PALAIOS, 2008, v. 23, p. 738–750
Research Article
DOI: 10.2110/palo.2008.p08-022r

Paleoecology of early–middle Permian marine communities in eastern Australia: Response to global climate change in the aftermath of the late Paleozoic ice age

Matthew E. Clapham* and Noel P. James

Department of Geological Sciences and Geological Engineering, Queen's University, Kingston, Ontario, K7L 3N6, Canada
e-mail: mclapham@ucsc.edu

**Corresponding author. Department of Earth and Planetary Sciences, University of California Santa Cruz, California 95064, USA.*
Keywords: Cisuralian, Artinskian, Brachiopoda, Bivalvia, relative abundance data

ABSTRACT

Climate change has exerted a major influence on the biosphere in historical times, altering the geographic range of many species and elevating the extinction risk in both marine and terrestrial realms. This study investigates marine community change during the major early Permian climatic transition from the late Paleozoic ice age to a largely ice-free greenhouse climate. Quantitative counts of fossil abundance from 71 field assemblages and 15 collections from the literature, spanning the early and middle Permian (Sakmarian–Capitanian) of the Tasmania, Sydney, and Bowen basins of eastern Australia document substantial changes in the composition of marine communities during Sakmarian–Kungurian postglacial warming. During the last stages of glaciation (Sakmarian), communities were dominated by the brachiopod *Trigonotreta* and the bivalve *Eurydesma*, whereas communities from the later greenhouse climate (Kungurian–Guadalupian) contained abundant productide brachiopods such as *Terrakea* and *Echinalosia*. The shift was broadly synchronous at all paleolatitudes within eastern Australia but appears to have occurred first in offshore habitats. Artinskian communities may also have been much more variable than either earlier or later communities. This variability may have been triggered by rapid climate fluctuations, similar to the changes observed in Artinskian tropical terrestrial ecosystems, but it may also stem from sampling a greater number of depositional environments and habitat types. The ultimate fate of the dominant glacial genera differed after they lost dominance, with *Eurydesma* becoming extinct during climate warming but *Trigonotreta* persisting at low abundance levels for a much longer time. These results support the theory that climate change most often causes extinctions through indirect paleoecological effects and underscore the important consequences that even gradual, long-term climate change can have in marine ecosystems.