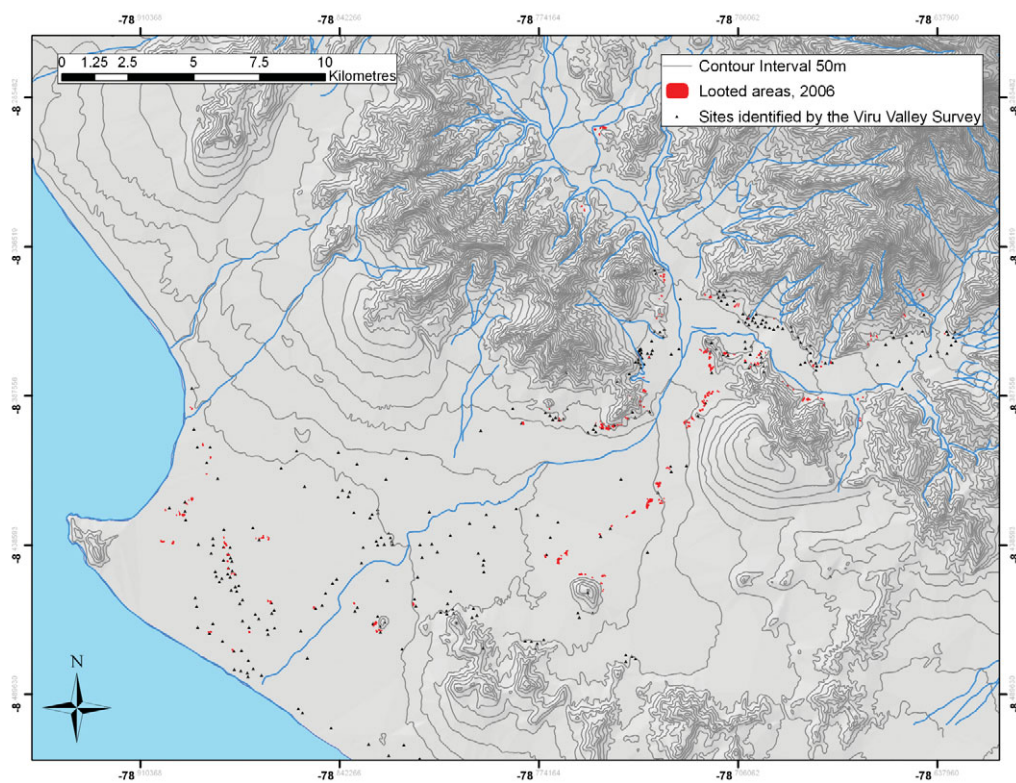


Figure 1. Areas of looting damage recognised in the Virú Valley.

distinct areas of looting within larger sites, were identified using this method. Following the investigation of the sites identified by the Virú Valley Survey, the entire Virú drainage was visually scanned for further evidence of extensive looting, and a further 195 areas of likely looting damage were identified. The limits of the area scanned were defined by the drainage basin of the Virú Valley.

The 263 areas recognised using this combination of methods (Figure 1) were then investigated in more detail. Once looted areas were identified, .jpg images were downloaded from Google Earth Pro at the highest resolution possible (4800×3229 pixels), adjusted (contrast, brightness and colour balance) to improve visibility of features, and georeferenced in ArcGIS 9.2. For proper attribution, and as imagery dates are critical for longitudinal studies, the provider, date and Catalog ID# of the satellite images incorporated into Google Earth were identified (accessible in Google Earth by turning on the layer Primary Database→More→DigitalGlobe Coverage) and noted as metadata for each image (see Contreras & Brodie in press for a detailed description of methodology).

Areas identified as likely to have been damaged by looting were used to create boundary polygons in ArcGIS. Since image resolution was generally not adequate to allow counting of individual pits, and thus direct calculation of the total number of pits and density of looters' pits in each site, the total looted area was instead approximated by bounding the visibly disturbed areas (Figure 2). In several cases this led to multiple polygons being defined

