Chogha Mish Faunal Dataset
Data Cleaning Protocol

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Original dataset available at:
http://opencontext.org/media/234FDB46-12B2-4FB8-BE75-8D4B53E40D9C

Refined dataset cleaned according to the following protocol available at:
http://opencontext.org/tables/39fd14fe7196aea0821ce8c7e08251f8

	Expected	Observed	Comment	Priority
SITE	Site location and background	Yes		
	Excavator and sponsoring institution	Yes		
	Excavation type and techniques	No		
	Cultural sequence, periodization, and affinities	Yes		
	Dating	Yes		
	Special characters and features of site	Yes		
	Modern environment	Yes		
	Ancient environment	Yes		
RECOVERY	Sampling	No		
	Context types	Yes		
	Context integrity	No		
	Recovery Techniques	No		
	Dry/wet screening mesh size	No		
RECORDING	Identification method	No		
	Identifier	Yes	Jane Wheeler Pires-Ferreira	
	Presorting	No		
	Mending	No		
	Refitting	No		
	Access to comparative specimens	No		
	When recorded	Yes	1961-1965	
	Where recorded	Yes	Both in the field and in Chicago	
	Recorder	Yes	Jane Wheeler Pires-Ferreira	
	Recording protocol	No		
	Media used recording	Yes	Computer punch cards	
	Curation and storage	No		
	Labeling	No		
BASICS	Taxonomic ID	Yes		
	Skeletal ID	Yes		
	Completeness	Yes		
	Portion	Yes		
	Symmetry	Yes		
	Epiphyseal fusion	Yes		
	Tooth eruption wear	No		
	Sex	Yes		
	Pathology	No		
MODIFICATION	Ancient/modern break	No		
	Erosion rolling	No		
	Burning	Yes		
	Cut marks	Yes		
	Cut mark position	No		
	Carnivore gnawing	No		
	Other gnawing	No		
	Regurgitated/digested	No		
	Scratches	No		
	Artifact	No		
	Fragment weight	No		
	Fragment count (NISP or NF)	?		
	Element count (MNE)	No		

Major anthropological questions to be incorporated into zooarchaeological analysis:

1) Adoption of agricultural economy
2) The gradual appearance of central places
3) Increasing specialization and technological advancement
4) Specialization in subsistence economy
5) Emergence of social complexity
6) Emergence of states

Analytical Procedure:

1) Data surveying to identify potential errors/problems/limitations
1) Data cleaning and standardization prior to quantitative analysis
2) Data sampling through prioritizing and eliminating mix contexts

Recovery:

1) Such potential problems as vagueness or total absence of data on compatibility of excavation units, on completeness and integrity of contexts, and on detailed description of recovery methods applied by the excavators oblige me to make some assumptions and decisions accordingly.
2) Designation of some “periods” as “mixed” implies that there is a certain degree of mixing of the sediments and of their contents because of the insensitivity of the excavation method to the sites topography or other arbitrary decisions made by the excavators. The potential effects of this bias were eliminated through exclusion of mixed periods from the analyses.
3) Currently, there is no information with respect to sampling strategies and decisions in terms of horizontal and vertical coverage of the mound. We also lack information whether the samples are representative of a range of functionally discrete areas. We do not know the relationship between the volume of excavated sediments/ the number of excavated units and the sampled equivalent of sediments and units. This bears significant methodological and theoretical weight in a zooarchaeological research as archaeofaunal samples smaller than the 5,000 bone threshold suggested by Gamble (1978) may not be sufficient to address questions such as age and sex structures.
4) We do not know whether deposits from each period and context were systematically processed during the excavations for the recovery of small findings and ecofactual remains. There is no information regarding presence/absence of wet or dry screening either. It is known that hand-collecting or not screening introduces size-related biases in favor of the remains of large taxa and/or large specimens. This in turn negatively impacts analysis of species trends through time and consequent interpretations of paleoeconomic reconstructions. Thus, a more conservative approach should be adopted in developing a picture of animal exploitation patterns due to lack of fine-grain or fine-resolution.

