

MULTIDISCIPLINARY PALEONTOLOGICAL RESEARCH AT THE LATE MIOCENE (MN9) LOCALITY OF HÖWENEGG (BADEN-WÜRTTEMBERG)

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Höwenegg, originally investigated by JÖRG and TOBIEN in the 1950's and 1960's, is a late Miocene locality exceptional for the completeness of its paleobiological record. Famous for its complete skeletons of *Hippotherium*, *Aceratherium*, *Miotragocerus* and other less common mammals, our current research has also revealed an abundant and species rich record of mammals, reptiles, invertebrates, leaves, fruits and pollen. Furthermore, volcanic sediments in Lake Höwenegg have provided a single crystal argon date of 10.3 Ma, giving a precise, later MN9 correlation for the locality. The Höwenegg locality, based on its biotic and sedimentological record offers a unique opportunity to reconstruct the MN9 community ecology and paleoclimatic conditions that existed then. This further provides the possibility to make multidisciplinary comparisons to other similar aged localities in Europe.

This paper presents a joint research project, which is based on a wide range of paleontological, geological, geochronological, and geochemical approaches and aims to place the Höwenegg locality in a broader geological and paleobiological context. The first results of three working groups (vertebrates, invertebrates, and plants) are presented. The investigation is being undertaken by the State Museums of Natural History in Karlsruhe and Stuttgart, and Howard University Washington D.C., including individual cooperation with specialists from other national and international institutions.

Deposits of the Höwenegg succession comprise at least a 12 m thick sequence composed of autochthonous marly sediments intercalated by poorly sorted debris flows with a tuffite matrix. These sediments were deposited in a lake adjacent to the Höwenegg-volcano. Our investigations have re-established the trench excavated in 1985, 1991 and 1992 by the State Museum of Natural History in Karlsruhe and have focussed on the reconstruction of Jörg and Tobien's stratigraphic section, identification and exploitation of geologic horizons that yield paleontological data.

Vertebrates - The vertebrate skeletons are exceptional in their completeness of preservation and of great value for morphologic, functional anatomical, systematic, biostratigraphic, phylogenetic, and taphonomic investigations. They in themselves are an important resource for comparative vertebrate paleontologic studies. The renewed investigations at Höwenegg have included discoveries of several vertebrate skeletons including those of the antelope *Miotragocerus* and the aquatic turtle *Trionyx* along with a potentially new species of cervid, teeth and bones of other large mammalian taxa, a small sample of micromammals and lower vertebrates. Our goals include retrieval of a more species diverse assemblage within a precise taphonomic context. The working group will include an

international team of paleontologists who will refine the systematics, biostratigraphic correlations and ecological interpretations resulting from their studies. We will also undertake studies of functional anatomy of the skeletons and paleodietary reconstructions based on the mesowear and microwear methodologies and studies of enamel isotopes.

Invertebrates - Only taxonomic lists of invertebrates are known so far, while paleobiological and modern taxonomic studies are absent. Invertebrates are dominated by abundant limnic (e.g. *Gyraulus* sp., *Ferrissia* sp., *Planorbarius* sp., *Radix* sp.) and terrestrial (e.g. *Cepaea* sp., *Tropidomphalus* sp., *Leucochroopsis* sp., *Abida* sp.) gastropods, while bivalves are absent. Limnic gastropods are distributed all over the marly sediment and fragments can be accumulated in particular layers, while terrestrial snails are most abundant within the debris flows. Furthermore, ostracods and a few fragments of fresh-water crabs and terrestrial click-beetles (Elateridae) were found. Based on the distribution of taxa and taphocoenoses, this working group will focus on the ecological reconstruction of the lake and hinterland environments.

Plants - Few plant remains were known from Höwenegg unto the new excavation campaign. Accurate sampling showed that diaspores, leaves, and pollen are present in different layers of the Höwenegg section. The fruits reflect best taxa from aquatic habitats, e.g. Cyperaceae and calcified fructifications, e.g. *Celtis*. The leaves are taphonomically sorted. Among these, *Populus* and *Buxus* are most common. The pollen show a divers spectrum of phanerogams as *Ulmus*, *Betula*, *Quercus*, *Fagus* and allow insight in the woody flora of the hinterland. Additionally, *Rumex*, *Plantago*, Chenopodiaceae pollen impart knowledge about the herbaceous flora.

Analytical Working Group – All of Jörg and Tobien's taphonomic data, and associated sedimentologic and stratigraphic data have been retrieved and digitally stored for future integration with this project's geologic and paleontologic data. The analytical working group will design methods for integrating the other working groups.

This project is currently funded by the L.S.B. Leakey Foundation, the Gesellschaft zur Förderung des Naturkundemuseum Stuttgart, the town on Immendingen, and the collaborating institutions. The project working groups are lead by Bernor & Heizmann (vertebrate working group), Rasser (invertebrates), Eder (plants) and Mittmann (analysis) with overall project responsibility coming from the State Museum of Natural History in Karlsruhe (V. Wirth, Direktor).

DIE KORRELATION VON CONODONTEN- UND GONIATITENABFOLGEN DER *PERICYCLUS*-STUFE (OBER-TOURNAISIUM BIS MITTEL-VISEUM, UNTERKARBON)

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In der klassischen Gliederung des deutschen Unterkarbons wurde traditional eine *Pericyclus*-Stufe ausgeschieden, welche dem Unterkarbon II bzw. dem Erdbachium entsprach. Lithostratigraphisch beinhaltete sie im Rheinischen Schiefergebirge die Abfolge vom Unteren Alaunschiefer bis zum Einsetzen der Gattung *Goniatites* in den Kieseligen Übergangsschichten. In der britischen Abfolge handelt es sich etwa um das mittlere Courceyan bis zum Holkerian/unteren Asbian, in Belgien etwa um das mittlere Tournaisium bis Livium, in Nordamerika etwa um das mittlere Kinderhookian bis tiefe Meramecian. Für die Goniatiten-Gliederung existiert das Problem, dass die deutsche Abfolge praktisch keine

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Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Berichte des Institutes für Geologie und Paläontologie der Karl-Franzens-Universität Graz](#)

Jahr/Year: 2005

Band/Volume: [10](#)

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Artikel/Article: [Multidisciplinary paleontological research at the Late Miocene \(MN9\) locality of Höwenegg \(Baden-Württemberg\). 5-6](#)