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variation in the limb skeleton. However, the amount of variation was related to functional digit length, not the number of phalanges per digit. Additional sources of variation (digital duplication, phalangeal fusion, interdigital ossicles) were frequently observed in the forefins of *Stenopterygius*, but never in the forefins of *Mixosaurus*, indicating that the loss of proximal-distal differentiation was more closely associated with the presence of these qualitative variants than was hyperphalangy. These results suggest that although variation, both in phalangeal count and qualitative anomalies, may be retained in a population due to enclosure in a soft-tissue flipper, the presence of the flipper does not itself predict either high levels of qualitative variation or the degree of variation in phalangeal count.

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Freies Thema

Hyperphalangy and intraspecific variation in ichthyosaur limbs

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Adaptation to an aquatic habitat results in profound changes to tetrapod limb morphology as limbs take on the roles of propulsion and steering and lose their weight-bearing function. Changes include enclosure of the limb in a soft-tissue flipper, and proportional lengthening of the distal limb, often accomplished through the addition of de novo skeletal elements (hyperphalangy). Alteration of the developmental architecture allowing for hyperphalangy and the flipper structure itself are thought to increase limb variability, based on a cetacean model. The objective of this study was to examine the roles of hyperphalangy and morphological differentiation of limb regions on intraspecific variation. I addressed these questions using the ichthyosaurs *Stenopterygius* and *Mixosaurus*. *Mixosaurus* is a basal ichthyosaur from the Middle Triassic, with a large, well-preserved sample of available specimens originating from the area around the Italian-Swiss border. *Stenopterygius* is a derived ichthyosaur from the Lower Jurassic of Europe, with the largest available sample originating from the region around the village of Holzmaden, in southwestern Germany. *Mixosaurus* differs from *Stenopterygius* in retaining more digits and a greater degree of proximal-distal differentiation of elements, but the limbs of both genera were modified as flippers and exhibit hyperphalangy.

Large amounts of variation in phalangeal count were observed in *Stenopterygius* and *Mixosaurus*, consistent with the hypothesis that hyperphalangy increased observed

Freies Thema

Coral reef diversity after rapid warming: the Last Interglacial

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The Last Pleistocene Interglacial (LPI, 130–120 ka) was the result of rapid global warming culminating in temperatures two to four degrees warmer than today. To explore the ecological impact of such warming, we compared coral distributions and coral reef diversity between the LPI and today at global and regional scales. Global scale comparisons were done using the Paleobiology Database for the Pleistocene and OBIS (Ocean Biogeographic Information System) for the Recent. The warmer LPI showed a pronounced equatorial diversity depression of reef corals, due to range retractions away from the equator. These retractions were far more profound than high-latitude range expansions, confirming the deleterious consequences of global warming.

At regional scales we analyzed and compared quantitative community data from LPI coral reefs in the Red Sea and the Caribbean. Caribbean Pleistocene reefs have been extensively studied, while Indo-Pacific reefs are poorly explored. Accordingly, we used previously published material from the Caribbean and generated new data from taxon-quantitative line-transects from the Red Sea Gulf of Aqaba region. Just as today, Pleistocene coral diversity was much lower in the Caribbean than in the Red Sea, in spite of much more comprehensive sampling.

in the Caribbean. Differences in coral diversity among the Pleistocene reef sites are even higher than modern differences, indicating that reef diversity in the Caribbean remained unstable after several extinction events ~1 myr ago. By contrast, high-diversity communities of Indo-Pacific Pleistocene reefs appear more stable through the Pleistocene. The reasons for that dichotomy are still unexplored but may be sought in the geographic isolation of the Caribbean.

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Freies Thema

Untermiozäne Biber aus Japan: Endemismen und biogeographische Verbindungen

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Terrestrische Kleinsäuger sind im Untermiozän von Japan extrem selten, einige Ordnungen wie z.B. Eulipotyphla und Lagomorpha sind nur durch ein oder zwei Funde belegt. Nagetiere sind mit neun Taxa aus drei oder vier Familien vertreten: ?Sciuridae, Castoridae, Eomyidae und Diatomyidae. Biber (Castoridae) sind die am besten dokumentierte Gruppe, sowohl was taxonomische Diversität als auch Anzahl der Fundstücke betrifft. Das meiste hier vorgestellte Material stammt aus der Nakamura-Formation (Mizunami-Gruppe) des Kani-Beckens in der Gifu-Prefektur, Zentraljapan. Weiteres Material stammt aus der Toki- und Akeyo-Formation (Mizunami-Gruppe) des benachbarten Mizunami-Beckens, sowie aus der Oya- und Fukazuki-Formation (Nojima-Gruppe) von Sasebo in der Nagasaki-Prefektur. Radiometrische, magnetostratigraphische und marin-biostratigraphische Untersuchungen haben für die verschiedenen Kleinsäuger-Fundstellen innerhalb der Mizunami-Gruppe numerische Alter von 19,5 bis 17,5 Ma ergeben. Daher werden die Fundstellen mit der Ostasiatischen Neogenen Säugereinheit MNU 4 korreliert, was den Europäischen Neogenen Säugereinheiten MN 3

bis MN 4 entspricht. Das fossile Bibermaterial, bestehend aus einem fast vollständigen Schädel, Unterkiefern sowie isolierten Knochen und Zähnen, repräsentiert mindestens vier Taxa sehr kleiner bis extrem grosser Castoriden. Der größte ist *Youngofiber sinensis*, ein riesiger castoroidiner Biber, der zuerst aus Sihong in der Jangsu-Provinz in Ostchina beschrieben wurde. Eine andere grosse Form belegt einen primitiven anchitheriomynen Biber, gen. et sp. nov. Er ist deutlich kleiner als der nordamerikanische *Amblycastor*, und auch kleiner als die eurasische *Anchitheriomys*. Eine dritte, mittelgroße Form dokumentiert einen fortschrittlichen palaeocastorinen Biber, gen. et sp. nov., der hochgradig an fossoriale Lebensweise angepasst ist. Die vierte Art repräsentiert einen sehr kleinen castoroidinen Biber, der möglicherweise mit *Euroxenomys* verwandt ist. Besonders interessant ist die Paläobiogeographie der japanischen Biber: mindestens zwei der vier Taxa aus der Mizunami-Gruppe – der anchitheriomynen und der palaeocastorinen Biber – sind endemisch in Japan, aber haben ihre nächsten Verwandten in Nordamerika. Der Riesenbiber *Youngofiber sinensis* ist endemisch in Ostasien und der kleinste Biber könnte eine biogeographische Verbindung mit Europa andeuten. Das paläobiogeographische Muster der Castoriden entspricht dem der anderen Kleinsäuger der Mizunami- und Nojima-Gruppe, möglicherweise ein Resultat der Trennung des japanischen Inselbogens vom ostasiatischen Festland während des Untermiozäns.

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Freies Thema

A new Eocene lizard from Messel and the origin of *Amphisbaenia*

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Molecular investigations have dramatically challenged the traditional view of squamate phylogeny. Among the most prominent changes in paradigm has been the