Osteology for the new millennium

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Abstract: This presentation will tell you about a way to make the osteologists work more efficient and timesaving. The lecturer has constructed a database for osteological analyses, OsDat. The "OsDat" helps you to make the calculations like MNI and MNE automatically and makes your diagrams and presentations in reports neater and gives the reader a better overlook than traditional presentations. You can also upgrade your results with just a "click", no further calculations or consideration is needed. This lecture will take you from the basics in database construction via logical operations such as MNI and MNE and ending in the final report.

Key words: Archaeoosteology, Quantification, Database

Introduction

I have called this lecture "osteology for the new millennium". And it is a new era, now we have got computers to help us in our work. In an osteological analysis we use a lot of numbers and we do a lot of calculation. For an example, the calculation of the "minimum numbers of individuals" or the "minimum number of elements". In this lecture I will try to describe an osteological database, OsDat, this is a database that can be used as it is or as a model when you want to construct a database for a specific material.

An osteologist's work can be divided into three parts. First the osteological handicraft, then the part when the results will be transformed to understandable data. For last we have the interpretation part. A database will mostly be a tool for the second part of the work. If we look at a few typical osteological analyses we can see that all of them have tables that look rather the same. In this program you can get some of these tables just with a "click" on a button. And if you later on want to add a few other bone fragments, you don't have to do any calculation at all, you just press the same button and the computer will make a new updated set of tables. This will have two major effects on your work. First of all it will shorten the time of the work, which means that you will do the analyse faster or that you got more time for the interpretation.

When to create a program like Osdat you must have a few things in mind. First you must do the program as easy as possible, otherwise nobody will ever use your program in the work. Another criterion is that the program must be competent. This picture shows the meaning of OsDat, we have to translate bone fragment into binary code and form the binary code to an understandable picture. The program must in the same time be very complicated and easy, a paradox as it seems.

Today we have many different databases in use for osteological materials. Some of them are more famous than others. Many of them have only one user. One of the first attempts is the basic code presented by Klein and Cruz-Uribe in "the analysis of animal bones from archaeological sites" (Klein & Cruz-Uribe 1984). This was in fact many programs, one for registry of bones and one for the teeth and one for getting the results and so on. One of the more famous for human materials is "Standardized Osteological database (SOD)" which was created after the pattern that was presented in Standards for data collection from human skeletal remains (Bukistra J. E. & Ubelaker D. H. 1990, SOD). A third example is the Bonestack presented by Milles (1995). The big difference between these three programs is that the two programs for animal material was based upon the bone fragments and the SOD was for whole skeletons.

The user interface

At first look the interface in OsDat is rather the same as that you find in Microsoft Access. This is because I have been working with this system and because this program is well known and therefore the user will feel at home. The first window that you see is the main menu, from this you got three choices. First you can choose "registry", in this window the fragments can be described and recorded. The second choose is the "look up" part and it is a help window for looking up information such as when a specific bone will be fused or in which biotope a specific species is found. The last choice to do is the "quantification". Here are, for now, seven functions that all creates it's own specific table.

Register

This is the core of the program. Here we find all information about every bone fragment. Every fragment will be one post in the database, with a few exceptions. If two fragments can be put together they can be recorded as one fragment but then the number of fragments should be set to two instead of one. The same technique can be used for recording all unidentified fragments. Just let "species" and "element" be empty and set the number to the number of unidentified fragments.

Every fragment shall be coded by the same technique as the one presented by Lepiksaar 1988 (Lepiksaar J. 1988). The fragment will be divided into different parts or zones. Zone 1 and 6 in the long bones are the epiphyses. Other types of element like scapula or coxae will be coded differently. At lest 51% of the zone must be represented for be recorded.

For the fragments from the skull they all shall be recorded as "cranium" in the field "element". Then the fragment can be described in detail under the "skull parts". This is so that you won't mess up the quantification.

Tables

The tables are MNI, MNE, Nisp, Measurements, Stage of fusion, Bone modification. I will return to some of these functions and what the technique behind them looks like later. The inspiration to which tables I should create and the design of them I have got from the ones presented by Ekman (1973).

The database

Now, let us take a step down and look behind the shell. The OsDat is a relation database and normalized (Connolly T. & Begg C. 1999) to get a faster and more easily worked program. If we look on a sketch over the structure we se that the database is a lot of tables linked to each other. This is in order to save space on the hard drive and to facilitate the process of changing the information. For an example, if we want to change the name of "Bos taurus" to only "Bos" we just have to change this in one post and every other post reference to this post will be changed at an instance.

