

# Outline Proposals for an Anthropology Extension to the ABCD Schema

Charles Copp      September 2007



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## 1 Introduction

This document discusses and outlines a model for an Anthropological extension to the ABCD schema (<http://www.bgbm.org/TDWG/CODATA/Schema/>). The work was commissioned under the NA – D (Networking – Developing and Maintaining Databases) Element of the European SYNTHESYS Project (see <http://www.nhmus.hu/SYNTHESYS/nad.html>). The objective of the proposed schema is to facilitate the networking of information related to physical anthropology collections, mainly held in Natural History museums across Europe. These collections consist predominantly of human and humanoid bones but also include related artefacts, documents, models and images and may grade into traditional archaeological and ethnographical collections. Specialist collections may include gene data and census information. The date range of material may be from early pre-hominid (several million years old) to post-medieval or even recent human remains. Their context ranges from geological to documented history and some specimens may be linked to known individuals with biographic details. The model proposed in this document builds on work from previous SYNTHESYS workshops as described in an earlier NA-D Report.<sup>1</sup>

## 2 An Anthropological Extension to the ABCD Schema

### I Schema namespace

The namespaces for the BioCASE schemas, so far, are ABCD (the main schema) and EFG (the Extension for Geology). Following the same style and progression I suggest HHI (for Human History Information). It could be pronounced 'aitch-two-eye'. **H<sub>2</sub>I**

The development namespace would be : <http://www.synthesys.info/ABCDEFGHHI/1.0>

The documentation for the proposed anthropological extension to the ABCD schema is temporarily available at <http://eim.metapath.org/hhi/HHI.xsd.html>

### II Scope of the Schema Logical Model

An outline logical model upon which the HHI schema can be based is given in *Figure 1*. The three key entities in the model are the *Anthropological Unit*, *Cultural Artefact Unit* and *Archaeological Provenance*. Anthropological Unit and Cultural Artefact Unit are extensions of *Specimen Unit* (a core element of the ABCD schema). Archaeological Provenance is an extension of the ABCD *Gathering Site* Element. Other new elements to be described relate to the description, measurement, dating and associations of the three key elements. Entities coloured blue are existing elements in either ABCD or EFG schemas. Yellow entities represent new elements in the HHI schema.

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<sup>1</sup> **Report for SYNTHESYS Network Activity NA-D: Developing and maintaining databases.** NA-D 2.5.2: Standardisation of anthropological collection data. Author: Zsuzsanna Guba. Contractor: Hungarian Natural History Museum (HNHM), Budapest, Hungary. November, 2006



### 3 Scope of the Anthropological Unit

This unit is for recording details of anthropological specimens, chiefly bones and teeth but also including natural and burial-practice mummies and soft parts when preserved. Specimens can be described in much the same way as other collection material, using the descriptive elements of the ABCD schema whilst older specimens, recovered from geological deposits and more recent archaeological material can use many elements from the EFG schema, as used to describe dating, preservation, taphonomy and condition of fossil vertebrate material.

The range of anthropological specimens includes recent and historical specimens which may have recorded biographical information as well as cultural and racial associations which need extensions to the schema.

The SYNTHESYS Report, NA-D 2.5.2 listed a number of keywords for anthropological classes that can be used as the basis for considering the information likely to be linked to anthropological specimens. These are considered in *Table 1*.

*Table 1: Types of anthropological material.*

<b>Type</b>	<b>Discussion</b>
Human skeletal material	<p>The human body comprises over 200 bones ranging in size from the stapes (in the ear) to the femur (in the leg). The most resistant material being the teeth, which are the most frequently preserved parts in ancient deposits. Rapid natural burial or ritual burial in suitable conditions can, however, preserve partially or completely associated skeletons. It is therefore, important for the schema to be able to name the bones present in a single unit and list their degree of association. Details of completeness, mineralisation, transportation etc. can be listed under taphonomy.</p> <p>It is often possible to sex and age anthropological specimens, based on a variety of indicators and with different degrees of certainty. The ABCD schema has a simple 'Sex' element and a 'PhaseOrStage' element that can be used to record 'adult' or 'juvenile' but both lack a means of qualifying the information. It would therefore, be worthwhile creating a new type for 'AgeOfIndividual' to cover the lifespan (not the geological) age and which could include elements for source and certainty. The Sex and Stage elements could also be extended to include these elements.</p>
Mummies	<p>Mummies include natural mummies created through freezing, drying or peat preservation after burial and burial practice mummies where the body has been prepared in various ways. Natural preservation can be described using elements from the EFG schema (preservation and taphonomy) but there are no elements in ABCDEFG that relate to cultural practices. It is proposed to add a new burial element which would include details of funerary practices related to the specimen.</p>
Preserved organs	<p>Organs may be preserved <i>in situ</i> in some natural mummies and even some unusual types of fossilisation. Organs may also be preserved separately as part of mummification rituals. There are also medical collections of organs either as “wet collections” or other forms of preparation. Organs may be isolated specimens or they may be linked</p>

