Zitteliana

An International Journal
of Palaeontology and Geobiology

Series B /Reihe B
Abhandlung der Bayerischen Staatssammlung
für Paläontologie und Geologie

31

International Conference on Ruminant Phylogenetics Munich 2013

03.–06. September 2013

Programme and Abstracts

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GeoBio-Center LMU München

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Zitteliana	B 31	48 Seiten	München, 01.09.2013	ISSN 1612-4138

Editors-in-Chief: Gert Wörheide, Michael Krings
Guest-Editor: Gertrud Rössner
Production and Layout: Martine Focke
Bayerische Staatssammlung für Paläontologie und Geologie

Bayerische Staatssammlung für Paläontologie und Geologie
Richard-Wagner-Str. 10, D-80333 München, Deutschland
http://www.palmuc.de
email: zitteliana@lrz.uni-muenchen.de

ISSN **1612-4138**
Print: Gebr. Geiselberger GmbH, Altötting

Programme: Wednesday, September 4, 2013 (Continuation)

Time	Speaker	Title
Session 4: Phylogenetic Implications from Basal Hornless Ruminantia		
11:00 am - 11:20 am	**Theodor**	Basicranial and ear morphology characters among basal ruminants
11:20 am - 11:40 am	**Métais**	Eocene-Oligocene selenodont artiodactyls from Asia and their bearing on the phylogeny and paleobiogeography of early ruminants
11:40 am - 12:00 pm	**Mennecart**	Reassessment of early European Ruminantia: implications for the diversity and evolution of the group
12:00 pm - 12:20 pm	**Barry**	The fossil tragulids of the Siwalik Formations of southern Asia
12:20 pm - 12:40 pm	**Sánchez**	Phylogeny of the Tragulidae (Mammalia, Cetartiodactyla, Ruminantia)
12:40 pm - 1:00 pm Group picture		
1:00 pm - 2:20 pm Lunch break		
2:20 pm - 2:40 pm	**Aiglstorfer**	New insights into tragulid phylogeny of Europe: *Dorcatherium naui* from the latest Middle Miocene of Austria
Session 5: Phylogenetics in Cervidae		
2:40 pm - 3:00 pm	**Lister**	Systematics of the endemic Pleistocene deer of Mediterranean islands
3:00 pm - 3:20 pm	**Azanza**	Fossil taxa and molecular clock calibrations in Cervidae phylogeny: the challenge of the middle-late Miocene muntjac-like deer
3:20 pm - 3:40 pm	**Heckeberg**	A revision of cervid phylogeny using a total evidence approach
3:40 pm - 4:00 pm	**Schulz**	Separating phylogenetic signals from trophic convergence in cervid dentition – implications from tooth morphology and 3D surface texture analysis
4:00 pm - 4:20 pm	**Zhang**	Late Miocene *Cervavitus novorossiae* (Cervidae, Artiodactyla) from Lantian, Shaanxi Province
4:20 pm - 4:50 pm Coffee break		
4:50 pm - 5:10 pm	**Ghaffar**	Fossil remains of family Cervidae from the Siwaliks of Pakistan
5:10 pm - 5:30 pm	**Croitor**	Deer from Plio-Pleistocene of Western Eurasia: matching fossil record and molecular phylogeny data
5:30 pm - 5:50 pm	**van der Geer**	Morphology of articular surfaces can solve a phylogenetic issue: one instead of two ancestors for *Candiacervus* (Mammalia: Cervoidea)
5:50 pm - 6:10 pm	**Doan**	Extinction-recolonization events in Crimean red deer populations during Late Pleistocene
6:10 pm - 6:30 pm	**Kubo**	Geographic variation in body size of Japanese sika deer: Bergmann's rule revisited

fusions of ossicones but with more generalized metapodials (long). (7) *Schansitherium* is intermediate with four ossicones as in Sivatheriinae but a Palaeotraginae-like skull shape (the ossicone apices are dead). (8) Palaeotraginae are united by a dead ossicone condition and various cranial features. *Samotherium* is more primitive than *Palaeotragus* in its larger size and ossicone position. *Palaeotragus* is derived by a size reduction and the repositioning of ossicones medially. (9) Bohlininae have a specialized metapodial condition; the deep posterior trough. A morphocline is observed: *Birgerbohlinia* shortest metapodials, *Honanotherium* longer and *Bohlinia* longest. (10) Giraffinae: *Giraffa* is specialized with large head sinuses, posterior positioning of ossicones, long radius, long metapodials and neck. The junction of the neck to the thorax is specialized. *Giraffa* may be near Bohlininae or long necks have evolved independently twice. The oldest *Giraffa* is from the Siwaliks of Pakistan (7 mya). This is suggestive of *Giraffa* migrating into Africa. (11) Okapiinae: *Afrikanokeryx* has elongated canals inside the ossicones. *Okapia* displays dead apices on ossicones like Palaeotraginae and *Schansitherium* but large head sinuses like Sivatheriinae and Giraffinae. The neck is short. *Okapia* may be near Sivatheriinae.

