Vita

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Universities Attended:

University of New Brunswick (2017)
Bachelors of Science

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Publications / Conference Presentations:

Alexandra E. DeShaw, Francisco Figueroa-Martinez, Adrian Reyes-Prieto. (2017). Complete chloroplast genomes of the *Chlamydomonas reinhardtii* nonphotosynthetic mutants CC-1375, CC-373, CC-4199, CC-2359 and CC-1051. Mitochondrial DNA Part B. 2(2): 405-407.

"Exploring plastid function in free-living nonphotosynthetic algae." Fourth International Volvox Conference. Donald Danforth Plant Science Center, St. Louis, United States. Aug. 16-19, 2017.

"Where are they now: plastids after adopting an alternative trophic lifestyle." Fifth International Volvox Conference. University of Tokyo Hongo Campus Tokyo, Japan. July 26-29, 2019.

Genomic and metabolic surveys reveal diverse consequences of loss of photosynthesis to plastids offree-living nonphotosynthetic algae in the order Chlamydomonadales

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

Alexandra E. DeShaw

in the Department of Biology

U.N.B., Fredericton, N.B.

Wednesday, November 10th, 2021
10:00 a.m.

via MS TEAMS

Examining Committee

Dr. Adrian Reyes-Prieto	Supervisor
Dr. Aurora Nedelcu	Internal Examiner
Dr. Audrey Limoges	External Examiner
Dr. Mike Duffy	Chair of Oral Examination

Abstract

Photosynthesis has numerous advantages, but many algae have lost that ability in favor of heterotrophic lifestyles. There are diverse and numerous investigations about the loss of photosynthesis in parasitic algae, but our knowledge about free-living nonphotosynthetic cases is very limited. In my thesis, I set out to investigate genomic and functional consequences at the plastid level following the loss of photosynthesis in free-living species of the order Chlamydomonadales. Recent studies have revealed different trajectories of plastid genome (ptDNA) evolution in this algal group, including outright losses, inflation and compaction in lineages that lost photosynthesis independently. The two novel ptDNAs I present here continue to showcase variety. The ptDNA of *Hyalogonium fusiforme* is inflated and has an almost intact gene repertoire, whereas the ptDNA of *Polytoma* sp. is compact and lacks all the genes of photosynthesis. My analysis of transcriptomic data of *Polytoma uvella* indicates that the colorless plastid of this alga is heavily involved in the biosynthesis of most essential amino acids, tetrapyrrole, starch, nucleotides, and carotenoids. My study identified key functions that are retained in nonphotosynthetic plastids regardless of the algal trophic lifestyle.