<b>Type</b>	<b>Discussion</b>
	to another specimen (e.g. A mummy). Organs can be noted as such using the ABCD “KindOfUnit” element. Organs may also be pathological specimens.
Pathology specimens	A new “Pathology” element has been created for detailing pathological evidence and interpretation. This also links to the case of preserved organs and may also link to models and reconstructions.
Human genetic resources	ABCD already has a “PlantGeneticResources” Unit and so it could also have a “HumanGeneticResources” Unit if there are actually such collections to document. If the material is limited to sequence data then this can be handled by the existing “Sequence” element.
Facial reconstructions	Facial reconstructions are a special kind of model (either physical model, graphic art-work or digital) that normally relates to a skull specimen, although composite reconstruction may be done from fragmentary fossil remains. ABCD does not appear to have any elements for describing models, casts or reconstructions, such as material, method, artist, scientific advisor, link to specimen therefore a new “Model” element has been created.
Casts and models	Models and reconstructions commonly occur in all collections and some are highly important for their historical and personal links, hence the need to add a new “Model” element to document them.
Fingerprints, palmprints & soleprints	Ancient footprints such as those from Laetoli can be treated as trace fossils using EFG elements but collections of finger,palm and sole prints preserved as transfers or images could be treated as ordinary specimens.
Images	ABCD has a multimedia object element that allows recording of the technical details and storage path of an image file but not any elements for describing content.
Census data	Is a form of observational data. The ABCD structure is not ideal for transferring matrices of measurements but population or household data could be recorded under MeasurementOrFact with each row forming a separate record.
Growth data	Is a form of observational data and each set of measurements pertaining to an individual can be included under ABCD: MeasurementOrFacts

The following table lists the proposed elements associated with anthropological specimens, included in the prototype Anthropology Schema:

*Table 2: Entities and elements related to anthropological units*

<b>Elements</b>	<b>Description</b>	<b>Discussion</b>
ABCD elements	All elements from ABCD included through an import statement or ABCD used and extended by including anthropology elements	Anthropology specimens and observations could include most of the elements in the ABCD schema

<b>Elements</b>	<b>Description</b>	<b>Discussion</b>
EFG elements	All elements from EFG by import or ABCD extended by import of EFG schema	Many anthropological specimens are palaeontological specimens and therefore can be described using elements from the EFG schema including stratigraphical elements for matrix and gathering site.
AnthropologySpecimen	Is a container for complex elements that describe specimens of human or humanoid origin. These include socioCulturalElements, biographicElements, pathologyElements and archaeologicalTaphonomyElements.	This element would sit at the same level as PalaeontologicalUnit and ZoologicalUnit under the Unit element.
socioCulturalElements	Includes indications of social status, the method used to determine status, ethnic origin, culture affiliation and any measurements or related facts	
biographicalElements	Information on individual to whom the anthropology specimen relates including name, life events (birth, marriage, death etc.) social rank, work role and occupation and other facts and measurements.	
pathologyElements	Information describing any pathological conditions related to an anthropology specimen including general description, named condition and classification, affected part or parts, pre or post mortem, who did the diagnosis, references, images, measurements and facts.	
archaeologicalTaphonomy	Describes post mortem events, changes and indications of natural and ritual alteration, bone articulation, transport and burial. Elements include an extensive complex burial element, cremation details and description of bone articulation.	This element covers mainly human agency affecting remains, most often in association with burials. These elements should be used in conjunction with the EFG palaeontological taphonomy elements, which cover most natural processes.
burial	A specific type of taphonomic element which can include items specifically linked to burial including type of burial, content of burial, single or multiple occupancy, funerary practices, dating, associated known historical events, body position and orientation, references, measurements and facts and post-burial disturbance.	Descriptions of actual graves and excavations are documented elsewhere under archaeological context.
cremation	Related to burial but specifically for documenting the taphonomic details	Not currently fully analysed but includes a free text field for general

<i>Elements</i>	<i>Description</i>	<i>Discussion</i>
	of a cremation	description of the taphonomic aspects of excavated cremation remains.