Basicranial and ear morphology characters among basal ruminants

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The modern family Tragulidae is often regarded as a primitive archetype for the earliest ruminants, as these are generally small-bodied selenodont taxa lacking cranial appendages. As a result, the basal ruminants have, until fairly recently, been placed within the Tragulina with little regard for the relationships among them, their monophyly or their morphological diversity. Increased diversity of Asian material and more explicit phylogenetic work has generated several testable hypotheses of relationship among basal ruminants, suggesting that the groups' ultimate origins are Asian, and the North American families, the Hypertragulidae and Leptomerycidae evolved independently from within Asian clades, immigrating separately to North America.

One current hypothesis unites the North American hypertragulids with the Asian praetragulids, as a basal offshoot of ruminants, but of the seven features suggested to unite them, only two (medial concavity of the posterior palate, and an enlarged orbital part of the lacrimal) represent potential synapomorphies. In this hypothesis the main ruminant stem is represented by the tragulids+lophiomerycid clade and an archaeomerycid(leptomerycid(bachitheriid+gelocid) clade. A number of basicranial features show unclear polarities or a high degree of variability (such as bullar mophology which is highly variable in early ruminants), while others can be argued to support this hypothesis. The occipital exposure of the mastoid, a feature of bachitheriids, archaeomerycids, gelocids, and leptomerycids; the closed postorbital bar, is present in bachitheriids, archaeomerycids, leptomerycids, and gelocids, and presumably evolved convergently among tragulids. Many of the cranial characters do not clearly support this hypothesis. The shallow subarcuate fossa is shared by gelocids and Pecora. Anterior displacement of the stapedial muscle fossa is known in hypertragulids, leptomerycids and tragulids, which suggests a possible functional component driving parallel evolution. The enlarged, subcentral tympanohyal vagina is known in archaeomerycids and leptomerycids, but remains unknown for others. Detailed high-resolution CT of the ear region of *Hypisodus* shows a mix of derived and ancestral features. The medial petrosal carries the basicochlear groove, unlike other ruminants; the deep subarcuate fossa contains a large mastoid fossa within it, also known in basal tylopods. However, it also bears a sharp crest on the medial petrosal, a feature of more derived ruminants, raising the question of whether the degree of inflation of the bulla is correlated. Additional information remains to be identified using high-resolution CT studies; many basal artiodactyl taxa have recently been described using these techniques to better understand basicranial and petrosal features, and better documentation of basal ruminant taxa may allow considerable improvement in resolution by clarifying character states and homology assessments.

Morphology of articular surfaces can solve a phylogenetic issue: one instead of two ancestors for *Candiacervus* (Mammalia: Cervoidea)

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During the Late Pleistocene, the insular deer of Crete underwent cladogenesis in isolation as a result of which it is represented by six to eight species (depending on the taxonomy followed). The body size range from the smallest (about 22 kg) to the largest species (about 316 kg) is impressive. For decades, this unusual broad range has given rise to much debate concerning the process of speciation. Two alternative hypothesis have been proposed. One assumes two invasions, expressed in various generic names for the different species (e.g. *Praemegaceros* for the smaller, and *Leptocervus* or *Pseudodama* for the larger species) and thus making the Cretan deer a polyphyletic group. The other hypothesis assumes one invasion and a subsequent evolutionary radiation or cladogensis. In that view, the Cretan deer form a monophyletic group. Until now, this issue could not be satisfactorily solved because of the lack of any cranial and dental remains of the two largest species. Recent morphological and functional analysis of the articulations of the limb bones sheds new light on this issue. We found that both shape and absolute size of some articulations and the morphology of the vertebras are remarkably similar among the size classes, suggesting a common origin for all species of Cretan deer. In particular, the limb bones of both dwarf and giant representatives of the Cretan deer deviate morphologically from those of similar-sized mainland deer, including their ancestors. The result is massive bones with

broad joints in the dwarf species and very slender bones with narrow joints in the giant species, whereas this is opposite in the mainland species when we disregard length. To conclude, this means firstly that the ancestor of the Cretan deer species must have had a morphology in between that of the dwarfed and giant species and secondly, that the Cretan deer are monophyletic and thus the name *Candiacervus* applies to all six or eight species, which are now sister species. Since, concerning the postcranial skeleton, the least derived *Candiacervus* species is the *Dama*-sized *C. cretensis*, we suggest that the most likely sister species to all Cretan deer is a mainland deer of that size. *Candiacervus* shares many characters with *Dama* and *Megaloceros* but most characters that distinguish these two genera are polymorphic in *Candiacervus* and can thus not be used. Based on size alone, we tentatively suggest *Dama* as ancestral to *Candiacervus*.

