

Transcript

Julia Macpherson (JM): Welcome to Arctic Minded, a podcast where we discuss life, work and research in the Arctic. Arctic Minded is produced by ArcticNet, a Network of Centres of Excellence of Canada that brings together scientists, engineers, and other professionals in the human health, natural and social sciences with partners from Inuit organizations, northern communities, federal and provincial agencies, as well as the private sector, to study the impacts of climate and socioeconomic change in the Canadian North. From coast to coast to coast, we recognize that our work reaches across the ancestral and unceded territories of all the Inuit, Métis and First Nations people that call these lands home and who have been protectors of, and share connections with these lands since time immemorial. I'm your host, Julia Macpherson, and today's episode of Arctic Minded is called *The Interdisciplinarity of it All*. Our guest today has had experience in the field of geography, geology and ecology, to name a few, and now works investigating the impact of shipping in the Arctic. We're going to talk about her experience being an interdisciplinary researcher. What does this mean? How can you do it? Plus, we're going to talk about her latest research topics: permafrost, wildfires and Arctic shipping. Our guest today is Dr. Jean Holloway, a research associate at the University of Ottawa in the Department of Geography, Environment and Geomatics. Her research interests are focused broadly around determining how climate change is impacting various elements of the cryosphere in the Canadian Arctic and Subarctic. After receiving degrees in environmental science and geography at Queen's University, Dr. Holloway completed a PhD in the Department of Geography, Environment and Geomatics at the University of Ottawa, focused on determining the impacts of forest fires on permafrost in the boreal forest of Canada. Following her PhD, she joined the Environment, Society and Policy Group at the University of Ottawa, where she studies changes in Arctic shipping activity and the subsequent human and environmental impacts with the goal of producing research that is usable by policymakers. Dr. Holloway currently sits on the Board of Directors of ArcticNet, and is the former chair of the Canadian National Committee of the Association of Polar Early Career scientists, APECS Canada. Welcome to Arctic Minded, Jean.

Dr Jean Holloway (JH): Thank you for having me. I'm really excited to be here. And to have a hopefully really wonderful conversation with you.

JM: So, can you talk to us a little bit about your education background and what got you started in the field of Arctic research?

JH: Yes, absolutely. So, I didn't start in Arctic research, but I started in my undergrad and I was doing a sort of a dual degree in geology and environmental science. And I got an opportunity to be a research assistant in the summer after my third year of my undergrad and I got to go up to the James Bay Lowland and do some field work, so not totally the Arctic, but the subarctic. You know the sort of dwarf trees and you're starting to get into that into that landscape and the wetlands and so I was there for a month and I just totally fell in love, I could not get enough of field work. I loved being there. I was learning so much. And so, when I decided to pursue a Masters, I literally googled field work Arctic Queen's, because that's where I was doing my undergrad and I wanted to stay there for my Masters, so I found a professor who was doing research at a camp called the Cape Bounty Watershed Observatory in the High Arctic. His name is Scott Lamoureux. I think he's also been funded by ArcticNet in the past. And so, I just I you know, I loved doing the field work. And then I sort of just carried on with that, I couldn't get enough of it. So, after I finished that degree at Queen's, I moved to Ottawa where I did my PhD at the University of Ottawa in the

geography department. And for that I, sort of, I moved a little bit away from geology into geography. And so, I sort of switched fields lately, and I began doing research on permafrost and that's what I did my PhD in.

JM: Do you have a preference for one over the other, or like one that you enjoyed studying more?

JH: I mean, the reason I switched to geography was because I really enjoyed, the sort of, the hydrology, the soil science, the sort of, the more superficial stuff that I could see and touch. I really like those aspects with geology as well, like, I enjoyed going to the lab and like looking at the minerals and touching them and things like that. But I wasn't as into sort of the... yeah, the geology class that I was taking and I really was drawn more to the geography. So that was just my preference.

JM: So, you did your PhD focusing more on permafrost. We hear a lot about permafrost, ArcticNet has a lot of permafrost researchers. But I'm wondering if you could just talk a little bit more about the basics of permafrost. So, what is it and why are so many people studying it?