## 4 Scope of the Cultural Artefact Unit

The cultural artefact unit covers manufactured items and is included here to cover specimens associated with anthropological records, although it could be included in an archaeological schema or even stand alone as the root element of a separate schema. The inclusion in the anthropological schema allows the linking of details of human (and humanoid) remains with associated tools and other objects derived from the same context. Two methods of achieving this are available within the proposed schema. Associated Artefact Assemblage allows the inclusion of a simple list of objects linked to an anthropological specimen whilst Culteral Artefact Unit allows detailed description of artefacts possibly as separate unit records linked to the anthropological specimen via the Associated Unit ID in the ABCD schema.

One of the problems with introducing a cultural artefact type is that it could include all aspects of any manufactured, modified or decorated objects from the most primitive stone tools to the highest expressions of art and architecture or computer technology. This would also lead the ABCD schema away from being a biodiversity data schema towards a full museological data schema, although arguably the extension into earth sciences data has already started that transformation. A complete museological schema would be an achievable aim, using a modular schema approach but the development and management of the product would need to be considerably extended and it is not clear who would take responsibility for the overall standard.

Despite these considerations, I believe that it is important to include at least basic descriptive and dating information for associated objects because they are the most frequently used means for identifying and dating the anthropological remains.

Table 3: Elements associated with artefacts

<i>Elements</i>	<i>Description</i>	<i>Discussion</i>
ABCD elements	All existing ABCD elements may be used including kind of unit, record basis, gathering, associations/assemblages, collectors and measurements	Many of the ABCD elements are applicable to all types of specimens but some such as identification are aimed at biological taxa and so a new artefact identification element is needed.
EFG elements	EFG relates to earth science objects but some aspects including mineral and rock identification, dating techniques and taphonomy may be applicable to items such as stone tools.	EFG elements will apply to all fossil and sub-fossil anthropological specimens and many aspects will also apply to natural burials of any age.
Cultural Artefact Unit	A container element for information specific to items manufactured or shaped by human agency.	This element, by its definition, could be used for everything from structures (houses, tombs) to oil paintings, weapons to jewellery. It is therefore unlikely that the first attempt at defining it in a generalised manner will be

<i>Elements</i>	<i>Description</i>	<i>Discussion</i>
		comprehensive.
culturalArtefactSimpleName	Text field for applying a simple name to an artefact e.g. Cremation urn, biface tool, bronze sword etc.	Required because many descriptive names and old names are not controlled but still useful.
culturalArtefactDetermination	This element allows for full determination records to be linked to artefacts. It differs from taxon determination by being linked to typologies and expert opinion but otherwise has many of the same sub-elements.	Typological determination may link to published typologies or may be individual for an excavation or area, based on statistical analysis. There is no anthropological or archaeological equivalent of the taxonomic codes of nomenclature.
culturalArtefactDescription	Free text element for general description of an artefact	Covers the whole artefact as a unit. If there are different aspects to describe or the artefact has multiple components, these are described under culturalartefactParts.
culturalArtefactFunction	Text element for describing the use or function of an artefact – but could be linked to a controlled terminology list	
CulturalArtefactCompleteness	Text element to describe the completeness of an artefact or could use controlled terminology if desired	
culturalArtefactParts	<p>An element that allows any number of component parts to be described for an artefact e.g. For a composite artefact made of several materials and with different manufacture such as a gold signet ring with an inset carved stone. Included elements are: simplePartName, partFunction, partDescription, partMaterials, partManufactureProcess and partDecoration.</p> <p>Decoration includes repeatable elements for decorationDescription, decorationClassifiedName (determination), decorationTheme (what does it depict), decorationPattern, decorationProcess (how was it created) and decorationMaterials (list)</p>	<p>In single component artefacts such as a flint biface tool this element would be used for a single description but it could also be used to describe aspects of the artefact e.g. Top surface, bottom surface and cutting edge. The element can also be used to describe decoration such as incised patterns on pottery vessels.</p> <p>The element could be extended to include further elements including measurements, associated people (artist, manufacturer etc.), conservation treatment.</p>
culturalArtefactDamage	Text element to describe any damage to the whole artefact.	

