

MICROEVOLUTION IN THE ORDOVICIAN PELAGIC TRILOBITE CAROLINITES  
KOBAYASHI

MCCORMICK\*, Tim, School of Biological Sciences, University of Birmingham, Birmingham B15 2TT, United Kingdom.

With the exception of Tertiary microfossils from deep ocean cores, there are few studies of microevolutionary change in fossils which are well-founded in terms of quality of stratigraphic control and number of specimens for statistics. There are especially few demonstrating gradualistic evolution, and arguably none concerning Paleozoic organisms. The vast majority of documented statistically supportable cases are punctuational.

Theory suggests that gradualistic evolution should be more common in pelagic marine organisms than benthic ones. (1) If punctuational evolution occurs as a result of isolation of peripheral populations, then it should occur more readily in benthic organisms which inhabit the heterogeneous sea floor environment. Pelagics, by virtue of their wide dispersal as larvae and adults in the more or less homogeneous open ocean environment should resist allopatric processes. (2) In fluctuating environments (e.g. shallow marine) selection may favour "generalist" phenotypes which are immune to relatively small environmental perturbations, and which therefore remain in stasis until some environmental threshold is crossed which exceeds their tolerances, forcing an abrupt evolutionary shift. In more constant environments (e.g. that experienced by pelagics) organisms can afford to specialise more but are prone to being affected by minor shifts in conditions. Statistically significant examples of gradualistic evolution in the marine fossil record relate overwhelmingly to pelagic organisms.

The telephinid trilobite Carolinites has an extremely broad paleogeographic distribution in lower Ordovician rocks, being known from N America, Greenland, Spitsbergen, Siberia, China, Tasmania, Australia, the Baltic region and Argentina. The same succession of species occurs in most regions. It can be convincingly demonstrated that Carolinites had a pelagic mode of life on the basis of functional morphology, geologic occurrence, and analogy with extant pelagic arthropods. Evidence from Spitsbergen suggests gradualistic evolution in the lineage but this has yet to be backed up by morphometrics on large samples of specimens.

Carolinites occurs as abundant silicified sclera through Ross-Hintze zones G-2 to M of the extremely complete and well exposed "Ibexian" succession of W Utah. These faunas have as yet only been sparsely sampled. It is hypothesised that detailed sampling and multivariate morphometrics on the genus from four of Hintze's measured Ibex sections will reveal a gradualistic trend with good statistical support.

Carolinites has potential as a highly sensitive correlation tool for the lower Ordovician: (1) possible gradualistic evolution means high resolution stratigraphic zonation may be possible; (2) it has almost world-wide occurrence; (3) as a pelagic organism it has facies-independent occurrence.