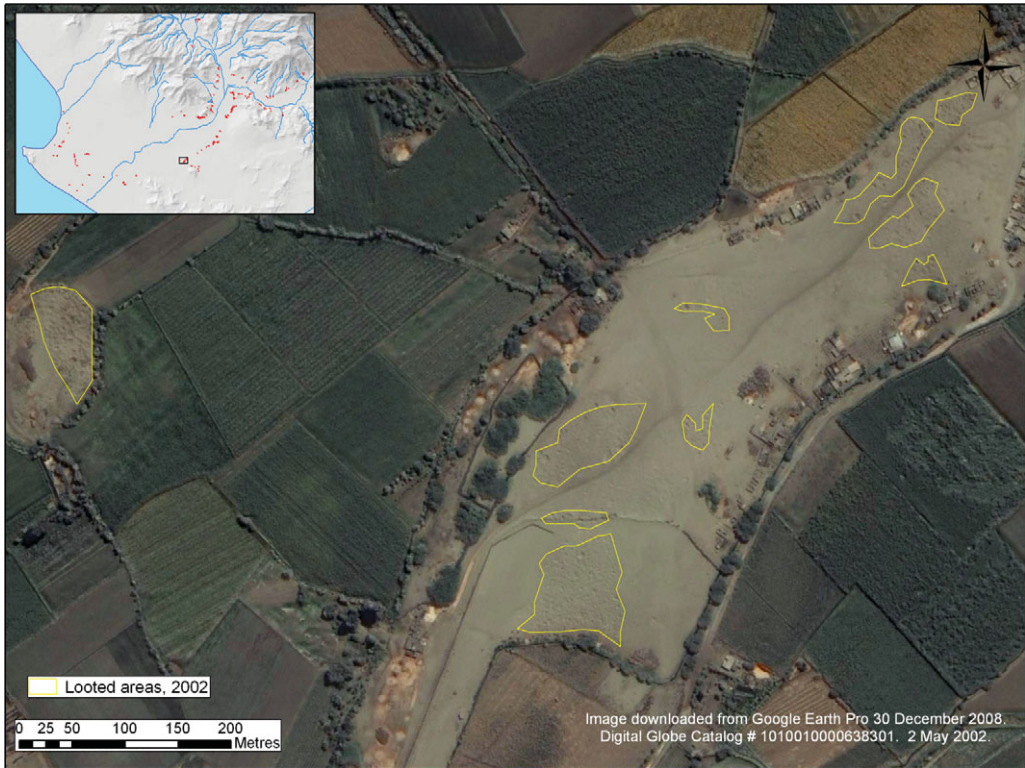


Figure 2. Example of looting damage visible in high-resolution Google Earth imagery.

for a single site; the resulting polygon shapefiles were then used to calculate the looted area in m^2/site . For each site, the published literature was consulted to identify a prior mention of looting damage and the period(s) to which the site most likely dated (when possible). This enabled assessment of the types of artefacts particular sites might yield to the illicit antiquities market, as well as investigating the history of looting prior to the date(s) for which imagery was available.

Results

The research presented here makes it possible to quantify the scale of looting damage in Virú. Including only those zones of dense pitting with total areas greater than 30m^2 (smaller areas are not reliably identifiable in the remotely-sensed imagery), the total area intensively damaged by looting across the roughly 700km^2 of the Virú Valley is approximately 47ha (see Figure 1). This total includes widely distributed looting damage, demonstrating that cultural remains are extensive in areas not covered by the Virú Valley Survey; Ford and Willey are in fact explicit about having incompletely and unevenly recorded sites (Ford & Willey 1949: 20; Willey 1953: 6). The 263 areas of looting damage identifiable on the remote sensing imagery range in size from 34m^2 to $19\,000\text{m}^2$.