## 5 Archaeological Provenance

The archaeological context of a specimen links to another potentially very large domain replete with its own extensive terminologies, techniques and data types. The description and management of data associated with excavations is an extensive discipline in its own right and cannot be fully modelled in the current project. The context from which anthropological specimens have been recovered is, however, an exceptionally important element in understanding their nature and origin. It is proposed, therefore to include the key elements related to excavation and dating to enable the bone and artefact material to be interpreted and linked to documentation.

One of the key differences between archaeological sites and geological or natural gathering sites is that they may include man-made structures and excavations that are part of the interpretation of the derived specimens. For instance, burials may range from simple pits to complex tombs and the preparation, positioning, adornment of the human remains and associated artefacts are all critical to the interpretation and dating of the remains. It is therefore necessary to model the key archaeological information related to a site. The detailed description of buildings and funerary complexes may lie outside the current scope but details of individual burials should be included. This might also be the case for similar archaeological contexts such as hearths. It would be possible to link anthropological specimens to more detailed information such as excavation reports that are better suited for more complex data.

### I Archaeological location types

Older anthropological specimens may be treated as geological specimens and much of their provenance and context information can be dealt with using the EFG schema but more recent specimens are frequently linked to archaeological or ethnographical investigations and recording methods. The context within which the specimen is recorded can be of numerous types.

Table 4: Typical location or context types used in relation to anthropological and archaeological specimens

Location Type	Description	Discussion
Landscape area	A landscape area is any area of specific interest in the broader countryside. Landscape areas may be derived from cartographic classifications e.g ‘The Mendip Hills’ or the ‘Somerset levels’. They may be designated areas, such as ‘Areas of Outstanding Beauty’ or ‘National Park’. They may also be user-defined, perhaps derived from a GIS analysis e.g. areas of high population density or areas with a high proportion of a certain habitat type. Landscape areas often do not have clear boundaries although they may be represented as polygons in GIS.	Landscape and administrative areas can be listed as namedAreas under the gathering element. ABCD does not allow the recording of spatial references for namedAreas.
Place	Any named place represented in a gazetteer or place name layer in GIS.	As above
Point location	Point locations are isolated spatial references. They may fall within sites that are defined by digital (GIS) or cartographic boundaries. Point locations may be associated with individual ‘finds’, sampling locations or points of interest, such as particular	ABCD handles point samples and point locations well through the site coordinates sub element of the Gathering Site element.

Location Type	Description	Discussion
	site or landscape features. They may also be used as reference points for sites, for the purposes of plotting onto sites onto 'dot' maps or assigning default spatial references to material associated with a site.	
Grid squares	Grid squares are most often used for representing or analysing data within GIS and mapping applications. In this case the square may be derived from more detailed spatial references. Some surveys collect data on a grid square basis (e.g. 1 kilometre, tetrad or 10 kilometre square). Detailed surveys may collect data at 1 metre resolution.	ABCD uses site coordinates at lower resolutions (e.g. 4 figure Lat/long or 6 figure OS Grid Reference) to define grid squares.
Defined site	A Defined site is normally defined by a polygon but in many databases may simply be associated with a name (and possibly a centroid grid reference) and not held in a GIS. Sites may be defined by habitat, ownership, protection designation, project boundaries, administrative boundaries or other interest (e.g. types of archaeological site). Sites may have more than one name and their boundaries may change with time. Several sites, defined under different interests may coincide or overlap.	In ABCD sites can be referred to using a number of elements under the Gathering Type, including LocalityText, platform, namedAreas and nearNamedPlaces. Polygons defining site boundaries can be transmitted using coordinate sets, GML markup (although this has not been implemented yet) or reference to WFS (Web Feature Services) or WMS (Web Map Services) via a URL.
Physical survey area	A physical survey area is defined by a polygon (or text description) and relates to the 'footprint' of a geophysical or geochemical survey e.g. magnetometry, resistivity or ground penetrating radar.	ABCD does not presently have the elements to handle geophysical survey data other than to link to a polygon describing the survey area and link to external images and documents
Project/Survey Area	The area which covers the full extent of a project or survey – from large areas (e.g. 'Hungary') to detailed project areas (e.g. the boundaries of a rescue dig).	In ABCD all survey and sampling data must be related to a Dataset element, which includes metadata on the scope of the dataset. The metadata includes geo-ecological keywords and taxonomic scope but does not include geographic information or links to spatial definitions (e.g. Polygon covering the project area). There does not appear to be any way of defining a project or survey area other than creating a 'pseudo-unit' which can represent all other units with a common gathering event. A unit

