

Taphonomie und Paläoökologie

Palaeoecology of macrobenthic assemblages in marginally marine environments across the Cretaceous/Palaeogene boundary in Patagonia, Argentina

M. Aberhan¹⁾, R.A. Scasso²⁾, S. Weidemeyer¹⁾,
L. Ruiz²⁾, F.A. Medina²⁾ & W. Kiessling¹⁾

The end-Cretaceous mass extinction had profound long-term effects on the composition and evolutionary dynamics of the global biota, but relatively little is known about the palaeoecology of level bottom assemblages of marine macroinvertebrates around the Cretaceous/Palaeogene (K/Pg) boundary. Analysis of the litho- and biofacies of the Lefipán Formation (Patagonia, Argentina) indicates the development of coarse-grained, tide-dominated deltas with abundant and diverse benthic molluscan faunas in a large embayment during the Cretaceous/Palaeogene (K/Pg) boundary interval. Sedimentary rocks range from mudstones to conglomerates and are grouped, together with trace and body fossils, in four facies associations. These represent in a landward direction (1) tidal bars in distal delta front; (2) proximal tidal bar complexes; (3) tidal channel and tidal flat deposits; and (4) multi-episodic, tide-influenced channels. Mollusc-dominated benthic faunas were grouped in six biofacies by means of cluster analysis. Differences in taxonomic composition and ecological structure revealed variations in environmental factors, with salinity exerting the principal influence on biofacies. Salinity varied from oligohaline and mesohaline in marginal marine, high-stress environments, as typified by monospecific bivalve assemblages of corbiculid bivalves or oysters, to diverse and trophically more complex associations indicating more normal marine and stable conditions. In the latter, other environmental factors than salinity, such as grain-size, oxygen supply and amount of particulate organic matter became important factors. A comparison of Maastrichtian and Danian faunas suggests that the K/Pg boundary event disrupted the stable Maastrichtian communities via the extinction of dominating species, leading to less diverse but more varied Danian assemblages. A shift in trophic structure to increased percentages of deposit-feeders in the Danian was not a direct consequence of impact-related environmental perturbations at the boundary in the studied onshore environment, but rather the result of a shift in „normal“ environmental conditions later on in the Danian. This contrasts with previous studies of siliciclastic offshore settings, where such a shift in trophic composition was interpreted as the consequence of a productivity crisis at the boundary.

search on Evolution and Biodiversity at the Humboldt University Berlin, Invalidenstr. 43, D-10115 Berlin.

²⁾ Departamento de Ciencias Geológicas, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Ciudad Universitaria, 1428 Buenos Aires, Argentina.

Zukunftspreis

Neue Erkenntnisse zur Ökomorphologie von *Hyaenodon* (Hyaenodontidae, Mammalia): Nordamerika vs. Europa

Katharina Bastl¹⁾, Gina Semprebon²⁾ & Doris Nagel¹⁾

Die Prämolaren von *Hyaenodon* sind wie in *Crocota* oft plateauförmig abgekaut. Die extreme Abnutzung der Molaren, besonders des m1 – der manchmal nur noch mit seinen Wurzeln vorhanden ist – führte schon früh zu der Ansicht, dass *Hyaenodon* eine hyänenähnliche Nische im Paläogen besetzt hat. Diese Hypothese der Nahrungspräferenz wurde anhand der Stereomicrowear getestet. Die Methode klassifiziert und quantifiziert „scratches“ und „pits“ im Zahnschmelz. Jene Strukturen wurden bei ausgewählten rezenten Carnivora und bei *Hyaenodon* mit Licht-Stereomikroskopie bei geringer Vergrößerung ausgewertet. Raubtiere mit unterschiedlicher Ernährung liefern auch unterschiedliche Ergebnisse, die sich im dietary microwear morphospace getrennt darstellen: *Vulpes vulpes* (generalistisch-carnivore Ernährung) grenzt an die Hyänen *Parahyaena* und *Hyaena* (Aas, Insekten, Früchte) an; *Crocota crocuta* setzt sich von diesen deutlich ab (hoher Knochenanteil in der Nahrung); Fleischspezialisten nehmen einen eigenen Raum ein, der von dem von *Acinonyx jubatus* (reiner Fleischfresser) in den von *Panthera leo* (variabler Anteil von Knochen) übergeht. *Hyaenodon* liegt im Bereich der Hyänen und des Löwen. Diese Verteilung zeigt, dass offensichtlich auch harte Bestandteile, wie Knochen, Teil der Nahrung waren. Analysen der Ultrastruktur des Zahnschmelzes lieferten bereits Hinweise darauf. Darüber hinaus nimmt *Hyaenodon* einen breiteren „morphospace“ ein, als die rezenten fleischfressenden Säugetiere. Interessanterweise gibt es ein unterschiedliches ökomorphologisches Muster zwischen Taxa von verschiedenen Kontinenten: die nordamerikanischen Arten sind mehr mit der Nahrungspräferenz des Löwen, die europäischen Arten mehr mit jener der Hyänen vergleichbar.