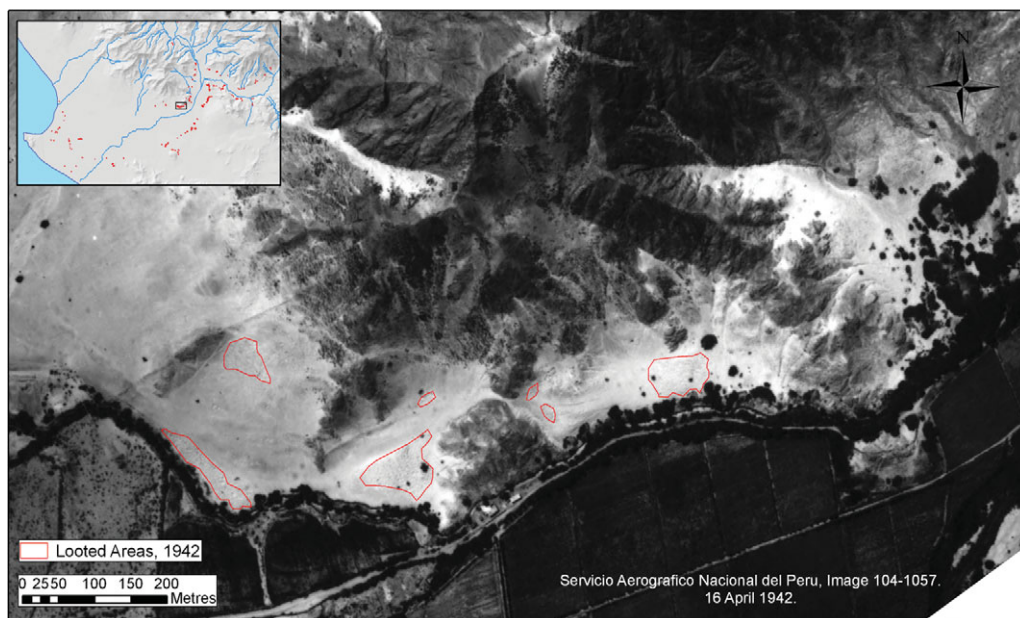


Figure 3. The area of the Cementerio San Francisco in a SAN image from 1942, with areas damaged by looting delimited in red.

This preliminary work with historical aerial photographs and Google Earth imagery confirms that the areas described as looted in the publications of the Virú Valley Survey also appear as looted in remote sensing imagery. In addition, while some looting damage may predate the Virú Valley Survey (as indicated by the survey's description of existing damage), in at least some areas looting has continued actively and extensively since; where historical aerial photographs as well as Google Earth images are available it is possible to characterise the extent of looting damage according to these time periods. In at least one case looting has taken place very recently, and may be narrowed down to having occurred between 1997 and 2006.

The Cementerio San Francisco (designated V-10 through V-13 by the Virú Valley Survey) and its surrounding area provide a telling example. The area consists of a cluster of cemeteries dating primarily (but not exclusively) to the Early Intermediate Period. Figure 3 shows the area in a Servicio Aerográfico Nacional aerial photo from 1942; looted areas are visible, amounting to approximately 15 000m². By 2006, visible in a Google Earth image in Figure 4, the intensively looted area had grown to around 35 000m².

Definitively recent looting is also identifiable. Just north of the Castillo del Tomaval, for instance, a new gravel quarry opened during the 1997-2006 period (the interval between available images), apparently prompting the discovery and extensive looting of a Gallinazo cemetery. The area is visibly intact in the 1997 SAN aerial photo and clearly extensively pitted by 2006 (approximately 5800m²) (Figure 5). In this case the observation has been ground-truthed as well, confirming the accuracy of the observations gathered from the remote sensing imagery (Figure 6).