Location Type	Description	Discussion
		description can include a polygon or the spatial references for a 'bounding box' within the gathering element. This is probably an issue that would need revision of the ABCD core schema.
Excavation site	The boundary of an area within which excavations are carried out during one or more seasons. Should be defined by one or more polygons reflecting boundary changes with time.	As discussed above, ABCD can handle these under the 'Gathering' element but this is not ideal where there are many specimens from one location, which will lead to much duplication of data. It is suggested that an excavation element could be introduced as an extension to the Dataset element (possibly under metaData) of Core ABCD
sub-site	Any defined area (by name or polygon) within the boundaries of a larger named site. For instance, areas designated for excavation within a site.	This is a standard feature of many databases but is not well handled in ABCD because ABCD is unit-orientated and not site-orientated in its hierarchical structure.
trial pit (sondage)	A small excavation used to test for presence of archaeological interest or gauge the stratigraphy of a site.	In ABCD a trial pit might be a Method under the Gathering element and could then have a spatial reference, measurements and description associated with it. Finds would have to be recorded as associated units. It could also be linked to multi-media objects (photographs etc.) and documents.
section	The side of a trench or trial pit, exhibiting the stratigraphy and layers that have been exposed.	The EFG schema provides a means for recording the stratigraphy of sections. Although developed for geologists, this would also be usable for archaeologists and anthropologists.
trench	a larger archaeological excavation – the basic unit of an archaeological investigation of a site	A large trench would need to be defined as a Gathering location to enable boundaries to be recorded and for various sampling methodologies to be recorded within it. This is not ideal because it provides no way of defining the relationship of the trench to a larger site or its sub-sites.
feature	Features are generally immovable structures, earthworks or natural	The EFG schema includes a NamedGeologicalFeature

Location Type	Description	Discussion
	features associated with an archaeological, site including walls and ditches.	element and it would be sensible to create a similar ArchaeologicalFeature element
Context	The context is the lowest recording unit in an excavation. All finds are linked to their context and each context is numbered and used in interpreting the stratigraphy or seriation of a site, Contexts are often represented on a Harris Matrix, an important tool in dating the finds and understanding the development of a site.	At its simplest the context number can be linked to a specimen using the gathering notes element. It might be better handled by the SectionIDNumber in the EFG SiteSections element or it would be sensible to create an ContextId element as part of the proposed ArchaeologicalLocation Element

## II Archaeological recording methodologies

Table 5: Typical archaeological methods and how they might be handled in HHI

Method	Description	Discussion
Magnetometry survey, Ground Penetrating Radar survey and Resistivity survey	These are all geophysical survey techniques that generate data streams for either transects or areas. These are usually collected and analysed using specialist software, the results of which are normally presented as area plots, often as pixel values (in squares of different resolutions). The plots can be geo-referenced and displayed over ground plans and terrain models in GIS applications. ABCD may not, therefore, be required to represent any of these data although it could refer to a WFS URL or similar source reference.	No changes required to the structure of ABCD would be required (if not moving the raw data) although new terminology (e.g. method types) would need to be added to controlled term lists.
Topographic survey	A topographic survey involves evaluating the landforms of a site or wider area to aid in the interpretation of its history, add context to finds and help locate features of interest, possibly for excavation. Topographic interpretation utilises maps, aerial photography and field walking. ABCD does not currently have specific elements for managing topographic survey interpretation data although maps, aerial photographs and documents can all be linked to the Gathering element.	ABCD is intended primarily for transferring data related to specimens and observations and so is not suited to describing topographic features although it would be possible to define a topographic unit.
Field-walking survey	Field-walking may represent a ‘survey’ in its own right (e.g. field-walking survey for a whole district) or it may be	No changes to ABCD would be required to manage these data although the ability to

