We provide a focused assessment of this tropical dead zone (TDZ) by generating a series of occurrence-based palaeomaps at a fine-scale (sub-stage) temporal resolution to precisely track shifts in terrestrial and marine vertebrate LDGs from the Late Permian to Middle Triassic. We then integrated our data with state-of-the-art palaeoclimate simulations to identify the driving forces behind these patterns across the Permo–Triassic boundary. Palaeoenvironmental outputs were obtained under a 4000 ppm Induan (earliest Triassic) pCO_2 climate scenario using the HadCM3L general circulation model.

Our results show that the TDZ was more volatile than previously recognised, with expansions and contractions corroborated by recent palaeoclimate records. These fluctuations offered life brief windows to recolonise and radiate across sections of Pangaea and Panthalassa, although a full return to the tropics would not occur until temperatures had sufficiently cooled during the Spathian, approximately 5 Ma after the Permo–Triassic boundary. We also find that both terrestrial and marine LDGs in the earliest Triassic were co-driven by temperature and formation count, with terrestrial biodiversity perhaps also influenced by humidity and seasonal rainfall. The latter variables may signal the presence of extreme tropical storm events, which may have frequently attacked the equatorial coastlines and increased poleward migration.

Our work advances our understanding of deep time LDGs and the spatial responses to extreme climate warming. We also highlight the environmental factors that may have shaped these major biogeographical shifts—insights that may inform predictions of species responses to the modern climate crisis.

Technical Session XI: Crocs & Turts (Friday, November 14, 2025, 8:00 AM)

Bone histology reveals the life history and niche of the oldest crocodilian fossil from Taiwan

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In 2006, a crocodilian fossil was discovered in the Yuwentao Formation of the Penghu Islands, Taiwan. Estimated to be 15 to 17 million years old, dating back to the Middle Miocene, it represents the oldest and most complete vertebrate fossil currently known from Taiwan. The specimen was named *Penghusuchus pani* and assigned to the family Gavialidae, a clade now absent from Taiwan and whose bone histology remains poorly understood.

Previous research focused on its morphology and systematics. In contrast, this study aims to investigate the life history and niche of *Penghusuchus* through its bone histology. Thin sections were prepared from the midshaft of the femur, the humerus, and the proximal third of the rib. The preserved tissue is mainly composed of parallel-fibered bone lacking primary vascularization. The outermost cortex shows an external fundamental system. A high density of erosion cavities and secondary osteons are observed throughout the sections, reflecting extensive remodeling. Notably, the femur and rib sections show an outer layer of reactive periosteal tissue, which, based on comparison with previous studies, is interpreted as pathological histology.

The high density of secondary osteons, extensive bone remodeling throughout the specimens, and the frequent presence of numerous growth marks indicate that the individual was senescent at the time of death, with this conclusion further supported by the closure of neurocentral sutures in the vertebrae. Additionally, femoral tissue images were analyzed using the BoneProfilerR, and the resulting data, including a bone compactness of 77%, were incorporated into a previously established ecological prediction model. The results suggest that *Penghusuchus* was semi-aquatic.

Interestingly, the specimen exhibits unusually extensive bone remodeling, which, although possibly related to its age and lifestyle, remains

uncommon even among older or semi-aquatic crocodilians. One possible explanation is gestation, as calcium mobilization during gestation can induce increased bone remodeling to meet the calcium demands of eggshell formation. However, in the absence of other evidence, this interpretation remains speculative.

Further research, including comparisons with extant gavialids, may help clarify the ecological adaptations and possible causes of the extinction of *Penghusuchus*, and determine whether its extensive bone remodeling reflects a unique physiological trait or a broader pattern within Gavialidae.

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Regular Poster Session III (Friday, November 14, 2025, 4:30 - 6:30 PM)

An unusual hybodontoid skull from the Middle Triassic of South China

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Chondrichthyan skulls are exceptionally scarce in the Triassic. Here we report a remarkably preserved articulated hybodontoid specimen (GZQ2208634) from the Zhuganpo Member of the 'Falang' Formation (Middle Triassic) in the Xingyi fauna. It comprises a partially preserved three-dimensional neurocranium, visceral skeleton, and dermal skeleton. The skull measures 280 mm in length, while the entire fossil block extends to 960 mm. The ethmoid region of GZQ2208634 exhibits morphological similarities with that of *Orthacanthus*. Additionally, the specimen preserves a large labial cartilage of the palatoquadrate and several branchial skeletal elements. The dermal skeleton is represented by a cephalic spine, two dorsal fin spines, 25 teeth, and numerous dermal denticles. The teeth are sharp-grasping type with multicuspid, strong-ridged and sharply pointed crown, closely resembling the dentition of *Hybodus basanus*. The material described here has important implications for our view of hybodont evolution.

Funding Sources National Natural Science Foundation of China (No. 42172009).

Regular Poster Session II (Thursday, November 13, 2025, 4:30 - 6:30 PM)

A new large *Nothosaurus* (Reptilia, Eosauropterygia) from the Middle Triassic of South China and the phylogeny of Eosauropterygia

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Recent discovery of many new marine reptiles from the Triassic of South China played an important role in understanding the marine ecosystem recovery after the Permo–Triassic mass extinction. Here we report a new large nothosaurian marine reptile, *Nothosaurus* sp. nov., represented by three specimens from the Upper Member of Guanling Formation (middle Anisian, Middle Triassic) in Luxi, South China. Bone histology indicates that the largest individual was adult and was close to skeletal maturation. *Nothosaurus* sp. nov. is recognized by apomorphies that include: a massive humerus with constricted mid-shaft being half the width of expanded proximal and distal ends; a distinctly elongated scapular dorsal process tapering to a relatively sharp tip; iliac blade reduced but projecting slightly beyond the posterior margin of the acetabulum of ilium. The phylogenetic analysis recovered a monophyletic *Nothosaurus* with *Nothosaurus* sp. nov. as the sister taxon to *N. jagisteus*. The monophyly of Eusauropterygia is collapsed, with Pachypleurosauria and Nothosauroidea