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The diversity, zoogeography and geochronology of monkeys

The synoptic perspective of the fossil record of Old World monkeys presented in the preceding articles prompted the author to explore aspects of cercopithecoid biology which are difficult to examine with parochial evidence. These aspects include origins and subsequent spread of monkeys through the Old World, relationship of major events in cercopithecoid history to global climatic history, zoogeography and palaeozoogeography, and comparison of palaeontological and neontological versions of cercopithecoid phylogenies. While there remain temporal and geographic gaps in the fossil record, difficulties in interpretations will persist, but for the cercopithecids, the fossil data base is sufficiently comprehensive to yield a view of several of the main events in their history.

Introduction

Preparing a post-conference commentary provides an ideal opportunity to bring together the results of diverse lines of research and to examine them from a wider prospective than may have been possible to each of the original authors. Even though the conference entitled «Dating of the Cercopithecoid fossil record» was essentially one of documentation and review, my hope was that it would lead to the development of some interesting lines of enquiry. Whilst each piece of a jigsaw puzzle may yield information, a partly completed puzzle yields information which is greater than the sum of the individual pieces, and the whole picture represents a further step upwards in terms of the information available. As far as cercopithecoid history is concerned, the jigsaw is far from complete, but we are beginning to get enough pieces together to be able to make informed judgements about which parts of the puzzle need more attention, which parts might need taking apart for rearrangement, and possibly what the whole picture might look like.

The different clumps of the jigsaw available to us consist of a variety of disciplines including stratigraphy, biostratigraphy and zoogeography. With regard to cercopithecoids, there is not only the geological evidence concerning the sequence of palaeontological events, but also a growing body of molecular and karyological evidence. By combining neontological data we are in a better position to reconstruct phylogenies and to calibrate cladogenetic and anagenetic events, than we would have been had we been working in isolation. If we then look at palaeoclimatic evidence we may be able to discern concordances between phylogenetic and palaeoclimatic histories. We also put ourselves in a position to compare the results of different lines of evidence, and to determine whether the scenarios which are proposed on the basis of each of these lines of enquiry are compatible or not.

Each field of research provides tests for hypotheses erected on the others. In this context we are reminded that hypotheses should satisfy all the evidence. For neontologists to ignore the fossil evidence is as great an omission as for the palaeontologists to ignore...
the neontological evidence. When reconstructing the history of any group of animals or plants, it is essential that the history makes geological as well as biological sense. It must also make zoogeographic sense. To belittle one or other fields of enquiry is to bias the data base, with the inevitable result that the hypothesis will be unbalanced, if not easily refuted.

The Geological Evidence

The completeness of the world cercopithecoid fossil record varies widely from region to region. The most extensive record occurs in East Africa, both in terms of the time span from which fossils have been found (20 m. y. to the present day, albeit with gaps) and as regards the number of specimens and species known. The southern african arena has provided a large number of specimens and quite a diversity of species, while in North Africa, fossil monkeys are few and far between. Vast areas of the continent however, have yielded no fossil monkeys at all, and while this may in part be due to lack of sufficient research, it is more likely to be due to the absence of suitable sediments.

In Europe in contrast, the absence of monkey fossils in sediments older than 11 m. y. is unlikely to be due to search failure, because numerous fossil sites older than this have been examined for more than a hundred years without producing a single monkey fossil. In upper Miocene sediments however, fossil monkeys are well known in the circum-Mediterranean region and their history in the region is reasonably well understood right up to late Pleistocene times.

Fossil monkeys in the Middle East are relatively poorly known, but the potential seems good that with appropriate researches it will improve. The little evidence that is available indicates a history rather similar to that of southern Europe. In the Indian Subcontinent where much collecting has been done, fossil monkeys are very rare, the oldest ones being latest Miocene in age. Cercopithecoids have also been found in Plio-Pleistocene sediments south of the Himalayas, but the material is fragmentary and scattered, making it difficult to interpret. In China, fossil monkeys are unknown from sediments older than the Pliocene, but their absence might well be due to the lack of searches in suitable strata. However, cercopithecoids are well known and reasonably common in sediments of Plio-Pleistocene age, especially in South East China.

In the Indonesian Archipelago fossil monkeys have been known for nearly a century, but the record is restricted to the late Pliocene, Pleistocene and Recent. Miocene strata are poorly known in the archipelago, and the history of terrestrial mammals is accordingly virtually unknown.

Stratigraphy

Four major lines of evidence have permitted us to determine the sequence of events in cercopithecoid history. These are stratigraphy, biostratigraphy, radioisotopic dating and palaeomagnetic stratigraphy. In East Africa, where the monkey fossil record is the most complete, the sequence has been established and calibrated by combining all four methods. In other parts of Africa, Europe, and the Far East only one or two methods can be applied. Despite this, the sequence of events can be accurately determined for many of the localities, and in some instances they can be reasonably confidently dated by biostratigraphic correlation.