Method	Description	Discussion
	a more restricted ‘event’, as part of another project (e.g. survey of a large site prior to excavation). Individual spot finds and pottery scatters would be handled as Units.	record the overall sampling area in the Dataset metadata would be helpful. This would also be useful for geophysical surveys.
Individual finds (objects)	Individual finds would be recorded as ‘units’ and could be linked to other ‘units’ if found in association with the work of a specific survey (e.g. picked up during a field walk). The details, treatment and storage of found objects can be recorded under the specimens unit heading.	No major changes needed to ABCD other than possible additions to controlled term lists and new elements that allow archaeological dating determination as well as identification. There will need to be a new determination type for cultural objects that allows typological comparisons.
Test Pit or Sondage	These are sample methods and yield information on the stratigraphy and contexts of sites and may also yield finds (removable objects) which are treated as units. Measurements and descriptors can be recorded against the unit.	The EFG extension to ABCD provides a means of recording stratigraphy. Units can be linked to Individual strata or contexts and the relationship between units can be recorded. There is a need to add three dimensional spatial references and allow the accurate recording of superposition and cross-cutting relationships between multiple contexts which is currently not available.
Trench	A trench is the standard unit of excavation and normally relates to a named site. Trenches can be mapped and plotted as sub-sites (with multiple boundaries through time, if the trench is extended). The trench is also a method that would be linked to an event with multiple samples which would include many types of units, including finds and immovable contexts (e.g. walls). Trenches can produce complex relationships between stratigraphy, structures and finds that need to be recorded and analysed, for instance through the creation of a Harris Matrix. Trenches need to be mapped, drawn and photographed and items should be spatially referenced in three dimensions.	It is clear that ABCD could be used for much of the information associated with excavation but the organisation by specimen units makes it difficult to use for the transfer of information relating to complex contexts such as an archaeological excavation.  It would be possible to transmit output such as a Harris Matrix as an associated document and each unit could have a context number but the interchange of full excavational detail would require a differently structured schema and possibly, extensive use of GIS web services.

### III Proposed Archaeological Elements to be added to the Anthropology Schema

The following table lists the proposed elements associated with the archaeological context of anthropological specimens, included in the prototype Anthropology Schema:

Table 6: Archaeological Provenance elements included in the Anthropology Schema

<b>Entity</b>	<b>Description</b>	<b>Discussion</b>
Archaeological Provenance	Archaeological Provenance is a container element for information related to the archaeological context of anthropological specimens and artefacts. This is an extensible element and currently includes information linked to metadata about an excavation and details of individual archaeological features and contexts.	It would probably be possible to use the ABCD framework for archaeological data although it must be remembered that ABCD is primarily specimen/observation oriented and not therefore optimised for site-based data-sets. It would not, however, be difficult to re-utilise existing elements in a site-oriented schema.
Archaeological Excavation Metadata	This complex element allows for basic documentation of an excavation including, excavationName, excavationDescription, excavationDates, associated people and organisations and published references. There is also an element for the geographic context which allows listing and discussion of the way an archaeological site relates to the local and historical landscape.	This element allows for the recording of excavation details when related to individual items in a heterogeneous dataset. If the whole dataset relates to items from a single excavation or source then it would be more economical to put such information in the dataset metadata section.
Archaeological Feature	An archaeological feature is usually regarded as an immovable component of a site consisting of one or more 'contexts'. Typical features include walls, ditches and earthworks. Features may have numerous recordable characteristics which may vary between types. For the purpose of the Anthropology Schema, the only feature, so far modelled, is Grave, which is most likely to be associated with anthropological remains.	This element can be extended by adding new sub-elements to cover other types of feature if needed.
grave	Graves are treated as a type of archaeological feature. A grave is a place of burial, usually an excavation of some kind. Graves may be important in the interpretation and dating of human remains, for instance the direction of orientation may reflect religious belief. This element allows for recording a description, identifiers and various measurements associated with a grave.	For the purposes of the schema the human remains and their post-mortem ritual treatment are grouped under the Burial element alongside taphonomy whereas the physical grave (and tombs if they were included in an extended schema) are treated as part of the archaeological context of the gathering site.
Associated Artefact	Archaeological features consist of one or	The associated ArtefactList element