Recording:

1) Decisions with respect to what to record and how to record vary depending upon the site, recovery methods, bone sample sizes, experience of the analyst, and more importantly, the questions being asked (see discussions in Atici et al. 2013; Chaplin 1971; Davis 1987; Driver 1991; Grigson 1978; Klein and Cruz-Uribe 1984; Lyman 1994; Meadow 1980; O'Connor 2003; Reitz and Wing 2008; Ringrose 1993; Russel 2012; Speth 1983; Thomas 1996; Uerpmann 1973).
2) Although a universal methodology that is employed by all zooarchaeologists and that is applicable to all faunal collections across time and space does not exist, many zooarchaeologists follow some ground

rules and collect some basic data such as those on skeletal part, taxon, symmetry, state of epiphyseal fusion, and nature of dental eruption/wear patterns. Some zooarchaeologists adopt a "diagnostic zones" approach and target selected skeletal elements or element portions that are suitable to address more specific questions, such as prey age and sex structures, and that are characterized with greater ease (e.g., Chaplin 1971; Davis 1987; Klein and Cruz-Uribe 1984). As far as the Chogha Mish faunal data is concerned, none of these decisions is known.

Identification:

1) We have no data regarding taxonomic and skeletal element identifications. We don't know whether the analyst identified specimens partly using a modern comparative reference collection and/or partly using published manuals and articles describing identification criteria, or based solely on her visual memory.
2) The use of local fauna to identify archaeological specimens can help to increase the certainty and accuracy and to eliminate problems such as population-dependent variations or features seen in morphology. When the degree of certainty of identification is not too high, zooarchaeologists often identify specimens to such commonly used "methodological categories" as "*Ovis*/*Capra*," "Large-size mammal," "medium artiodactyl," or "*Ovis*/*Capra*/*Gazella*." This analytical decision attests to an analyst's degree of certainty and conservatism, which indeed is a very good practice as it prevents the analyst from generating false data and from introducing further biases. For the purpose of statistical viability, however, the bones from sheep and goats, the most frequently occurring methodological category in almost every Near Eastern assemblage, are combined into an "O/C" ("caprine") category and treated as a single analytical unit. In addition, fragments not identified to genus but classified into a more general category such as "medium mammal" may be allocated proportionally into more specific categories. The Chogha Mish data suggest that the analyst was very conservative and certain in her taxonomic identifications, as these methodological categories account for large samples in many of the assemblages from almost all the periods.

Quantification:

1) As far as quantification of the assemblages at Chogha Mish is concerned, the analyst seems to have used basic fragment or specimen count, as the quantitative units most conventionally used by present-day zooarchaeologists were not available during the 60s. So, the analyst simply assign a single row for every specimen she recorded, and she did not designate a field to enter number of specimens/fragments, as she did not group specimens to be collectively entered represented by the same unique identification number.
2) The above-mentioned quantitative methodology does not create any limitations as the primary data—basic bone count—can be used to second or third level abstractions such as MNI, MNE, and even MAU, as the analyst recorded degree of completeness/fragmentation on different planes such as dorsal plane, sagittal plane, and transverse plane.
3) For age-at-death estimations and demographic profiles, MNE values were used to eliminate double-counting.

