

EARLY PLEISTOCENE MAMMALIAN FAUNA FROM LONGDAN, DONGXIANG, GANSU, CHINA by Qiu Zhanxiang, Deng Tao, and Wang Banyue, 2004. *Palaeontologia Sinica*, number 191 (New Series C number 27), 198 + xxxiv pp, in Chinese with 32 pages of English summary. ISBN 7-03-012592-4.

“Dragon bones”—vertebrate fossils sold to Chinese apothecaries—have for centuries been exploited as an ingredient in traditional medicines. The ancient trade of dragon bone-hunting began to tangle with the 20<sup>th</sup> century science of vertebrate paleontology when the scientific value of fossils was recognized. German paleontologist Max Schlosser could not resist describing taxa based on specimens purchased from drug stores in China (Schlosser, 1903), including occasional specimens of hominids. But in so doing he consigned future generations of vertebrate paleontologists to endless speculations of fossil localities. To secure better provenance data, Otto Zdansky, an Austrian vertebrate paleontologist, went to one of the most famous dragon bone counties in northwestern Shaanxi Province, and assembled the Lagrelius Collection at Uppsala University in Sweden (Zdansky, 1923). Thus began a long, uneasy relationship between professional paleontologists and dragon bone hunters. The Longdan Fauna described by Qiu et al. is one of the most spectacular examples of this uneasy collaboration between dragon bone hunters and professional paleontologists which ultimately resulted in a major contribution to Chinese late Cenozoic vertebrate paleontology.

Although modern paleontologists no longer describe drug store species, following the trails of the dragon-bone trade is still an excellent way to search for fossil localities. While one can cringe at the thought of lost field data and wanton destruction of invaluable specimens in the hands of desperately poor farmers, it is also undeniable that some of the most spectacular specimens would never have seen the light of the day if it were not for the untold laborers toiling in the darkness of the tunnels. Thus is the experience of profound ambiguity by Chinese vertebrate paleontologists, who, while enjoying an unexpected boom in funding and world attention prompted by the stunning discoveries of feathered dinosaurs and others, must endure a nagging sense of loss of invaluable specimens to world markets.

The Longdan Fauna is recovered near the village of Longdan (“long”—pronounced as in “loan”—stands for dragon in Chinese, but the authors did not attempt to trace the origin of the village name to see if it is related to dragon bone-hunting) in the Linxia Basin at the foothill of the northeastern Tibetan Plateau. Located in south-central Gansu Province, the Linxia Basin began to receive sediments in the Oligocene, and deposition was terminated by a blanket of eolian loess. It is within this terminal loess layer that the story of Longdan Fauna began.

Fossil vertebrates from the Linxia Basin started to draw the attention of paleontologists in the 1980s, mostly for its middle to late Miocene mammals unearthed by dragon bone hunters. The senior author, Qiu Zhanxiang, began to notice in 1999 that Quaternary mammals were mixed in some fossil collections. With the help of a local dealer, he was able to trace the origin of the fossil assemblage to the remote village of Longdan. Qiu immediately realized the importance of such a rare find and instructed the collectors to pay special attention to fossils unearthed from Longdan. Fortunately, loess deposits are confined in the vicinity of the Longdan village and all fossil-producing tunnels are plainly visible along the cliffs of the loess exposures. Preserved in the buff-colored and silty-textured matrix, the Longdan fossils can be confidently assigned to two fossil-producing horizons in the Wucheng Loess, minimizing the possibility of mixing of bones from different ages by dragon bone hunters.

Although the Chinese Loess Plateau covers a large area of western China that features a ubiquitous landscape of beautifully exposed canyons of loess exposures, vertebrate fossils in the loess deposits have largely eluded paleontologists, despite the fact that the loess preserves an exceptionally detailed record of Quaternary paleoenvironments and climates, and has been a focus area for intense geological studies. The new

Longdan Fauna thus represents a breakthrough in such a unique depositional environment, in addition to being the only faunal assemblage comparable to the better-known Nihewan Fauna that is associated with earliest stone artifacts in East Asia.