This research has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program 'Education and Lifelong Learning' of the National Strategic Reference Framework (NSRF) - Research Funding Program: THALIS –UOA- Island biodiversity and cultural evolution: Examples from the Eastern Mediterranean, Madagascar, Mauritius and Philippines during the past 800,000 years.

Late Miocene *Cervavitus novorossiae* (Cervidae, Artiodactyla) from Lantian, Shaanxi Province

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Fossil deer from the base of the Lantian Formation, Shaanxi Province, are described and assigned to *Cervavitus novorossiae* by its size, three-tined antlers, curved development of the beam, laterally flattened fork, long and curved brow tine, pedicles prolongated by a ridge on the frontals, the long span between the burr and first fork in young individuals etc. *Palaeomeryx-folds* on lower molars are present in European specimens but generally undeveloped or missing in Chinese ones. New biochronological data suggests the possible origination of *Cervavitus* in Europe, and subsequent migration to China. The differences of C. *novorossiae* with *C. shanxius* (Teilhard de Chardin and Trassaert, 1937; Dong and Hu, 1994) show that *C. novorossiae* might evolve into the latter in order to adapt to climatic and environmental changes. Overview of the pliocervines from China confirms five species of *Cervavitus* existed in China: C. *novorossiae* Khomenko, 1913, C. *shanxius* Dong & Hu, 1994, C. *huadeensis* Qiu, 1979, C. *ultimus* Lin, Pan & Lu, 1978, and C. *fenqii* Han, 1987.

The anatomy and paleoecology of the boselaphine *Miotragocerus pannoniae* from the late Miocene Höwenegg locality (Hegau, Germany)

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While the basal Boselaphini (or Tragoportacini) are known to be represented by a number of taxa in the late Miocene of Europe, the poor state of preservation of most early boselaphine remains makes it difficult to taxonomically define species and assess phylogenetic relationships among members of this tribe. Especially the interrelationships between two dominant genera in this context, *Miotragocerus* and *Tragoportax*, are poorly understood.

In contrast to most other late Miocene European fossil sites, the southern German Höwenegg locality (10.3 Ma; MN9) is known for the exceptional preservation and completeness of its numerous skeletons of various large mammals. Being represented by 24 complete or near-complete skeletons at present, *Miotragocerus pannoniae* is the most common mammal at this locality. No detailed description of the anatomy of Höwenegg *Miotragocerus* has as yet been published. This is surprising, given the sample's potential for helping in circumscribing the thus far proposed species of Miotragocerus as well as in taxonomically re-evaluating material allocated to other early boselaphines. A matter of particular interest in this regard is sexual dimorphism as evident in horn core morphology, given that such intraspecific variability causes much taxonomic confusion at localities where only disarticulated early bovid specimens are found.

Four recently discovered and prepared Höwenegg *Miotragocerus* skeletons housed in the Natural History Museums of Stuttgart and Karlsruhe have now been described in detail and compared to the remaining boselaphine material from this locality. In doing so, metric data for nearly all skeletal elements could be obtained. Furthermore, all currently accessible horn cores of Höwenegg *Miotragocerus*, some of which can securely be tied to female individuals in association with fetuses, were investigated. Measurements of horn core dimensions as well as morphological observations allowed the development of a thorough understanding of the extent and nature of cranial sexual dimorphism in this taxon. Our anatomical observations will aid in identifying morphological characters useful for future phylogenetic analysis of basal boselaphines.

We also analyzed the paleodiet of Höwenegg *Miotragocerus* using microwear and mesowear methods in order to assess the paleoecology of this species in particular and of the Höwenegg environment in general. The assessment generally indicates a browse-dominated diet for this boselaphine. Interestingly, while this is also true for the Höwenegg hipparion, *Hippotherium primigenium*, these equids must have preferred a diet slightly richer in grass, as is evident in the results of our microwear analysis. Further analysis of the functional anatomy of Höwenegg *Miotragocerus* based on postcranial elements will provide additional information on this boselaphine's paleoecology.