Taphonomy:

1) Documenting frequencies of skeletal parts in relation to nutritional and bone density values is one of the most commonly employed analytical approaches for assessing the completeness of archaeofaunas and for inferring the mechanisms involved in their accumulation and modification.
2) The first step should involve the role(s) played by various agents/bone filters in the process of bone accumulation, modification, and destruction. The primary goal of the zooarchaeologist is to isolate and identify the role of humans as a primary taphonomic filter. Or else show that non-human animals or other n-factors were primary, not humans. This would validate and contextualize interpretations cultural practices. Chogha Mish data do not necessarily provide us all variables that we need to distinguish between different taphonomic filters. Yet, it is adequate enough to address many problems, as data on carnivore ravaging and some cultural practices such as butchery are present.
3) Presence of raw bone counts/primary data can help us estimate MNEs to be used in certain taphonomic analyses such as taxonomic abundance, skeletal part abundance, and body part distributions.
4) Being able to estimates MNEs can enable us to evaluate differential survivorship of skeletal parts comparing expected and observed MNE values based on MNI values. We can also probe skeletal abundance and bone density and bone survivorship and economic value using %MAUs based on MNEs. All this information will shed light on animal resource use, carcass management processes, and decisions made by people and changes therein through time.

Zooarchaeology:

1) Taxonomic composition and possible similarities and/or differences in animal exploitation strategies can be investigated both diachronically and synchronically to specifically address specialization in animal exploitation toward a mobile highland pastoralism, as well as intensification in certain carcass utilization as well as in secondary product consumption.
2) Demography of mortality can be investigated using available data which is coarse-grained yet still useful. The analyst recorded epiphyseal fusion stages for limb bones, as well as described tooth wear stages using a descriptive terminology, as Payne's (1973; 1987) coding system was not yet available back then. Epiphyseal fusion stages are not available for each taxon due to sample size-related biases. Caprine remains, however, can yield good sample size to generate kill-off patterns analyses for most of the periods. As far as dental age is concerned, tooth eruption data can permit us to assign certain specimens to broader age classes. For example, mandibular M2 erupts at the age of two, enabling us to quantify individuals older than 2 years of age. Similarly, number of unworn mandibular dP4s, worn out mandibular M3s, and worn out mandibular P4s may also account for younger and older end of the age spectrum. This can at least help us to detect trend in the faunal record with reference to animal management systems and changes thereof.
3) In conclusion, the available data can still be used to study taxonomic abundance, relative importance of cattle, caprines, pigs, and wild game, carcass processing, transport, consumption patterns, and body part distributions. We can gain insights into the general trajectories and possible changes in the exploitation of animals and the underlying causes for these changes from the Neolithic through Protoliterate period at Chogha Mish.
4) Zooarchaeological data can easily be incorporated into such broader anthropological questions as adoption of agricultural economy in the Susiana Plain, resource intensification and technological advancement, and specialization in subsistence economy in general, and pastoral economy in particular.

Themes:

1) Assemblage formation and composition
2) Taxonomic composition and changes in animal exploitation through time
3) Broader socioeconomic implications (e.g. site use and function, animal management systems, secondary products, specialized pastoral economy, intensification of animal use etc.)

Prioritized Contexts:

1) Achaemenid
2) Protoliterate
3) Late Middle Susiana (formerly Middle Susiana 3)
4) Early Middle Susiana (formerly Middle Susiana 1)
5) Middle Susiana
6) Early Susiana
7) Archaic Susiana 3 to Early Susiana transition
8) Archaic Susiana 3
9) Archaic Susiana 2
10) Archaic Susiana 1
11) Archaic Susiana

Prioritized Taxa:

1) Principal taxa: *Ovis*, *Capra*, *Ovis*/*Capra*, *Bos*, *Equus* spp., *Sus* spp., and Gazelle
2) Present raw data with methodological categories first
3) Present principal taxa

Prioritized Skeletal Elements:

1) Eliminate all fragments not identified to element, but identified to a specific taxon (e.g., a *Lepus* specimen not identified to an element!)
2) Use specimens identified to a specific or general element or bone category, but identified to a methodological taxon (e.g. large mammal long bone shaft or medium artiodactyl vertebra)

Data Cleaning:

1) Deleted fields: Modern Name, Place ID, Area, Unit, Locus, Locus2, Top Elevation, Bottom Elevation, Catalogue Number, Domesticate
2) Inserted Fields: Unique Specimen ID Number, Body Part ID, Number of Fragments, Number of Elements, Fusion Proximal, Fusion Distal, Skull part
3) Renamed fields: Identification (TaxonomicID), Element (OsteoID), Disease (Pathology), Condition (Fragmentation), Modification (Modification 1)
4) Revised age at death data:
    a. For all relevant fields, “indeterminate” was replaced with “nonidentified” to reflect interanalsyt differences and variations in identifying specimens, and to imply each and every specimen can ideally be identified depending upon the experience and competitiveness of the faunal analyst.
    b. Proximal/Distal field was revised and edited to assign each specimen to either proximal or distal categories to tally epiphyseal fusion stages. Specimens were assigned complete, nonidentified, not applicable, shaft, distal shaft, or proximal shaft as well.
    c. Proximal/Distal field was revised and edited to reflect correct designation and to facilitate epiphyseal fusion analysis. For example all cranial skeletal elements with assigned “proximal

end" or "distal articulation with epiphysis" sort of entries have been corrected as Proximal/Distal not applicable.

d. Fusion data revised and re-entered separately into "Fusion Proximal" and "Fusion Distal" fields in accordance with already existing fusion data recorded, as well as with other fields such as "Fragmentation" and "Portion" considered.
e. All skeletal elements have been revised for accuracy and consistency regarding fragmentation and portion designation. For example all cranial elements and/or elements not bearing epiphyses such as carpals or astragali were assigned "not applicable" value with respect to fusion proximal and distal. All astragali and calcanei have been revised to eliminate incorrect directional terminology such as "proximal end with shaft."
f. All long bones were revised to correct inconsistencies and inaccuracies regarding fragmentation and proximal/distal designation. Axial elements such as vertebrae and ribs were also revised with respect to proximal/distal and shaft to reflect appropriate osteological terms such as use of "corpus" instead of "shaft" for vertebrae and ribs.
g. Long bone shaft fragments with no articular ends were reassigned "not applicable" fusion stages to be accurate and to not double count same bones.
h. For scapulae, Proximal/Distal data have been reversed to correct the anatomical orientation and directional terminology with respect to epiphyseal fusion. Thus, all proximal portions have been reentered as distal to record distal epiphysis fusion stage of scapulae.
i. For all metapodials proximal epiphyses have been assigned "not applicable" for proximal fusion. For first and second phalanges, distal epiphyses were assigned "not applicable" for distal fusion. For third phalanx, both proximal and distal epiphyses were assigned "not applicable" for fusion data.
j. All specimens with "immature" and "foetal" age identification were assigned "unfused" to their epiphyseal fusion state fields.
k. All specimens that were not identified to a skeletal element, and that were assigned a fusion state were reassigned "not applicable" to their fusion state field.

5) Revised osteological IDs to use proper Latin terminology:
   a. Indeterminate (8804 specimens) renamed to "nonidentified skeletal element"
   b. All cranial elements to cranium identified to specific element in the inserted field "skull part"
   c. Squasmosal temporal to "squamosal temporal"
   d. Horn core (Antler) to "horncore" for bovids; to "antler" for cervids
   e. Pre maxilla with/without teeth in bovids to "premaxilla" as they do not bear upper incisors and canines
   f. Tooth (isolated) to "Loose tooth" as per appropriate class (i.e. indeterminate to nonidentified loose tooth; upper to loose maxillar tooth, and lower to loose mandibular tooth etc."
   g. Tooth associated to "maxilla or mandible with teeth" as appropriate
   h. All "vertebrae" have been renamed to singular form "vertebra"
   i. Sternebral vertebrae to sternum
   j. Vertebra to "nonidentified vertebra"
   k. Radius ulna to "radioulnaris" in bovids and equids. Were these two elements fused and/or associated? To resolve this issue, I have copied 49 bovid +equid "radius ulna" and renamed the first group to "radius," and second group to "ulna" to eliminate over- or underestimating them
   l. First/second/third/fourth carpal to "os carpale I/II/III/IV"
   m. Intermedium carpal to "os carpi intermedium"
   n. Radial carpal to "os carpi radiale"
   o. Ulnar carpal to "os carpi ulnare"
   p. Second third carpal to "os carpale II + III"
   q. Radio intermediate carpal to "os carpi intermedium"