JH: Yes, absolutely. So, if you didn't gather by the name permafrost, so permanently frozen, it's ground that remains at or below 0°C, that's frozen for two or more consecutive years. It's found in the polar regions and, you know, high altitude, so mountainous areas where the temperature is cold enough that the soil and ground freezes in the winter and then doesn't thaw completely in the summer. So, like I mean in the South, I live in Ontario, so I'm in southern Ontario. So, in the winter the ground freeze is like you can't dig. You can't... If you're building a fence, you have to wait till the summer because you can't get into the ground. Or it's more difficult. But then for us, in the summer, the air warms up and the ground thaws fully. But in in the polar regions, yeah, that doesn't happen. So, we get this, this layer of frozen ground that just remains permanently and has a really... it creates a very specific environment and has a lot of really unique aspects. And so, there's some areas like in the interior continents, like in Siberia, where the permafrost, that frozen layer, gets to be like 500 meters thick, it's been, you know, so cold and so frozen for so long at sort of the marginal areas, the most southern limit of permafrost it's, you know, less than 5 meters thick and it's very patchy. So, you know it covers wide landscapes and it's different in lots of different areas. And then the other sort of the other important thing to think about with permafrost is that it's frozen, but it doesn't necessarily mean that there's ice in it. A lot of permafrost does contain ice, but some doesn't. So yeah, I think what people picture is like big, big ice. Yeah, almost like big ice cores. But that's not necessarily what it is. It could be frozen rock even. It's just any ground material that's frozen. So much of Canada, like, about 50% of Canada is underlaid by permafrost and mainly in the Yukon, Northwest Territories and Nunavut, but it's important to understand, you know, so much of our country and you know, a lot of the world is underlaid by this feature. And so, we need to understand how it's changing and understand that for the environment and for the people and ecosystems who live in those areas, especially in a changing climate.

JM: So, we hear a lot of concerns about the permafrost melting. So, is that one of the only ways that's being impacted by climate change or are there other ways that it's being changed in warming climate as well?

JH: Good question. Ultimately, permafrost thawing is what happens, but there's other sort of aspects of climate change that, you know, trigger other things that then trigger thaw. So, for example, my PhD was on how forest fires were impacting permafrost. So, with climate change, there are more frequent and more severe forest fires occurring like all over the world, but particularly also in Canada. And so, you know,

you get a warming climate, you get more forest fires, and then what happens is the forest fires destroy the near surface vegetation. And you know, the canopy if they're really severe. And that changes what's called the energy balance. So, if you think about like how much radiation from the sun can get to the surface, and that's what you know thaws or doesn't thaw the permafrost. It's not the actual fire going over like it's not the heat that is flowing in from across. It's the changes to the surface and then over the, you know, next 5 or 10 or 50 years. Those changes impact how the permafrost responds, and so you get a fire that comes through and if more of them are happening, it has a more of an impact on the permafrost. So that's one aspect, for example, of climate change triggering more fires that then triggers more thaw, so there's things like that also happening.

JM: So is it possible for permafrost to recover in a way? Like you just mentioned... So, it's more like that the vegetation is being disturbed and the radiation is then hitting the permafrost. So, in cooler months, when we're not seeing as many forest fires or anything like that, is the permafrost able... I don't know if recover is the right word, but almost re-freeze or return into permafrost?

JH: Yeah, no recover is the right word. But so yes and historically, like we've always had forest fires. So, there was a balance where what would happen is the forest fire, let's say, would go over. The permafrost would thaw a little bit, sort of from the surface down, so you'd get, like we call it, the active layer. So, every year there's like this little active layer that freezes and thaws. So maybe you'd get a thicker active layer, but, over time the forest... It's called succession, so the vegetation recovers and then the permafrost also recovers, sort of following that pattern. So that's been happening for thousands of years. But what's happening with climate change is it's altering that natural pattern of recovery. So, the summer and the winter months are getting warmer, especially the winter months, so the permafrost doesn't recover as much and when the fires are more severe, the thaw is deeper, and then it just can't fully recover. Other things that happened so, if that active layer gets super deep, so that's the thaw layer in the summer, even if it freezes in the winter, it won't freeze all the way. And so, it's called a talik – T A L I K. And so that talik is this little area or maybe not little, but that remains unfrozen so you can have this, like whole permafrost frozen area, and then this little unfrozen talic. And what happens in those taliks if they're unfrozen all? There. They can expand and or water can move through them and then water transfers heat as well. And so it just sort of it's just like it's a positive feedback loop, can be for more and more thought.

JM: So, is permafrost considered a carbon sink?

JH: Yes, in most places, especially in frozen peatlands. And so, again, historically it has been... so, if you think about, you know over thousands of years, there's all of this like organic material like plants and like animal carcasses and stuff that have been frozen into the ground. So, you know, a plant dies and then it gets covered in snow and then it, you know, gets frozen into the ground and then thousands of years go by. So, what's happening is if we're thawing all of that material and the ground is, you know, it's not frozen anymore, it's in a thawed state, the microbial activity increases. So as the temperatures increase, so does the microbial activity and then that releases these soil microbes. They release carbon into the atmosphere. So, permafrost, I would say, is still probably worldwide a carbon sink, but it's turning into, can be turning into, more of a source as it thaws, especially in those frozen wetlands. That's actually a huge issue. One of like I would say the major issues with permafrost thaw and it doesn't just affect the local scale, it affects all of us at the global scale because as more permafrost thaws, we get more carbon released and then as more carbon releases, we get more climate change. And then that thaws more permafrost. So, it's yeah, again, another positive feedback loop.

