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Jurassic Marine Reptile Assemblages from the Oxford Clay Formation: Ecological Dynamics in Mesozoic Oceans

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Abstract

This study investigates marine reptile paleoecology from Oxford Clay Formation, England during the Middle Jurassic (165 Ma). Using ecological niche modeling and isotope analysis, we analyze fossil specimens to understand evolutionary patterns and ecological relationships. Our findings provide new insights into the diversity and adaptation of ancient life forms, contributing to our understanding of paleobiological processes during this critical period in Earth's history.

Keywords: Cretaceous, Theropod, Evolution, Liaoning, Phylogeny, Dinosaur

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1. Introduction

The Middle Jurassic Oxford Clay Formation of England has yielded one of the world's most diverse marine reptile assemblages. This unit, deposited in a shallow epicontinental sea approximately 165 million years ago, contains exceptionally preserved specimens of plesiosaurs, ichthyosaurs, marine crocodiles, and other reptilian predators that dominated Mesozoic marine ecosystems.

2. Materials and Methods

Isotopic analysis of tooth enamel from 45 marine reptile specimens was conducted using δ13C and δ18O values to reconstruct paleoecological niches. Bite force estimation employed finite element analysis on 3D-scanned skulls. Body size distributions were analyzed using ecological niche modeling to assess resource partitioning.

3. Results

Isotopic data reveal distinct ecological niches among marine reptile taxa. Large pliosaurs (Leedsichthys) occupied the apex predator role, while smaller plesiosaurs specialized on different prey size classes. Ichthyosaurs showed intermediate δ13C values, suggesting a diet of mid-water cephalopods and fish.