Functions

Minimum number of elements (MNE) & individuals (MNI)

The function minimum number of elements sorts all posts by species, element, side and part of the element and returns the number of elements and age of the element. The function will check which zone or part of the element that is most frequent for each element. The MNI-function does rather the same thing but it takes the maximum value of young and adults from both sexes for every species. (Table 1)

Measurements

This function sorts all measurements by species and element. For every group (species/element) it presents the maximum, minimum, average, standard derivation and how many elements

that were measured. (Table 2)

Bone modification

Bone modification is presented in a table. The modification is sorted by species, element and type of modification and where on the bone element it appears and how many bone fragments that have this change.
Nisp

This is only a sorting by species and for each species presents a number of fragments and the summary of weight for each species. In the end of the list it presents the total identification grade of the material. (Table 3)

Stage of fusion

This table shows how many fragments you have in the material sorted by the stage of fusion. All the parts are counted separately so that one fragment can and will be counted for its proximal part as well for it's distal part. All fragments are sorted by species, age of fusion and part of element. Then the function will take a look at the stage of fusion of the fragment and add one to one of the groups "infant", "open", "closing" or "closed". (Table 4)

References

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Standardized Osteological Database (2001-07-31) http://www.cast.uark.edu/~shelley/sod/

Tables

Species	Bone element	Nisp	MNE
Sus scorfa dom.			
	Cranium	3	2
	Femur	2	2
	Humerus	5	3
	Mandibula	1	2

Table 1. Example of the Nisp/ MNE table.

Species	Element	Measurement	n	min	max	avarage	st.dev
Bos taurus	MT	GL	3	210	250	223,00	15,13

Table 2. Example of the Measurement table.

Species	n	Weight (g)
Bos taurus	31	0
Equus caballus	4	0
Ovis ammon	3	0
Sus scorfa dom.	13	0
Grade of identification: 37%		

Table 3. Example of the Nisp table.

Bos taurus

Age of fusion	Bone/ part	Inf.	Open	Closing	Closed	Nisp
42 - 48 mon.	Coxae/ -	0	0	0	0	1
42 - 48 mon.	Femur/ Dist.	1	0	0	3	8
42 - 48 mon.	Femur/ Prox.	1	0	0	2	8
18 - 24 mon.	Phalanx 1/ Prox.	0	0	0	1	1
18 mon.	Phalanx 2/ Prox.	0	0	0	1	1

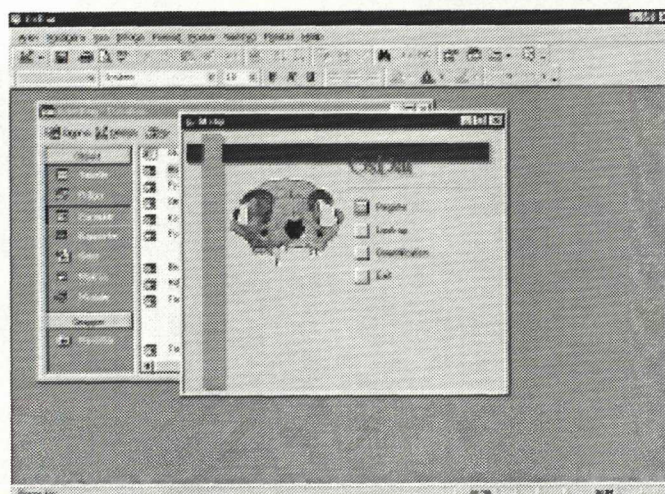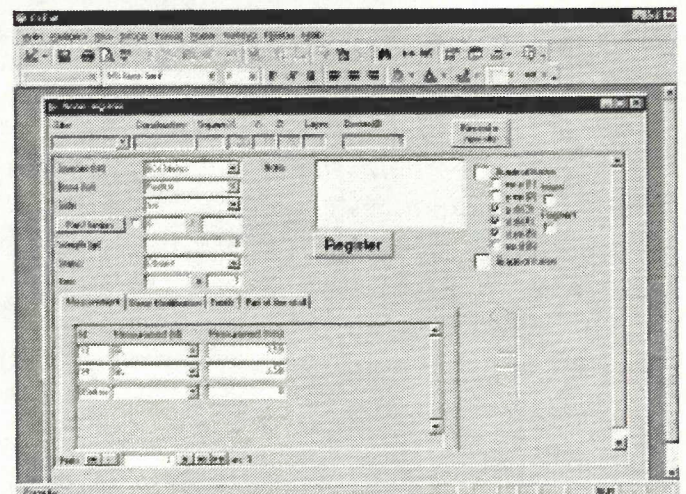*Table 4. Example of the Age of fusion table.*

Figures

Figure 1. The main menu

Figure 2. The register form.