

PRESERVED SKIN WITH PUTATIVE SCALES IN A NEW PLESIOSAUR FROM THE JURASSIC POSIDONIA SHALE OF GERMANY

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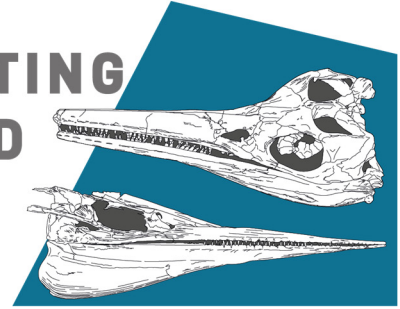
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Little is known about the soft tissue anatomy of plesiosaurs, because documented specimens preserving non-skeletal body remains are extremely rare. However, a newly prepared plesiosauroid plesiosaur from the Lower Jurassic Posidonia Shale of Germany includes patches of soft tissues in the tail region and along the trailing edge of one forelimb. These were studied using an array of analytical techniques, including IR microspectroscopy, time-of-flight secondary ion mass spectrometry (ToF-SIMS), electron microscopy, and thin sectioning. The results reveal the presence of residual epidermis ($\leq 250\ \mu\text{m}$ thick) with morphologically distinguishable stratum corneum and stratum spinosum. Both keratinocytes and the remains of melanophores are also visible. SEM and TEM imaging confirm the presence of remnant pigment cells with dense clusters of melanosome organelles. ToF-SIMS indicates the presence of aliphatics, aromatics, and possibly also degraded eumelanin. SEM imaging of demineralized tissue from the front flipper shows an absence of melanosomes, instead revealing what appears to be scale-like residues with layers visible in cross-section possibly corresponding to the Oberhaut, and β -keratin layers. In addition, a thin section of the forelimb tissue demonstrated a thin and dark exterior-most layer that might represent the scale surface stratum with underlying keratinocytes. Although removed during preparation, detailed pre-preparation photographs of the tail area served to indicate the presence of a fluke – only the second example ever recorded in a plesiosaur. In summary, our novel in-depth analysis of plesiosaur soft tissues demonstrates a relatively thick epidermis with putative scales covering at least the forelimbs. The occurrence of melanophores and melanosomes on the ventral side of the tail suggests a dark coloration in at least part of the animal.

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