Evolving the Archaeological Mapping of Afghanistan

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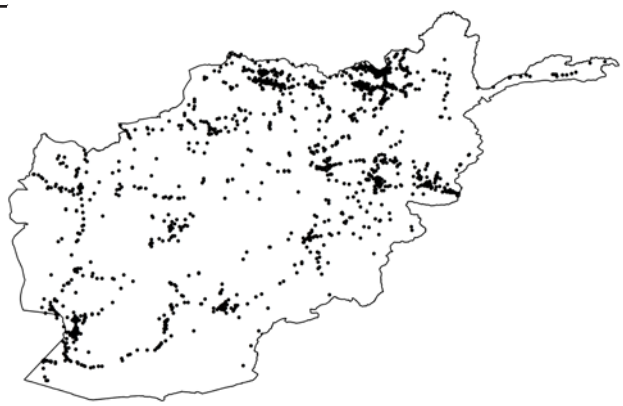

Fig. 1. Sites mapped in the GIS.

The application of GIS to the archaeological mapping of Afghanistan offers an excellent means of evolving a new platform for synthesizing and interpreting data, for assessing and monitoring the preservation of sites, and for the eventual collection of new data. In conjunction with other Central Asian GIS projects, it can also form a tool with which to study historical human geography within and across the region, and themes such as the evolution of settlement patterns and cultural interactions across the Iranian plateau and Central Asia. The GIS described in this section is a first step in this direction, containing over 2000 sites and associated data sets, derived from the *Archaeological Gazetteer of Afghanistan* [Ball 1982], the French surveys in eastern Bactria [Gardin 1998; Lyonnet 1997; Gentelle 1989] and other sources.

From maps and catalogs to GIS

The two main sources of archaeological data digitized were the *Gazetteer* and data from the plains east of the Kunduz river, which were the object of an extensive regional survey by a French team in the 1970s. Geographic and cartographic "base map" data sources include publicly available vector data such as National Imagery and Mapping Agency (NIMA) Vmap1 and current data from Afghanistan Information Management System (AIMS), as well as raster data such as 3-arcsecond Digital Elevation Models (DEMs). Of great potential are geo-referenced 1:100,000 and 1:50,000 Soviet military topographic map sets, which not only allow for precise localization of known sites, but the addition of hundreds of undocumented sites, which are marked as mounds on these maps (Fig. 1).

The *Gazetteer* data were digitized by scanning the site catalog, performing text recognition, and creating a single database record for the text of each catalog entry, including its detailed description, periodization, bibliographic references, etc. The coordinates given for each site were extracted automatically into separate database fields and converted into decimal degree format. Because seconds are not provided in these coordinates, the resulting calculated decimal degree coordinates significantly exaggerate their geographical precision (since the geographical range of sites within one minute could amount to a difference on the ground of over a kilometer). Entries in the *Gazetteer* spanning more than one geographical minute were averaged into one decimal degree coordinate. Averaged coordinates are mainly the groups of sites subsumed by Gardin into one catalog entry in the *Gazetteer*, but most of these were individually localized much more precisely in the digitization of more data from the original survey maps of the Gardin team. Such precise localizations are necessary in areas crowded with sites, which sometimes even bear the same names.

The separate publications of the latter data formed the second main source for the GIS. In three seasons (1974-5-6) of survey in the Dasht-i-Qala plain, approximately 200 square kilometers were surveyed, recording 349 sites, while one season (1977-8) of extensive survey across some 1,500 km. recorded 474 sites. The GIS in its present form contains localizations only of the sites of the extensive survey (mapped in Fig. 2); however the digitized site database includes records for the remaining 226 sites in the Dasht-i-Qala plain.

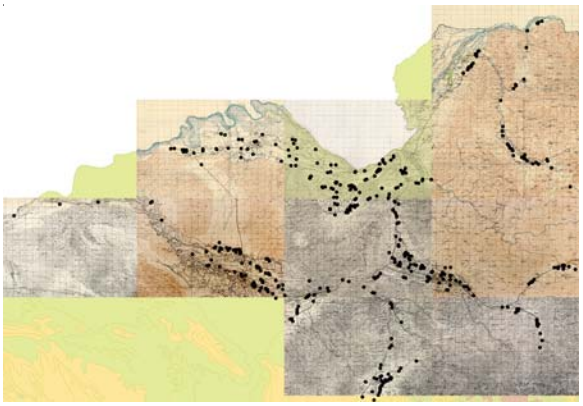

Fig. 2. Sites of eastern Bactria (excl. Dasht-i-Qala plain).

