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Title: The "Bones" Meeting - Monday, 20Th February, 1995 At The Grosvenor Museum, Chester

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THE "BONES" MEETING - Monday, 20th February, 1995 at the Grosvenor Museum, Chester.

Editors Note:

53 people attended the meeting.

The morning session was chaired by Maggie Reilly, Hunterian Museum, Glasgow, and talks were given by James Rackham (an Environmental Archaeologist), Chris Norris, Kate Andrew (Geological Conservator and Collection Care Consultant), and Paul Finnegan (Natural History Centre, Liverpool Museum).

The afternoon session was chaired by Steve Garland, Bolton Museum, and talks and demonstrations were given by Kate Andrew (again), Clem Fisher, Geoff Yates, and Rosina Down (University College London).

Three papers based on the talks are published here; it is intended that papers by James Rackham, Kate Andrew and Rosina Down will appear in the next issue.

THE USE OF OSTEOLOGICAL COLLECTIONS FOR SYSTEMATIC RESEARCH

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Introduction

Osteological material has a very great significance in systematic studies of vertebrates. As Szalay (1994) states, its use ensures the vital continuity between living and extinct forms. Even with the great advances in molecular techniques made over the last twenty five years, the osteological collections of the world's museums remain in constant demand as a source of taxonomic data.

This paper briefly reviews the categories of research methodology that can be employed when using osteological materials for taxonomic purposes and their applicability to the range of osteological collections available in museums. The types of bone most commonly used are described and, in conclusion, some of the problems and opportunities for managers of osteological collections are discussed. The paper concentrates to a large extent on mammalian systematics, but the general principles are applicable to most types of vertebrate material.

Research Methodologies

Broadly speaking, the systematic research methodologies employed on bones can be characterised as "direct" or "indirect." Direct methodologies involve the use of the actual bones as a source of data, be it in a quantitative or qualitative form. In contrast, indirect methodologies use the bone as the starting point for the analysis, but derive their final result from the molecules contained within the bone; for example, through the comparison of homologous sequences of DNA.

Direct methodologies

1) Quantitative studies. These involve the measurement of the specimen (using a variety of dimensions) and the replication of these measurements across a large number of other specimens. Analysis of the resulting data using a specialist software package produces phylogenies based on numerical similarity. The strength of such methodologies lies in their ability to distinguish the subtle differences in proportion that may separate populations of a species, or species within a genus. However, this same sensitivity makes such methodologies unsuitable for studies of more distantly related taxa, where the magnitude of the differences may swamp the analysis.

There are a large number of confounding variables in such analyses, whose elimination tends to dictate the requirements in terms of material. A largen umber of specimens is required, in order to reduce the effects of individual variability (e.g. in size). It is helpful to have access to series of specimens from the same locality, in order to separate within-locality variation from between locality variation. Wherever possible, specimens should be compared with those of the same age and sex, to reduce the effects of variation based on these factors (e.g. sex-based dimorphisms). It is also important to have a set of measurements that may be accurately replicated. The type of collection available may have a marked effect on this. For example, in the taxonomic review of the marsupial genus Phalanger carried out by Menzies & Pernetta (1986) a large proportion of the specimens used were hunting trophies obtained from indigenous peoples in New Guinea. In such specimens the cranium had usually been shattered to allow removal of the brain. The specimens were thus reduced to the orbito-rostral and palatal areas of the skull (see below). Although more complete specimens were available in the museum collections utilised by Menzies & Pernetta, the need to ensure replicability across all the samples meant that the study was restricted to a set of palatal dimensions (figure 1) which represented the "lowest common denominator" of the material available.

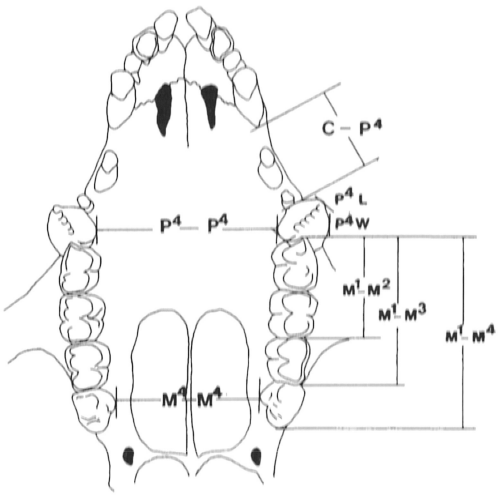

Figure 1. Palatal view of the skull of a cuscus (Phalanger), showing the dimensions recorded by Menzies & Pernetta (1986).

The demands of quantitative studies, in terms of the size and characteristics of the collections required and the quality of the associated data, are such that they cannot be effectively undertaken in any but the largest of collections.

2) Qualitative studies. Such studies involve examination and categorisation of a variety of distinctive morphological features of the specimen. An example would be the relationship between two bones in the skull - do they meet directly at a suture, is there a third bone separating them, etc? Comparison of a number of specimens within the same taxon enables a judgement to be made as to whether the formation of the character is consistent for that grouping. If it is, then it can be added to a set of characters to be compared between taxa. The observations are converted into a binary format for