

Winter and Large Lakes with Dr.

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JESSE: Hi, I'm Jesse Schomberg. Today, the second day of winter, I'm here in the studio with Dr. Ted Ozersky, Assistant Professor of Biology and a researcher with the Large Lakes Observatory at the University of Minnesota Duluth. Dr. Ozersky's research interests include the under-ice ecology of large lakes and he's gearing up to begin a two-year study supported by Sea Grant called: "Opening the Black Box of Winter: Ice Cover and Biological Productivity in Lake Superior."

Welcome to The Sea Grant Files, Ted.

Ted: Thanks Jessie, I'm glad to be here.

JESSE: You'll notice Dr. Ozersky has an accent hats because he grew up in St. Petersburg Russia and is a Canadian Citizen. So tell us about your interest in studying life in lakes during winter. Doesn't it get a bit chilly?

TED: Yea, it can get a little bit cold. So I've become interested in winter lake research over the past few years by working with colleagues of mine in Canada during my ph D and postdoctoral work but especially when I got a chance to do winter work on Lake Baikal in central Siberia and what struck me especially in my work in Russia are two things, one how much life and biological production there can be under the ice and two how little we actually know about it. So overtime I've become really interested in the way the unique environmental conditions of winter shape biological communities and the dynamics of nutrients and energy in lakes. I am also very interested in how conditions in winter affect the conditions in subsequent seasons. A question that I think is especially urgent now as winter conditions change with the change of climate. Climate change really adds urgency to this goal of understanding winter process because of the rapid change in winter conditions and also because winter is the least well studied period in the seasonal cycle of temperate lakes which is especially true in large lakes like Lake Superior

JESSE: Yea I imagine there are some difficulties involved

TED: For sure

JESSE: So what do we know about what happens under lake ice so far?

TED: Well a lot less than what we know about what happens in lakes during summer. That's for sure. But there has been some really exciting work coming out of European and North American labs over the last little while that has significantly advanced our understanding of what happens in lakes in winter. What we are realizing is that extent and duration of ice cover has far reaching consequences for process occurring throughout the water column and also throughout the year. Ice or lack of ice cover can affect things like mixing of the water column, life levels and nutrient availability with important consequences for the critters that are living in the lake. So for example research on Lake Baikal and Lake Erie suggests that winter ice conditions have larger precautions for both the productivity and the type of phytoplankton communities developed during winter. In Years with clear and extensive ice cover, we see a high productivity of large diatom algae and other algae that can support high zooplankton production. In years with less ice, productivity can be lower and algal community can be dominated by smaller and possibly less nutritious algal species.

JESSE: So the last two winters have been relatively cold and icy for Lake Superior. I know I have been able to actually get out ice fishing the last two winters which was pretty odd recently. But this one seems to be setting up to be substantially warmer than average so far. What do you say when people ask you about the variation in Lake Superior ice cover in winters from year to year?

TED: Well thanks to recent work Jay Austin's lab at the large lakes observatory we now know that Lake Superior's ice cover is extremely sensitive to variation in air temperature. A change of just a couple of degrees in average winter temperatures can mean the difference between a year like 2013 and 2014 where you were able to get out on the ice with a lot of ice cover and a year with almost no

ice. What we also know is this interannual variation is kind of superimposed on top of a very clear trend towards reduced extent and duration of ice cover. Work by Jay Austin and Steve Colman, also at the large lake observatory, has shown that over the last 30 years or so ice cover extent has been decreasing at a rate of about 4% per decade on Lake Superior.

JESSE: Is Lake Baikal showing winter trends similar to Lake Superior?

TED: Unlike Lake Superior, Lake Baikal still experiences complete ice cover every year. However, like Lake Superior the duration of ice cover on Lake Baikal has substantially decreased. Baikal lost close to about a month of ice cover over the last century

JESSE: What is your new Sea Grant research going to be focusing on?

TED: For this project i'm going to be looking at ice covered and ice free areas of the neutral zone of Lake Superior. Trying to understand how ice cover affects the biology of the lake. So we will be doing comparisons of physical and chemical conditions in ice covered and ice free areas and looking at how these conditions affect the phytoplankton and zooplankton communities that form the basis of the food web in Lake Superior.

JESSE: You mentioned that Lake Baikal still completely freezes over with ice whereas Lake Superior sometimes some of it freezes over and it's a lot more variable. I would imagine that would add some difficulties to doing the research. If it's all frozen than you need your snowmobile and you know it's going to be awfully cold but you don't have to worry about floating away on an ice flow towards Canada or something like that. What kinds of things do you have to do to prepare for those kinds of conditions you're going to expect on Lake Superior

TED: I think the most important thing when you are working in the winter on the ice on lakes like Lake Superior where the ice cover is not as predictable as the ice on Lake Baikal is. Of course to know the weather forecast to know what you can expect in terms of weather. To know what the ice conditions are like and of course practice safety things like letting people know where you are going, making sure you're dressed for the weather, having a GPS phone with you incase something goes wrong and just being careful.

JESSE: The avoidance of winter research has been especially pronounced for those that experience winter ice, but critical ecological processes can take place under ice. Even when obscured by snow, ice transmitting as little as 2% incident light can allow relatively high rates of photosynthesis, and winter trophic interactions may have year-round repercussions. Worldwide shortening in ice duration lends imperative to under-ice studies, in order to more fully understand changes in ecosystem structure and function that may already be underway. Sea Grant is looking forward to what Dr. Ted Ozersky will discover in the next several years.

Thanks for joining us, Ted. And, as our advisory committee said, "Don't die out there on the ice; don't fall in!"

TED: Thanks Jesse i'll do my best. Thank you for having me here.

This episode of the Sea Grant Files was produced by Jennifer Gasperini, Sharon Moen, Mariah Schumacher and, me, Jesse Schomberg. For more information, or to listen to other episodes of the Sea Grant Files visit Minnesota Sea Grant at www.seagrant.umn.edu. You can also follow Minnesota Sea Grant on Facebook or Twitter. Thanks for listening!