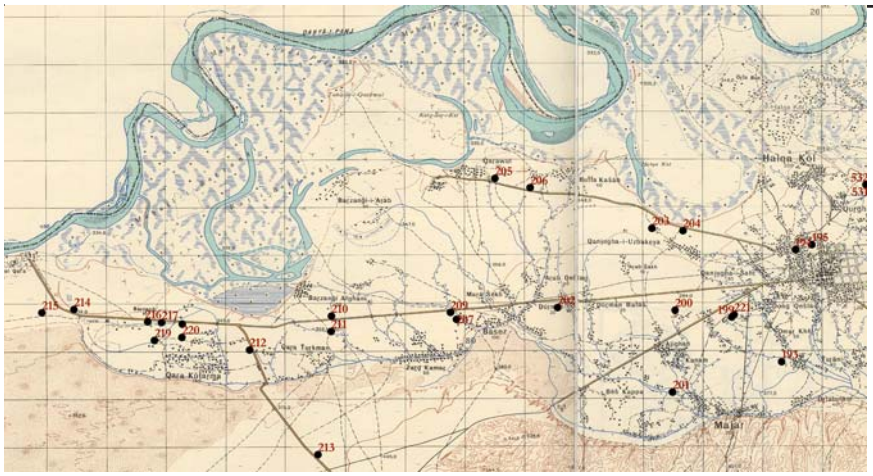

Fig. 3. Sites in the area of Imam Sahib, near the Amu-darya.

Data have so far been entered in the database for these fields: number (sometimes with sub-number identifying letter); Ball number and sub-number identifying letter (A, B, C, etc.); a 'D number' for sites in the Dasht-i-Qala plain (to distinguish these sites, which are numbered in a different sequence); name when given; the designated geographic area, sectors, subsectors, and sub-subsectors, and finally the presence-absence fields for the different ceramic groups at each site. The complex set of fields used for coding the ceramic finds at each site is a function of the notation of periodization used by Gardin [1998], which generally refers to degrees of certainty of attribution (and which is not always the same as the identifications in Lyonnet 1997).[1] Exclusive of a subset of sites in the Dasht-i-Qala plain, the present form of this subset of the digitized site database thus contains 695 complete records.

Not yet included in the database is the full narrative description for these sites, which generally contains a measurement and descriptive localization (itinerary). No coordinate locations are given in this site catalog, but in the localization in the GIS through the use of the original maps used on survey, coordinates were identified within a estimated precision of hundreds of meters for most sites (and the descriptive data could be used for even greater accuracy in localizing sites with larger scale maps). These original survey maps were a set of 1:100,000 scale Soviet topographic maps and corresponding photocopies marked with the field data from the survey.[2] Some of the maps were themselves large-format black and white photocopies or color reproductions of varying quality. The photocopies of sections of these maps corresponding to sectors or portions of sectors described in the survey synthesis were marked with all the sites recorded on the survey, labeled with the survey number. In the case of larger sites a sketch of the extent and shape of sites was where one 'x' or a small circle identifies a series of sites, a point was entered at the center of the shape (Fig. 3).

Even in rare cases where exact locations of individual sites were not indicated, the error can be estimated to be under a kilometer, and in most cases the accuracy of the coordinates digitized in this fashion are probably better or even similar to the total error range of a standard (non-survey) GPS receiver. The maps published in the survey synthesis were consulted during the digitization process, but because of their schematic nature, the sources described above were given preference in making all geographic determinations.

Desiderata for database development

Data from sources not entirely included in the *Gazetteer*, such the Soviet-Afghan mission [cf. map in Sarianidi 1976], as well as unpublished ones, also need to be incorporated. The development of the database also requires reorganization of the material which has already been digitized. Database entries from the *Gazetteer* contain entire texts of catalog entries in one field, with the exception of coordinates. While this text field can be queried (e.g. for the string "Bronze Age" or "Kushan"), including spatial queries, the ability to carry out more complex queries on the *Gazetteer* data is limited, and each of these entires should be converted into database fields, for which they are essentially already structured.

