DOMOIC ACID PRODUCTION IN *PSEUDO-NITZSCHIA (BACILLARIOPHYCEAE)* AS A GENERAL RESPONSE TO UNBALANCED GROWTH: THE ROLE OF PHOTO-OXIDATIVE STRESS.

A Thesis

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in

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by

April Woods

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ABSTRACT

DOMOIC ACID PRODUCTION IN *PSEUDO-NITZSCHIA (BACILLARIOPHYCEAE)* AS A GENERAL RESPONSE TO UNBALANCED GROWTH: THE ROLE OF PHOTO-OXIDATIVE STRESS.

by April L. Woods

Toxic *Pseudo-nitzschia* blooms, resulting from species-specific production of the neurotoxin domoic acid (DA), have caused human deaths and illnesses, numerous mass mortality events of marine birds and mammals, and economic loss brought on by fisheries and aquaculture closures. A spectrum of potentially growth limiting biotic and abiotic factors are implicated in production and release of DA in this diatom genus. Because the consequences of toxic *Pseudo-nitzschia* blooms may be environmentally and economically severe, scientists are investigating the how and why of DA metabolism and biosynthesis to gain understanding of; what ecological purpose DA serves, and whether biomarkers exist in *Pseudo-nitzschia* that would help monitor shifts toward toxin production and thereby refine identification of environmental parameters used to inform modeling of toxigenic DA event prediction indicators. In an effort to define a common mechanism of DA induction, the hypothesis of this thesis is that DA production is a general response to cellular stress and thus DA could be induced or attenuated through a direct stress signal. Up regulation of DA production was induced when toxin positive cultures were transitioned to growth under high irradiance. Biomarkers of oxidative stress accompanied the increase in DA, supporting the hypothesis that excess photon pressure generates a cellular stress response. A pharmacological chemical model of photosynthetic stress induction was used to mimic the physiological response of excess irradiance in order to provide a physiologically robust test of the hypothesis that DA biosynthesis is enhanced as a general response to photo-

oxidative stress. The data shown here do not support that outcome. Additional data collected, suggests a correlation in enhanced cellular resilience to stress among toxic species.