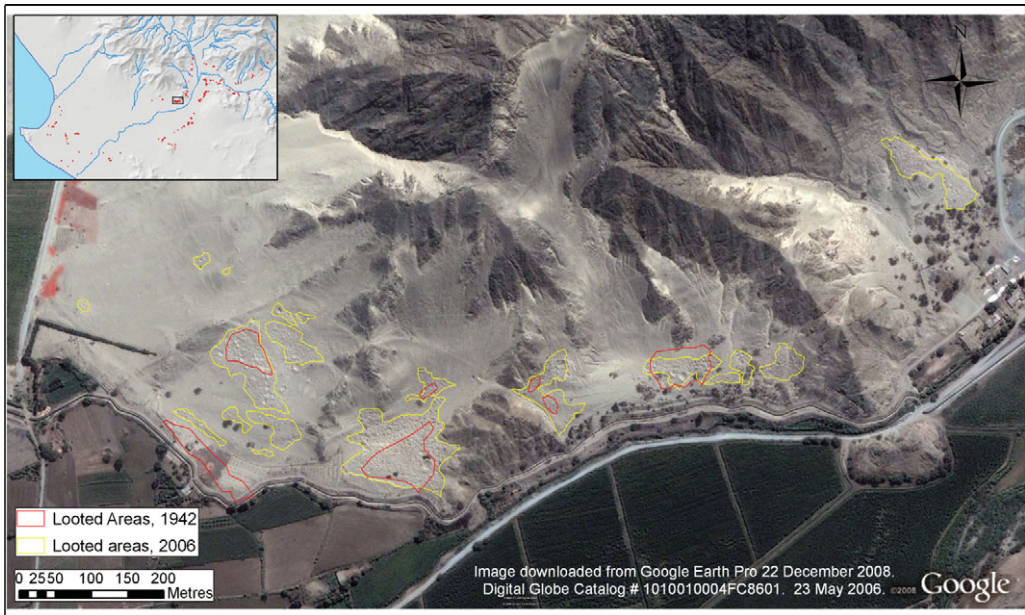


Figure 4. The same area as in Figure 3 in a Google Earth image from 2006, with areas of looting damage delimited in yellow (as visible in 2006 Google Earth image) and red (as visible in 1942 SAN aerial photo). Note also damage from the construction of the Chavimochic irrigation project, visible at the left.

Distribution of looting damage and assessment of settlement pattern data

In publication of the data from the Virú Valley Survey, the participants acknowledge that logistical limitations prevent their survey from presenting full-coverage. Willey writes: *'In retrospect, we see the Virú-settlement job as a much larger one than we had anticipated. Our total of 315 is no more than one-quarter of the total prehistoric sites in the Valley'* (Willey 1953: 6). One of the problems facing the survey was the prior destruction of sites that fall within the areas under modern cultivation. This served to focus their attention on mound sites (generally left intact in fields before the advent of mechanised farming) and sites on marginal land. Sites falling within the limits of irrigable land were already being destroyed by the 1940s when the Virú Valley Survey began and that impact has only increased, particularly since 1994 with the beginnings of the Chavimochic irrigation project (the cultivated area at the far left of Figure 4 is one example of previously arid land now irrigated and under cultivation).

Another key logistical limitation was accessibility; as a result 44 per cent of the sites identified fall within 400m of the road network. Survey of the satellite imagery for looting damage reveals that huaqueros, given much more time to work and more intimate knowledge of the local area, apparently have suffered fewer logistical limitations: only 34 per cent of looted sites fall within 400m of the road network. One of the results is the identification of the existence – if not the chronological or cultural affiliation(s) – of 195 areas that apparently contain prehistoric remains known to looters but unidentified by the Virú Valley



Figure 5. Area north of the Castillo de Tomaval in a Google Earth image from 2006, with areas of looting damage delimited in yellow. No looting damage is visible in a 1997 SAN aerial photograph.

Survey (this number is derived from counting all those looted areas that are >100m from any site identified by the Virú Valley Survey). On-the-ground documentation of these sites would yield some chronological information, as huaqueros generally leave significant amounts of unsaleable material – e.g. broken ceramics – which in most cases should include chronologically diagnostic material.

This constitutes information that is both archaeologically significant as well as revealing the scale and ubiquity of looting damage. Looters' pits, that is, can be taken to represent a sort of *ad hoc* sampling program sensitive to the edges of cemetery areas. As a result, an estimate of the looted area may serve as a proxy for the burial population, a variable key to evaluating the excavated sample of burials from a given site (if such exists). There is a strong argument for considering looting damage at least a plausible minimum estimate of cemetery size, given the economic incentives driving it. Even if we consider looters inexperienced – which ethnographic evidence (e.g. Atwood 2004; Smith 2005) suggests they very much are not – it is highly unlikely that they would persist in digging in areas that were not fruitful. Thus, while not all areas with burials will necessarily have been looted, the vast majority of looted areas (excepting perhaps a thin perimeter of failed prospection pits) are likely to have contained burials. Although it is difficult to assess the success of looters' pits after the fact, field observation suggests that detailed and systematic collection would yield at least



Figure 6. Area visible in Figure 5, as seen from the ground in 2007 (photograph by Ignacio Cancino).

some fragmentary cultural material and human bone from pits that successfully encountered burials.

Seen in this light, the number and distribution of looted areas in the Virú Valley is significant not simply as a testament to the scale of looting damage, but also as an index of ancient occupation.