The Longdan volume describes 31 mammals, mostly based on superbly-preserved skulls, jaws, and antlers, as well as some postcranial materials. Small mammals are poorly represented by three rodents and a lagomorph: *Aepyosciurus orientalis*, *Marmota parva*, *Bahomys* sp., and *Sericolagus brachypus*. The authors attributed this poor record to a collection bias by the local farmers, and these four taxa were recovered only after the authors had specifically urged the farmer collectors to pay special attention to smaller bones. Surprisingly, two primates were recovered (both based on partial skulls and jaws): *Macaca* cf. *M. anderssoni* and *Paradolocopithecus gansuensis*. These are the first records of these taxa from the Chinese loess, which is ordinarily not considered prime habitat for primates. Carnivorans consist of an extraordinary 52% of the total taxonomic diversity, with five canids (*Vulpes chikushanensis*, *Canis teilhardi*, *Canis longdanensis*, *Canis brevicephalus*, and *Sinicuon* cf. *S. dubius*—three of these are new species), two mustelids (*Eirictis robusta* and *Meles teilhardi*), three hyaenids (*Chasmaporthetes progressus*, *Pachycrocuta licenti*, and *Crocuta honanensis*), and six felids (*Homotherium crenatidens*, *Megantereon nihowanensis*, *Sivapanthera linxiaensis*, *Panthera paleosinensis*, *Felis teilhardi*, and *Lynx shansius*). The authors acknowledged that large, charismatic carnivorans tend to fetch more money in trade, but did not speculate if this may be sufficient to account for the overabundance of carnivorans. Perissodactyls are represented by two equids (*Proboscoidipparion sinense* and *Equus eisenmannae*), a woolly rhino *Coelodonta nihowanensis*, and a chalicothere *Hesperotherium* sp. In contrast to the superabundant carnivorans, artiodactyls—normally the most diverse group of large mammals in the Quaternary—are represented by only a deer *Nipponicervus longdanensis*, a gazelle *Gazella* cf. *G. blacki*, and two large bovids (*Leptobos brevicornis* and *Hemibos gracilis*).

As is typical of the authors’ grasp of Chinese late Cenozoic vertebrates, this volume is a superb treatment of an outstanding fossil assemblage. Particularly welcome is a tight calibration of its age by paleomagnetic means. The two main fossil horizons are confined to the lower part of the Matuyama Chron with estimated ages of 2.16 and 2.55 Ma, respectively. The authors considered these age estimates to be slightly older than that based on stage of evolution of the fauna. Western readers of this volume need to adjust to the Chinese usage of the beginning of the Quaternary at the Matuyama/Gauss boundary, instead of calling the Longdan Fauna late Pliocene as defined by the GSSP (Global Boundary Stratotype Section and Points).

As commented by Li Chuankuei in the Foreword of the book, the Longdan volume is truly a tour de force in the senior author’s language skills. Qiu’s talents in languages stand out as his best asset in a volume like this. Able to freely access nearly all of the important languages in the paleontological literature, Qiu is able to go in-depth in taxonomic developments of each taxon published in various languages. Amazingly, Qiu can write technical papers in Chinese, Russian, English, and German, and read French and Spanish. A 32-page English summary adequately captures the essence of the systematic descriptions, but Western readers will miss some interesting background information and nuanced treatments in the Chinese text (some of which is highlighted in this review).

Reflecting the substantial improvements of research environments in China, particularly that of vertebrate paleontology, the print quality of this volume is a dramatic improvement over previous volumes of *Palaeontologia Sinica*. I recall a conversation with Qiu about his monograph

on the Chinese hipparion horse published in the same series (Qiu et al., 1987), and he lamented that the photo reproductions were so poor that much of the details in the original plates were sadly lost. Times have changed. Digital photography has greatly accelerated the production cycle and the results are 34 impressive photographic plates. I see only minor problems in the lack of depth of focus in some skulls, and in some cases, harshness of shadows produced by flash lights.

Availability of the Longdan volume outside China is still a major issue that plagues Chinese scientific publications, and difficulties in access to Chinese vertebrate paleontology literature often relegate them to obscurity. I am aware of only one online venue (<http://www.hceis.com/product/index/paleontology.htm>; this is not an endorsement for this site) that ships this volume overseas at an inflated price of \$55 plus \$9 shipping, as compared to the Chinese price of ¥60 (approximately \$7) sold within the country. (Science Press, publisher of the volume, has a web site in Chinese, [www.sciencep.com](http://www.sciencep.com), that permits online ordering of the book.)

Overall, this volume is an excellent example of paleontological mitigation that treats a stratigraphically well-controlled and anatomically well-preserved fossil assemblage, despite the fact that it was largely assembled by dragon bone hunters. In the current laissez-faire market economy and rampant disregard of the rule of the law, coupled with dire

living conditions in most fossil-producing countries, dragon bone hunting in China will continue in the foreseeable future. In the end, Chinese vertebrate paleontology will continue to face the challenge of minimizing loss of paleontological resources in the country's headlong rush to economic prosperity.

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