

Autecology and phylogeny of *Coolia tropicalis* and *Coolia malayensis* (Dinophyceae), with emphasis on taxonomy of *C. tropicalis* based on light microscopy, scanning electron microscopy and LSU rDNA1

Abstract

Coolia is a widespread and ecologically important genus of benthic marine dinoflagellates found in tropical regions. Historically, there has been taxonomic confusion about the taxonomy and toxicity of this group. The goal of this study was to resolve morphological questions concerning *Coolia tropicalis* and determine the taxonomic identity of the Australian *Coolia* isolate which has been reported to produce cooliatoxins. To accomplish this, the morphology of tropical strains from Belize (the type locality of *C. tropicalis*), Malaysia, Indonesia, and Australia were examined and compared to published reports. The morphological analysis showed that *C. tropicalis* differs from the original description in that it has a slightly larger size (35–47 μm long by 30–45 μm wide versus 23–40 μm long by 25–39 μm wide), and the shape of fourth apical plate, and the length of Po plate (7.4–12 μm versus 7 μm). Based on both morphology and phylogenetic analysis using LSU D1- D3 rDNA sequences, the clones of *C. tropicalis* from Malaysia, Indonesia, and Belize were found to form a monophyletic clade within the genus. The strain producing cooliatoxin was found to be *C. tropicalis*, not *Coolia monotis* as originally assumed. To explore the factors influencing the growth of *Coolia* species, the growth rates of *C. tropicalis* and *Coolia malayensis* were determined at different temperatures and salinities. Both species tolerated a wide range of temperatures, but cannot survive at temperatures $<20^{\circ}\text{C}$ or $>35^{\circ}\text{C}$. *C. monotis*, the dominant species reported in the literature, probably does not produce toxins.