¹⁾ Institut für Paläontologie, Universität Wien, Österreich, e-mail: katharina.bastl@inode.at, doris.nagel@univie.ac.at

¹⁾ Museum für Naturkunde, Leibniz Institute for Re-

²⁾ Bay Path College, Longmeadow, MA, USA, gsem-preb@baypath.edu

Virtuelle Paläontologie

Applied three dimensional biometry on Larger Benthic Foraminifera: a tool to approach palaeobiology, ontogeny and functional shell morphology

Antonino Briguglio¹⁾ & Johann Hohenegger¹⁾

Larger Benthic Foraminifera (LBF) are characterized by complex shell morphology. Systematics and taxonomy are based on several morphological parameters easily to obtain on preferred sections of such shells.

The use of computed micro tomography on these shells gives the opportunity to investigate simultaneously different morphological parameters on the same specimens obtaining an infinite number of virtual sections avoiding test destruction. Beyond the morphological study of the tests, the three dimensional scan reveals, after some rendering and segmenting operations, quantitative information on volumes and surfaces, impossible to obtain with the oriented section methodology. Insights on ontogeny can be inferred as well as correlations between growth rate and environmental changes. Such inter-fingering between biology and ecology is definitely revealed and can be directly measured and quantified for both recent and fossil specimens.

The three dimensional model allows to verify evolutionary concepts, developed during the last centuries by the traditional two dimensional biometry obtained with oriented sections, with new three dimensional measurements, more precise and comprehensive. In such directions we are working since two years and several results have been obtained. The study of the volume of LBF lumina gives precise information on the ontogeny and on the palaeoenvironmental conditions the organisms was living under. Growth cyclicality and periodic growth functions have been discovered for both recent and fossil forms testifying obvious correlation with environmental variations.

Furthermore, some algorithms have been recently created to link, algebraically, axial oriented sections to chamber volumes to get growth trend and tendencies only by a two dimensional analysis that are proved by MCT.

A quantitative and qualitative study on several surface elements of LBF tests (e.g., papillae, pustulae, spines, septal filaments) also gives interesting results as each surfaces can be mathematically expressed and solved. Correlations between insolation – and therefore water depth, water turbidity, currents influence – and different surface structures

type density can be modelled by complex mathematical equations.

¹⁾ Institut für Paläontologie, Universität Wien, Althanstraße 14, A-1090 Wien, Austria, email: antonino.briguglio@univie.ac.at

Taphonomie und Paläoökologie

Hydrodynamic effects of morphology on bivalve shell transport and its taphonomic implications

Devapriya Chattopadhyay¹⁾, Ashish Rathie¹⁾,
Anirban Das²⁾, Partha Pratim Saha³⁾
& Sandipan Dutta⁴⁾

Bias introduced by the differences in the hydrodynamic properties of shells is an interesting topic for palaeontologists, especially taphonomists. Since the fossilized shell assemblages are often the results of post-mortem transportation of shells, it is crucial to identify such biases to ensure the validity of ecological interpretation of a community structure. Shell size, shape, state of taphonomic alteration plays important role in dictating the hydrodynamic properties as explored in this study. One other process that substantially changes the morphology of the shell is predation, specially drilling predation. Predatory drill holes in marine invertebrates represent an important source of information on the nature of biotic interactions and have often been used to explore the ecological and evolutionary roles of such interactions. Measures of drilling frequencies, and of valve and site stereotypy represent the raw data for inferring the intensity and selectivity of drilling predation. Any biases that may affect these measures are therefore of special interest as they may impact the ecological and evolutionary interpretations of the data. One potential source of bias relates to the hydrodynamic properties of shells: presence of drill holes or drill hole position may influence how shells behave when subjected to moving fluids.

In a flow tank study with bivalve *Donax scortum*, we found that the threshold current velocity for the entrainment of undrilled convex-up shells is generally determined by its size. Taphonomically altered smooth shells require a higher velocity compared to the Recent sculptured shells. The direction of the movement of shell depends on the asymmetry and size of the valve. While compared with the drilled shells, we found that the entrainment velocity for undrilled shell is significantly lower than for centrally drilled shells. One possible explanation for the observed differences is the effect of the drill hole on lift. According