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Plesiosaur-bearing rocks from the Late Cretaceous Tahora Fm, Mangahouanga, New Zealand - a palaeoenvironmental study

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Mangahouanga Stream, Hawkes Bay, New Zealand is world-famous for its high southern latitude vertebrate fossils including plesiosaurs, mosasaurs and more rarely, dinosaurs. The fossils are preserved in the conglomeratic facies of the Maungataniwha Sandstone Member of the Tahora Formation. A palynological investigation of sediments from the boulders hosting vertebrate fossils reveals well-preserved palynological assemblages dominated by pollen and spores from land plants but also including marine dinoflagellate cysts in one sample. The palynofacies is strongly dominated by wood fragments including charcoal, and the sample taken from a boulder hosting plesiosaur vertebrae is entirely terrestrially derived, suggesting a fresh-water habitat for at least some of these plesiosaurs. The key-pollen taxa *Nothofagidites senectus* and *Tricolpites lilliei*, together with the dinocyst *Isabelidinium pellucidum* and the megaspore *Grapnelispora evansii*, strongly indicate an early Maastrichtian age for the host rock. The terrestrial palynoflora reflects a mixed vegetation dominated by podocarp conifers and angiosperms with a significant tree-fern subcanopy component. The presence of taxa with modern temperate distributions such as *Nothofagus* (southern beech), Proteaceae and Cyatheaceae (tree-ferns), indicates a mild-temperate climate and lack of severe winter freezing during the latest Cretaceous, providing an ecosystem which most probably made it possible for polar dinosaurs to overwinter. The paper is dedicated to Mrs Joan Wiffen who with her great persistence, enthusiasm and courage put Mangahouanga on the world map, becoming a role model for many young scientists.