r. Metacarpal I/II/III/IV/V to Metacarpus I/II/III/IV/V
s. Metacarpal I/II/III/IV/V for bovids and cervids to "Metacarpus III + IV"
t. Metacarpal I/II/III/IV/V for equids to "Metacarpus III"
u. Metacarpal III IV for equids to Metacarpus III
v. Metacarpal III IV for *Ovis*/*Capra*/*Gazella*/*Bos* to Metacarpus III + IV
w. Indeterminate Metacarpus for *Ovis*/*Capra*/*Gazella*/*Bos* to Metacarpus III + IV
x. See h-l for metatarsals (i.e. metatarsal to metatarsus with appropriate numbering)
y. Indeterminate metacarpal to nonidentified metacarpus
z. Metapodial for bovids and cervids to nonidentified metapodial III + IV
aa. Metapodial for equids to nonidentified metapodial III
bb. Metapodial for all other taxa to nonidentified metapodial
cc. First/second/ third/ fourth tarsal to "os tarsale I/II/III/IV"
dd. Central fourth tarsal to "os tarsi central + os tarsale IV
ee. Lateral malleolus to "os malleolare"
ff. First/second/third phalanx to "phalanx anterior/posterior 1/2/3"
gg. Distal seasmoid to "distal sesamoid"
hh. Proximal seasmoid to "proximal sesamoid"
ii. Fibula tarsal to "calcaneus"

6) Revised taxonomic IDs to use proper Latin terminology.
   a. Specimen # CGM23930, a *Canis aureus* (golden jackal) right occipital bone distal end fragment, has been renamed as *Canis familiaris*. Probably overidentification or a sort of mix-up.
   b. All specimens identified as *Bos* have been renamed Bos taurus, as there is no evidence for aurochs hunting based on the information provided.
   c. One nasal bone identified as *Cervus* has been renamed Large Mammal to eliminate overidentification.
   d. Two antler specimens identified as *Dama* have been renamed Dama mesopotamica, based on the zoogeographical data.
   e. Specimens # CGM904, 7469, 7470, 7473, 7474, 7856, and 7857 identified as *Equus equus* have been renamed as *Equus caballus*, as there is no such species as *Equus equus* in the Genus Equus. It seems that the analyst meant "horse" by not using other more generic categories.
   f. Specimens identified as *Equus hermionus* (probably typo?) have been renamed *Equus hemionus onager* (Persian Onager). I have, however, only entered genus and species name, not the subspecies.
   g. Six specimens (five carpals and one nasal!) identified as Equus her. or as. Have been renamed as *Equus hemionus/asinus*.
   h. Three *Camelus* species identified as *Camelus* sp. Have been renamed *Camelus bactrianus* based on zoogeographic information.
   i. One hundred sixty seven specimens identified as *Equus* sp. have been renamed as *Equus* spp. to denote the presence of multiple *Equus* species.
   j. One hundred sixty specimens identified as gazelle have been renamed *Gazella* sp. to conform the Latin genus name.
   k. Two hundred and four specimens have been renamed from goat to *Capra* sp.
   l. Seventy five specimens have been renamed from sheep to *Ovis* sp.
   m. Four thousand seven hundred and ninety nine specimens have been renamed from Sheep/Goat to *Ovis*/*Capra*
   n. Five hundred sixty four specimens have been renamed from Sheep/Goat/Gazelle to *Ovis*/*Capra*/*Gazella*
   o. Eight specimens (#CGM2137, 2142, 2191, 2192, 4593, 4764, 4923, 10289) have been renamed from Suid to *Sus* sp.