JM: That's so interesting. You mentioned that you did a dual degree in your undergrad. What is that? I don't think... is that like a major and a minor or is that something different?

JH: Good question. I'm not even sure if that's the proper term for it. So, the program that I did was a new one when I started at Queen's and this is in 2008. I was in the Environmental Science Department, but since the Environmental Science Department was so new, we could also, we did a specialization is what it was called. So I was in geology, but you could also do it in biology, or I forget what the other options are, but those are the two I think most common ones. So, I took half my courses in the Environmental Science Department and then half in the Geology Department. So, I think some people do like double majors. On my degree it says like environmental science specialization, geology.

JM: OK. Yeah. Dual degree, that's really cool. Because I wanted to ask you a little bit about interdisciplinary science because you talked about switching from geology to geography, also mentioned the dual degree and how in geography, I think.... So right now, you're doing Arctic shipping studies, correct?

JH: Yes.

JM: And I guess I'm just wondering if you can talk to us a little bit about what it was like kind of switching from geology to geography and now working in shipping. That seems to be a pretty interdisciplinary field and I know that that can be a little bit hard for grad students to navigate. So, I'm hoping you can just share your experiences so far.

JH: Yeah, absolutely. So, I think, I think interdisciplinary research is really important. I think it's the future, especially because we can't tackle global complex problems, the type that we're facing without... by just staying in our silos and not communicating or working with others. So, I think it's very important, but yes, it can be challenging. Switching from geology to geography, it was pretty seamless. Although I did find it challenging in the sense that I hadn't taken a lot of the undergraduate courses in geography that at the Masters and PhD level, I should have had more of a foundation in certain things that I just didn't have. Long term - It hasn't affected me in like, sort of, my long-term research program, but yeah, it made things a little challenging, especially in my PhD for my comprehensive exams like that was a that was a big challenge for me. But one of the beautiful things about interdisciplinary research, especially, even during my PhD studying forest fires and permafrost, I was working at the interface between ecology and geography in my case, or you know, because I was doing permafrost. So that's interdisciplinary as well. And so, what it what it allows you to do is you have... You know you're learning more, you're working with different people, learning different techniques and methods, so you can have so many more experiences. So, it can be challenging, but it's super valuable. One of the things that I always say when I talk about, like navigating interdisciplinary research is understanding like you can't possibly know everything yourself. And so, what I what I did even in grad school when there's like, this pressure that you have to do everything on your own by yourself because it's for your thesis. Even then, like you can rely on your co-authors, your committee members, your colleagues, other students, you're not alone. I spent the first, I think few years of my research sort of feeling like that, but that's not the case and especially now like as I've graduated and I was a postdoc and then I'm a research associate. We do interdisciplinary research. You build teams of people with different skill sets and different perspectives and different training. Because yeah, it's not possible to achieve all of it as one individual. So that's how I think interdisciplinary research is successful. It's all about communication and yeah, teamwork and being open to new ideas. I think it's impossible to do interdisciplinary research well if you're not going to listen to any new perspectives or bring on people who have different ideas.

JM: Yeah, that's a great point. So, I don't - I maybe you said it and I maybe I didn't catch it. How did you like... what is the process of finding a supervisor when you're working in an interdisciplinary project like is there you know like if you are looking to find a PhD program, or even a Masters program, a lot of times, you're kind of looking at a lab or research, or at least a research topic, but it can be hard to find supervisors who work or state outright that the work that they do is interdisciplinary. I mean, you could always refer to their websites and see what kind of research they're doing, but did you find it easy to find a supervisor, or were you struggling? Did you just kind of reach out to a bunch of people and approach them with an idea? Or how did that work for you?