Separate database fields are important for bringing the data on a uniform level with other site databases, as well as for analysis. This is particularly relevant for periodization and site size, but other fields contain data of significance for interpretation — for example the fieldwork type (excavation, survey) could be compared with new data on intensity of survey (scale of intensity, quantified in terms of time, surface area collection size, etc.). The incorporation of a structured, site-by-site bibliographic database is likewise an important aim. Finally, the inclusion of the site plans, and the creation of a photographic database, are goals for developing the database as a tool to track the state of preservation of sites and

collections. A unified database form should ideally encompass a spectrum of formats from fields which contain discrete quantifiable data which needs to be formalized for analytical purposes (spatial queries, etc.), to more descriptive fields which can contain miscellaneous descriptive information, notes etc.

Finally, without ground-truthing, inaccurate or imprecise localizations can only be somewhat ameliorated by consulting original archaeological publications and comparing cartographic sources. The correction of geographic localizations can also sometimes be achieved using higher quality cartographic sources, and the Soviet topographic sets also record many mounds which have not been examined or identified, but which are in many cases archaeological sites. An important task would be creating a point feature set from all mounds marked on these maps, identifying those which are documented in the literature, and taking the remaining mounds as a basis for future documentation (point sets can simply be downloaded into a GPS and then navigated to as waypoints).

Potential applications

Over twenty years ago, after collecting and reviewing most of the existing archaeological data from Afghanistan, Ball offered an assessment of the work to be done in the Introduction to the *Gazetteer* [1982, p. 20]: "Generally ... the need for survey – and survey of a systematic and organized sort – appears to be paramount. In many ways, surveys can answer more questions than excavation." While a GIS database including unpublished material and material published since the *Gazetteer* offers new possibilities for the interpretation of existing archaeological data, and for remedying some of the many imbalances in our knowledge of Afghanistan's past, the need for survey can only have grown during the tragic events since the time of Ball's judgment.

Many factors may of course limit the logistical feasibility of carrying out any kind of fieldwork in Afghanistan for years to come. Nevertheless, the return of stability in certain regions of the country has made it possible for archaeologists to renew fieldwork and even undertake some limited excavations [Tarzi 2004; Franke-Vogt n.d.], and several important discoveries have already been made [Lee and Sims-Williams 2003; Grenet, Lee, and Ory, n.d.]. This work, undertaken by scientists hazarding the dangers of travel in the countryside of Afghanistan, follows a series of spectacular discoveries over the past decade which were sadly made in undocumented and illicit circumstances, such as a group of Bactrian socio-economic documents, which have unveiled what was essentially an unknown language [Sims-Williams 2001]; new inscriptions, which have settled questions of chronology that kept generations of scholars busy with speculation [Falk 2001]; large numbers of Kharoshthi birch-bark scrolls, which proved to be the earliest Buddhist manuscripts known [Salomon 1999]; the Mir Zakah hoard, "one of the largest coin deposits attested in the history of mankind" consisting of "three to four tons of gold, silver and bronze coins" [Bopearachchi 1999, p. 109], as well as a host of other material which has surfaced on the antiquities market, such as Bronze age funerary material from Bactria.

The appearance of such a wealth of material in a such a chaotic fashion only underscores the need to design a GIS database to accomodate new data, and when and where possible, from new surveys, which offer perhaps the best possibility for effectively documenting a large amount of data before it is lost. Some possibilities in this direction include designing the database to accommodate data from different survey techniques; adapting a ceramic database template for surface collection; establishing a baseline for evaluating (or indeed, if possible, quantifying) the current preservation of sites, against which historical and future assessments can be measured; establishing a protocol for collecting photographic documentation (for example, following relatively simple methods which will make it possible for the images to be post-processed for photogrammetry); creating a general database template which can be distributed to archaeologists and others working in the field, and so on. Obviously, a GIS of Afghan archaeology should be designed with such potential applications in mind, and should be open to international collaboration of the broadest scope.

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Notes

1. In collaboration with several scholars, a database derived from Lyonnet 1997 is in the process of digitization, which is an especially important component, because it provides a detailed ceramic typology with comparisons across the region.

2. The original maps and photocopies were generously provided by Jean-Claude Gardin to the author and Sebastian Stride, who has collaborated on many aspects of this project.

Fig. 1. A modern excavation such as this generates vast quantities of irreplaceable data. This excavation at Domuztepe (Turkey) generated over 10,000 images of archaeological contexts, artifacts, and other finds.