

C07-P07

WARD HUNT LAKE: A SENTINEL ECOSYSTEM AT THE TOP OF THE CANADIAN HIGH ARCTIC

Paschale N Begin (*Center for Northern Studies, Laval University, Canada*)

Warwick F Vincent (*Center for Northern Studies, Laval University, Canada*)

paschale-noel.begin.1@ulaval.ca

Ward Hunt Lake is Canada's northernmost lake, located on Ward Hunt Island (lat. 83°05'N, long. 74°10'W), off northern Ellesmere Island. This region experiences a polar desert climate¹, with an average air temperature of -17°C and precipitation around 150 mm. The lake is ultra-oligotrophic and perennially ice-covered, but complete loss of ice cover was recorded in 2011 and 2012². Given its extreme northerly location, Ward Hunt Lake is a potentially sensitive indicator of global warming. The objectives of our limnological studies in Ward Hunt Lake are to determine the structure and functioning of this remote aquatic ecosystem, and to better understand the nature and implications of ongoing change. Our previous work has shown that that loss of ice cover over Ward Hunt Lake could have a major effect on the protist community, with a shift toward mixotrophic chrysophytes that would affect food web processes³. In August 2014, a 2.2 m thick ice layer covered the lake. The water column was inversely stratified with a bottom water temperature at 9.5 m of 4.9°C. Oxygen levels dropped from just above air-equilibrium immediately under the ice (109 % saturation) to below saturation (57%) through most of the water column. No traces of macrozooplankton were observed, and the highest trophic level in the planktonic food web of this lake is likely to be microzooplankton, including heterotrophic and mixotrophic protists. Earlier studies showed that microbial mats dominated by cyanobacteria occur across the rocky substratum of the shallow littoral waters of Ward Hunt Lake^{4,5}, and these communities were thought to be restricted to this edge zone. However, our survey of the lake by underwater video camera in 2014 revealed a surprisingly luxuriant community of cyanobacterial mats and mosses at the deepest site (10 m) of the lake. The sediments in shallower waters had an almost continuous covering of thinner microbial mats, with moss communities restricted to isolated rocks. These shallow waters also had extensive accumulations of tube-like structures, as yet unidentified. These unexpected discoveries indicate that despite its extreme location, Ward Hunt Lake contains high standing stocks of benthic organisms, and further studies are required to sample and identify these intriguing aquatic communities that appear to be thriving at the bottom of this far northern ecosystem.

¹Vincent et al. 2011. *Ecoscience* 18: 236-261; ² Paquette et al. 2015. (in revision); ³Charvet et al. 2014. *FEMS Microbiol. Ecol.* 88: 550-564; ⁴Bonilla et al. 2005. *J. Phycol.* 41: 1120-1130; ⁵Lionard et al. 2012. *Frontiers in Aquatic Microbiol.* 3: 140.