Conclusions

This research elucidates broad patterns of looting damage, quantifies the scale of destruction, and begins to address the temporal as well as spatial variability in looting in the Virú Valley. In doing so, it of course elides considerable complexity on the ground – each area of visible pitting that we identify as looted is a palimpsest created in many cases by centuries of huaqueo, with varying goals and methods of excavation. In addition to this variability of physical damage, huaqueo as a category subsumes the behaviour of diverse actors with a variety of motivations. Ethnographic, ethnohistoric and journalistic sources (Fernández Villegas 1990; Nagin 1990; Kirkpatrick 1992; Zevallos Quiñones 1994; Alva 2001; Atwood 2003, 2004, 2007; Church & Morales Gamarra 2004; Smith 2005) indicate that actors carrying out illicit digging operations may be either local residents or arrivals from elsewhere,

and that looting may range from locally motivated and small in scale to directly intertwined in the international trade in illicit antiquities.

As various investigators have suggested, however, the increasing penetration of the international art market in Peru and the escalated valuation of Peruvian antiquities internationally have made looting more profitable, more industrial in scale and more market-driven (Coe 1993; Elia 1997; Atwood 2004). One of the benefits of quantifying looting damage, even in snapshot fashion, is that such research offers the possibility of teasing apart recent and historic looting damage. As I demonstrate with the example of the Cementerio San Francisco, the use of Google Earth imagery and historic aerial photography has the potential to enable researchers to test the hypothesis of a late twentieth-century upsurge in the scale and frequency of looting.

Demonstrating that extensive looting damage and international commercial interest in Peruvian antiquities are contemporary supports the difficult to document claim (e.g. Elia 1997; Atwood 2004; Brodie & Renfrew 2005; Bowman 2008; Higuera 2008) of a strong link between looting damage and the trade in antiquities. A link between the intensity of such damage and international commercial interest in Peruvian antiquities argues forcefully for the necessity of policy intervention on the demand side of the looting equation. Future work should be able to more finely resolve the chronology of looting and document the fluctuations in availability and price of specific categories of Peruvian antiquities, making it possible to more precisely characterise the link between the two. Even the broad pattern, however, is enough to suggest that huaqueo is neither a problem of the past nor a small-scale, local phenomenon.

In addition, the importance of the information about settlement size, pattern and chronology that might be gained suggests that archaeologists should be investigating looting as a practical research policy as well as a stewardship imperative. The mere cursory acknowledgment and appropriate lament in studies of burial material from heavily looted sites is all too common. This may represent an understandable reluctance to dwell on the unpleasant, but it nonetheless constitutes a research opportunity lost and serves to de-emphasise if not obscure the frequency and severity of looting damage.

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References

- ALVA, W. 2001. The destruction, looting and traffic of the archaeological heritage of Peru, in N. Brodie, J. Doole & C. Renfrew (ed.) *Trade in illicit antiquities: the destruction of the world's archaeological heritage* (McDonald Institute Monographs): 89-96. Cambridge: McDonald Institute for Archaeological Research.
- ATWOOD, R. 2003. Guardians of the dead. *Archaeology* 56: 42-9.
- 2004 *Stealing history: tomb raiders, smugglers, and the looting of the ancient world*. New York: St Martin's Press.
- 2007. The rape of Batán Grande. *Archaeology* 60: 29-33.

