Do brominated natural products defend marine worms from consumers? Some do, most don[t

Kicklighter, C. E., J. Kubanek, M. E. Hay

Limnol. Oceanogr., 49(2), 2004, 430-441 | DOI: 10.4319/lo.2004.49.2.0430

ABSTRACT: Worms and other marine invertebrates living in soft sediments commonly produce brominated natural products that have been hypothesized to function as defenses against consumers, but this hypothesis has not been tested directly. When 16 species of worms from a Georgia mud flat were fed to two sympatric fishes (*Fundulus heteroclitus*, *Leiostomus xanthurus*) and a crab (*Callinectes similis*), 15 species (94%) were palatable to all three predators. Only the hemichordate *Saccoglossus kowalevskii* was unpalatable to both fishes, but even it was readily consumed by the crab. Bioassay-guided chemical investigations demonstrated that *Saccoglossus kowalevskii* was rejected by fishes because it contained 2,3,4-tribromopyrrole at 0.2% of worm dry mass. This is the first direct test of brominated worm metabolites as defenses against sympatric consumers. The deterrence of 2,3,4-tribromopyrrole in *S. kowalevskii* may explain why densities of this worm increase 40-fold during seasons when predation is high and densities of palatable worms decline sharply. To more broadly examine the effects of brominated metabolites on worm palatability, we collected from North Carolina, Georgia, and Florida 14 species reported to produce brominated metabolites. These species were fed to sympatric consumers to assess palatability and also analyzed for brominated metabolites by gas chromatography mass spectrometry (GC/MS). Nine of the fourteen species contained brominated metabolites, but only two were unpalatable. In a final test, five additional brominated metabolites produced by marine worms were added to palatable foods at natural concentrations and at up to 20x natural concentrations. None deterred feeding at natural concentrations, one was deterrent at 5-15x natural concentration, and four had no effect at even 20x natural concentration. Thus, while one worm was defended by a brominated compound, most worms containing brominated metabolites were palatable, and brominated natural products seldom functioned as chemical defenses against consumers.