

A SIMPLIFIED ATP ASSAY FOR PLANKTONIC ORGANISMS WITH IMPROVED
EXTRACTION EFFICIENCY

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by

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ABSTRACT

A SIMPLIFIED ATP ASSAY FOR PLANKTONIC ORGANISMS WITH IMPROVED EXTRACTION EFFICIENCY

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The adenosine triphosphate (ATP) assay, a proxy of living biomass (used by oceanographers for more than 50 years), was investigated for its potential as a ballast water compliance monitoring tool. Though some ATP assays are reliable for estimating living biomass in specific microbial communities, those assays may be less than optimal for others. For this project, an ATP assay was developed to quantify ATP concentration in most (if not all) aquatic microbial communities; it was also optimized for convenient and rapid assessment of ballast water compliance for persons without a scientific background (e.g., ship engineers, mates, ballast water inspectors). The newly developed ATP assay, called “the P-BAC ATP assay,” was tested against the traditional boiling Tris ATP assay and a 2nd generation ATP assay.

From this project, I concluded that the traditional Tris ATP assay underestimated ATP concentrations by 2 to 4-fold in various natural aquatic microbial communities compared to the P-BAC ATP assay. When compared to the 2nd generation ATP kit, P-BAC extracted comparably at times and up to 3.4-fold more ATP. Furthermore, the P-BAC ATP assay was successfully executed during full-scale shipboard treatment tests at the Golden Bear Test Facility (California Maritime Academy, CSU), by measuring the change in living biomass before and after administering the ballast water treatment.