<i>Entity</i>	<i>Description</i>	<i>Discussion</i>
Assmblage	more contexts, each of which may yields various finds and be subjected to various analyses. The source dataset for an anthropological specimen may not included details of individual contexts but there may still be an artefact list for the feature (e.g. Grave or general site) that yielded the human remains. This element includes repeatable the associatedArtefactList element for describing and naming individual artefacts associated with anthropological specimen that forms the main unit record. Included elements are; associatedArtefactName, associatedArtefactDescription, associatedArtefactFindNumber, associatedArtefactRegistrationNumber, associatedArtefactMeasurements, associatedArtefactImages.	used in Feature can also be used for individually identified and described archaeological context records.
Associated Biological Material	The associatedBiologicalMaterial allows the listing, naming and description of any plant or animal material associated with an anthropological specimen, including if the material has been used or modified in any way. Includes identifiedTaxon, MeasurementsAndDescriptors, Comment and anthropogenicEvidence elements.	This element can also be used in association with individual contexts.
Archaeological Context	The archaeologicalcontext element allows for the description of individual contexts and their content. The elements include, contextNumber, contextType, contextDescription, contextDate, contextFinds and contextBiological Material. Context Date uses the archaeologicalDateType described in the next section. ContextFinds uses the AssociatedArtefactAssemblage Type described under Feature.	Archaeological context can be used in conjunction with or as an alternative to archaeological feature. It allows the association of an anthropological specimen or observation with a single identifiable archaeological context (e.g. Within a complex excavation).

## 6 Dating of Anthropological and Archaeological Material

### *I Absolute, Relative and Cultural Date determinations*

Archaeological and geological material may be dated by absolute means (such as isotope and thermoluminescence dating), stratigraphic relative means (e.g. lithostratigraphy and biostratigraphy) and for archaeology, cultural means (e.g. pottery typology). The ABCDEFG schema can handle the terminology and hierarchies for most of the methods related to older geological material but would need extending to include more strictly archaeological dating

methods. In particular the dating module needs extending to include:

- Thermoluminescence and electron spin resonance dating
- Relative dating based on assemblages of artefacts and cultural types including typological analysis
- Relative dating based on Pollen analysis
- Dendrochronology
- Coin dating
- Cultural dating

Date attributions, of any type, should be recordable individually or in combination and applied to:

- collection units (a specimen, group of specimens) or an observation
- the host rock or sediment associated with finds and observations
- allocthonous material associated with a specimen or observation (e.g. where older material has been incorporated into a younger dated artefact or context)
- the location as a whole or its component archaeological features and contexts.

<i>Entity</i>	<i>Description</i>	<i>Discussion</i>
ArchaeologicalDateType	The archaeologicalDateType has been introduced to be used in association with anthropological and archaeological elements. It includes the stratigraphicDate element introduced in EFG to cover geologic and recent stratigraphic contexts. It also includes elements more familiar in historical dating such as , calendricalYear, RegnalYear, historicalPeriod and Dendrochronology dates.	Not all possible dating methods or analytical processes have been modelled in this work although it includes the most commonly used. For instance, Carbon isotope dating can be recorded using the RadiometricDates complex element from EFG.
CalendricalYear	This element allows dating based on texts or inscriptions that record a calendrical year. Years can be recorded singly or as a range and associated with a named calendar type (e.g. Julian, Gregorian, Persian, Jewish etc.)	
RegnalYear	Records dates by year of a reign or similar time period, typically used in ancient times (e.g. The Sumerian King List or Japanese Nengo numbers).	
HistoricalPeriod	Allows 'vague' and range dates associated with cultural periods (e.g. Tudor, Bronze age, post-medieval etc.) includes qualifiers (early, middle, late) and geographic context.	
HistoricalEvent	Element for dating by relation to a known historical event e.g. Battle of Hastings 1066.	

<i>Entity</i>	<i>Description</i>	<i>Discussion</i>
DendrochronologyDate	Dating evidence from tree-ring dating methods. Allows exact dates, ranges and age in years and links to the reference sequence used.	

## 7 Stratigraphy and Archaeological Seriation

The full analysis and inclusion of archaeological seriation is considered to be beyond the bounds of the current schema although the basis is already present in the EFG:SiteStratigraphy and HHI:ArchaeologicalProvenance elements.

## 8 Conclusion

This paper presents an outline of the proposed Anthropological extension to the combined ABCD and EFG XML schemas. The proposed schema includes numerous elements that are pertinent to other domains including biography and archaeology. These domains have not been fully analysed and further work will be required to define a practical schema that could accommodate the full range of archaeological and social anthropological data although it is believed that enough has been done to cover current physical anthropological use. The proposed schema is referred to here as hhi.xsd (human history information) as a working name subject to either acceptance or change by the user group. The schema will be lodged on the web for user review, revision and update prior to its submission to TDWG as a potential standard.