- BECK, A. 2006. Google Earth and World Wind: remote sensing for the masses? *Antiquity* 80. Available at: <http://www.antiquity.ac.uk/ProjGall/beck308/> (accessed on 19 February 2010).
- BENNETT, W.C. 1939. Archaeology of the north coast of Peru: an account of exploration and excavation in Virú and Lambayeque valleys. *Anthropological Papers of the American Museum of Natural History* 37(1): 1-153.
- BILLMAN, B.R. & G.M. FEINMAN (ed.) 1999. *Settlement pattern studies in the Americas: fifty years since Virú* (Smithsonian Series in Archaeological Inquiry). Washington (DC); London: Smithsonian Institution Press.
- BOWMAN, B. 2008. Transnational crimes against culture: looting at archaeological sites and the 'grey' market in antiquities. *Journal of Contemporary Criminal Justice* 24(3): 225-42.
- BRODIE, N. & C. RENFREW. 2005. Looting and the world's archaeological heritage: the inadequate response. *Annual Review of Anthropology* 34(1): 343-61.
- BRODIE, N., J. DOOLE & C. RENFREW (ed.) 2001. *Trade in illicit antiquities: the destruction of the world's archaeological heritage* (McDonald Institute Monographs). Cambridge: McDonald Institute for Archaeological Research.
- CHURCH, W.B. & R. MORALES GAMARRA. 2004. Tomb raiders of El Dorado: conservation dilemmas on a 'new' archaeological frontier in Peru. *The SAA Archaeological Record* 4(1): 24-9.
- COE, M.C. 1993. From huaquero to connoisseur: the early market in pre-Columbian art, in E.H. Boone (ed.) *Collecting the pre-Columbian past*: 271-90. Washington (DC): Dumbarton Oaks.
- COLLIER, D. 1955. *Cultural chronology and change as reflected in the ceramics of the Virú Valley, Peru* (Chicago Natural History Museum Publications 779). Chicago (IL): Chicago Natural History Museum.
- CONTRERAS, D.A. & N. BRODIE. In press. Quantifying destruction: an evaluation of the utility of publicly-available satellite imagery for investigating looting of archaeological sites in Jordan. *Journal of Field Archaeology*.
- ELIA, R.J. 1997. Looting, collecting, and the destruction of archaeological resources. *Nonrenewable Resources* 6(2): 85-98.
- FERNÁNDEZ VILLEGAS, O. 1990. La Huaca Narihuala: un documento para la etnohistoria de la costa norte del Perú (1000-1200 d.c.). *Bulletin Institut français études andines* 19(1): 103-27.
- FORD, J. A. & G. WILLEY. 1949. Surface survey of the Virú Valley. *Anthropological Papers of the American Museum of Natural History* 43(1): 1-89.
- HIGUERAS, A. 2008. Cultural heritage management in Peru: current and future challenges, in H. Silverman & W. H. Isbell (ed.) *Handbook of South American archaeology*: 1072-88. New York: Springer.
- HRITZ, C. 2008. Remote sensing of cultural heritage in Iraq: a case study of Isin. *The American Academic Research Institute in Iraq Newsletter* 3(1): 1-8.
- KIRKPATRICK, S.D. 1992. *Lords of Sipan: a tale of pre-Inca tombs, archaeology, and crime*. New York: Morrow.
- NAGIN, C. 1990. The Peruvian gold rush. *Art and Antiques* 7(5): 98-106.
- PARCAK, S. 2009. *Satellite remote sensing for archaeology*. London: Routledge.
- RAMÍREZ, S.E. 1996. *The world upside down: cross-cultural contact and conflict in sixteenth-century Peru*. Stanford (CA): Stanford University Press.
- SCOLLAR, I. & R. PALMER. 2008. Using Google Earth imagery. *AARGnews* 37: 15-21.
- SHIMADA, I. 1981. The Batán Grande-La Leche archaeological project: the first two seasons. *Journal of Field Archaeology* 8(4): 405-46.
- SILVERMAN, H. 2006. Cultural resource management and heritage stewardship in Peru. *CRM* 3(2): 57-72.
- SMITH, K.L. 2005. Looting and the politics of archaeological knowledge in northern Peru. *Ethnos* 70(2): 149-70.
- STONE, E.C. 2008a. Archaeological site looting: the destruction of cultural heritage in southern Iraq, in G. Emberling & K. Hanson (ed.) *Catastrophe! The looting and destruction of Iraq's past*: 65-80. Chicago (IL): The Oriental Institute Museum of the University of Chicago.
- 2008b. Patterns of looting in southern Iraq. *Antiquity* 82: 125-38.
- STRONG, W.D. & C. EVANS. 1952. *Cultural stratigraphy in the Virú Valley, northern Peru: the formative and florescent epochs*. New York: Columbia University Press.
- UR, J. 2006. Google Earth and archaeology. *The SAA Archaeological Record* 6(3): 35-8.
- VAN ESS, M., H. BECKER, J. FASSBINDER, R. KIEFL, I. LINGENFELDER, G. SCHREIER & A. ZEVENBERGEN. 2006. Detection of looting activities at archaeological sites in Iraq using Ikonos imagery. *Angewandte Geoinformatik; Beiträge zum 18*: 668-78. Heidelberg: Wichmann-Verlag.
- WILLEY, G.R. 1953. *Prehistoric settlement patterns in the Virú Valley, Peru* (Bureau of American Ethnology Bulletin 155). Washington (DC): Government Printing Office.
- ZEVALLOS QUIÑONES, J. 1994. *Huacas y huaqueros en Trujillo durante el Virreinato (1535-1835)*. Trujillo: Editora Normas Legales S.A.