p. Five hundred sixty one specimens have been renamed from *Sus scrofa* to *Sus* sp.
q. Three hundred ninety eight "indeterminate" specimens have been renamed to "nonidentified" to emphasize inter-analyst differences in degree and level of identifications
r. Three species (CGM # 18915, 18916, 20432) identified as *Vulpes* sp. have been renamed to *Vulpes vulpes*
s. Three species identified as missing have been renamed to nonidentified
t. Three horn core specimens identified to medium mammal have been renamed to *Ovis*/*Capra* as this is the most appropriate category for medium horn cores
u. Three horn core specimens with no taxonomic identification have been renamed to Bovid category as the most appropriate identification

7) Deleted data groups or subsets:

CATEGORY	**COMMENT**	**NUMBER**	**ACTION**
Indeterminate element	Identified to *Bos*	41	DELETED
Indeterminate element	Identified to Bovid	13	DELETED
Indeterminate element	Identified to *Equus hemionus*	9	DELETED
Indeterminate element	Identified to *Equus* sp.	11	DELETED
Indeterminate element	Identified to *Hemiechinus* sp.	11	DELETED
Indeterminate element	Identified to *Lepus* sp.	1	DELETED
Indeterminate element	Identified to Sheep/Goat	1	DELETED
Indeterminate element	Identified to Sheep/Goat/Gazelle	4	DELETED
Indeterminate element	Identified to Rodent	1	DELETED
Indeterminate element	Identified to Missing	13	DELETED
Indeterminate element	Indeterminate taxon; mixed context	89	DELETED

8) Deleted mixed periods:

PERIOD	COMMENT	# OF RECORDS	ACTION
Mixed	Mixed	535	DELETED
Mixed	Mixed Ach/PL	338	DELETED
Mixed	Mixed ES/AS	980	DELETED
Mixed	Mixed Late/PL	1	DELETED
Mixed	Mixed MS/AS	90	DELETED
Mixed	Mixed MS/ES	725	DELETED
Mixed	Mixed MS-ES-AS	478	DELETED
Mixed	Mixed PL/AS	99	DELETED
Mixed	Mixed PL/AS3	34	DELETED
Mixed	Mixed PL/MS	558	DELETED
Mixed	Mixed PL/MS 1	52	DELETED
Mixed	Mixed PL/S	407	DELETED
Mixed	Mixed PL-MS3	351	DELETED
Mixed	Mixed S	53	DELETED
Indeterminate	Indeterminate Period	472	DELETED
Mixed	Approaching or in virgin soil	74	DELETED
Mixed	AS 3 + Misc.	36	DELETED
Mixed	ES + Misc.	81	DELETED
Mixed	ES + PL	127	DELETED
Mixed	MS 1 + Misc.	22	DELETED
Mixed	MS + Misc.	78	DELETED
Mixed	MS + PL	78	DELETED
Mixed	PL + Late + MS	4	DELETED
Mixed	PL + Misc.	14	DELETED
Mixed	PL + MS + ES	21	DELETED
Uncertain	Probably Achaemenid	43	DELETED
Uncertain	Probably AS	11	DELETED
Uncertain	Probably PL	17	DELETED
Small sample size	ES-MS 1 transition	126	DELETED
Small sample size	Elamite	29	DELETED
Small sample size	Late Susiana	13	DELETED
Mixed	Archaic Susiana 1-2	47	DELETED
Mixed	Archaic Susiana 2-3	269	DELETED

9) Deleted mixed contexts:

CATEGORY	COMMENT	#OF RECORDS	ACTION
Surface wash	Integrity/certainty of context unknown	1281	DELETED
Slope wash	Integrity/certainty of context unknown	245	DELETED
Surface or slope wash	Integrity/certainty of context unknown	76	DELETED

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