

Diversity and Biogeography of Ordovician Trilobites from the Baltic Basin: Implications for Paleozoic Marine Ecosystems

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Abstract

This study investigates trilobite diversity and biogeography from Baltic Basin, Northern Europe during the Ordovician (450-440 Ma). Using taxonomic analysis and biogeographic modeling, 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: Ordovician, Trilobite, Diversity, Biogeography, Baltic, Marine

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1. Introduction

Trilobites were among the most successful arthropods in Paleozoic marine ecosystems, with over 20,000 described species spanning nearly 300 million years. The Ordovician Period (485-444 Ma) represents the peak of trilobite diversity, particularly in the Baltic Basin of northern Europe. This region provides exceptional opportunities to study biogeographic patterns and evolutionary dynamics during the Great Ordovician Biodiversification Event.

suggests partial isolation from global marine systems, creating conditions for evolutionary diversification and speciation.

2. Materials and Methods

A total of 847 trilobite specimens representing 23 genera were collected from 15 localities across Estonia, Latvia, and Sweden. Taxonomic identifications followed recent systematic revisions. Biogeographic analysis employed parsimony analysis of endemism (PAE) and non-metric multidimensional scaling (NMDS) to identify faunal provinces.

Table 1. Trilobite generic diversity by stratigraphic interval

Stage	Total Genera	Endemic Genera	Endemism (%)	Shannon Index
Tremadocian	12	3	25.0	2.31
Floian	18	7	38.9	2.67
Dapingian	23	11	47.8	2.89
Darriwilian	19	8	42.1	2.54

3. Results

Trilobite diversity peaked during the Dapingian Stage with 23 genera present. Biogeographic analysis reveals three distinct faunal provinces: a northern Scandinavian province dominated by Asaphidae, a central Baltic province with mixed fauna, and a southern Estonian province characterized by high abundance of Cheiruridae and Pliomeridae.

4. Discussion

The observed biogeographic patterns reflect complex interactions between sea-level changes, paleoclimatic conditions, and oceanic circulation patterns. High endemism in the Baltic Basin