JH: Yeah, that's a great question. So, I didn't target, I wasn't targeting supervisors who were doing interdisciplinary research, specifically that just happened. It just sort of happened that way. However, I think what you suggested, going on people's websites and looking at their past projects and sort of looking at what they're involved in. That's a great way of doing it. You can also just like when you're reaching out to folks you can just ask them and say that's something you're interested in doing and ask them. For me, I found all of my supervisors by knowing what I was interested in doing as a topic, I would say so. Like I mentioned, I was really interested in pursuing permafrost, so I found supervisors who were doing that type of research. So, for my PhD, a supervisor was recommended to me from someone I was working with already a colleague and I met with my...His name is Antoni Lewkowicz. He's a now retired professor at University of Ottawa. So I met with him, we talked about his research program. He asked me questions about my Masters and it just like, it just seemed like a really good fit. I was really, really interested in the research he was doing. And then it depends on what level you're at. Some people come to their supervisors with topic ideas and especially at the Master's level, often the supervisor tells you what projects they have going on, and helps you develop your project. At the PhD level, often you're encouraged to come with your own ideas or come up with at least parts of your thesis, your chapters. So even at the PhD level, though, you work with your supervisor to develop your project often. You know I've only had the experiences that I've had, but my supervisor supported me a lot, and that's how, so I ended up when I started working with Tony. He sort of had a few projects on the go. He gave me some options for what I could sort of get involved in and work on and I was really, really interested in the in the forest fires project that he had just started getting involved in. That was right after in the Northwest Territories in 2014, there were, at the time, record setting forest fires. That was I think the record was broken last year when like sort of the devastating fires happened last summer. So, at the time in 2014, there was a similar fire year. And so, I started my PhD in 2015. And so right after Tony had gotten involved in this project and he needed a student to get involved in it. And so, it was just like the timing of it just really worked out for me. And then, so we were the permafrost team members and then the rest of our team were ecologists. So that's how you know I got involved with this sort of interdisciplinary project. And then the topic also, is interdisciplinary, so like if I'm looking at the impacts of forest fires on permafrost, I have to know about forest fires. And then I also have to know about permafrost, so that that, yeah, that sort of choosing your topic, if you're interested in doing interdisciplinary research, choosing a topic that sort of fits into that that scope.

JM: So, when you were doing your PhD, were you the only student who was kind of an interdisciplinary researcher, or did you have a lot of other people that you could talk to about this at the time?

JH: I didn't really talk to anyone about interdisciplinary research in particular. I kind of just like, put my head down and did my project. I think it wasn't till after I was done that I kind of thought more critically about like some of the challenges that I had personally and that like that maybe weren't just me that

they're, you know, sort of a product of the nature of interdisciplinary research, so I didn't really talk to anyone or seek anything out. I, as I mentioned earlier, I did really rely on like... I asked a lot of questions. So, like I reached out for help and I asked a lot of questions and got a lot of like support from my colleagues. So, in that way, like I had really good support, but I think it would have really benefited me to like go into the project knowing some of these things in advance. And I think as a group like as an Arctic research community, that's what I'm trying to say, an Arctic research community. We are doing better about having like webinars and I think at conferences like panel discussions about introduce Larry Research. So, I hope that you know incoming students and stuff like that are more prepared.

JM: Yeah. Well, I agree, because I mean every conference I've been to and every student I've talked with at various conferences, I find a lot of them are interdisciplinary researchers now or if they're not, they're interested in learning like more about how to navigate that space because kind of like what you said, I would almost imagine. There would be a feeling of maybe slightly like impostor. If you're learning about geography, like human geography or the cryosphere, things that you know about just as a living person, but haven't actually studied, and then to be put in a space where you're expected to have such a high level of knowledge or like expertise in these fields, I feel like that could be something really difficult to. Kind of deal with, especially because you're in those positions for sometimes four or five years of your life. So, I'm just wondering, like, how was that experience for you?

JH: Oh yeah, that's definitely something that I struggled with and that's kind of one of the things again, like I didn't realize until afterwards that I was like oh, the way I've been feeling there's a term for this. It's called imposter syndrome. It's not just me that's feeling this way, and I think that's one of the challenges of doing interdisciplinary research in grad school versus after you graduate. I'm a research associate now, so I'm not a professor. I don't have my own research program. But you know my supervisor Jackie gives me a lot of a lot of freedom to explore things that I want to. So as like a more, senior researcher, I'm still a junior researcher, but more senior than a grad student. It's not the same. It's not the same. Like I'm able to, for example, I'm working on a paper right now and I am so bad at statistics. That it's just not my thing, so I instead of learning it now... in grad school like I would have had to learn it because you have to cause it's for your thesis so often you feel that way. You feel that pressure. Now I can... I emailed a colleague and asked if they wanted to get involved and work on the project and they're gonna do the statistics for me. So that's how research is done. It's all through collaboration, like you don't have to do everything by yourself. But yeah, there is this feeling and part of it is true, like you do have to do the research for your thesis. You either feel like you don't know enough, or you don't have the skills that you need, or there is that just sort of like, you know, you go to a conference and you're listening to people talk. And it just seems like they know so much more than you. So, you have that imposter syndrome or I feel like looking back now. From where I am, it's like ohh, like how would I have expected myself like two years, like let's say I'm a Masters student, I'm two years into researching this particular topic, how would I ever expect myself to know everything? But that's like at the time I really put a lot of pressure on myself and felt like I should. And you're surrounded by all of these brilliant people who have been, you know, professors who have been studying these things for decades. And yeah, it's like, it's really hard to sort of remember that you're just starting, so it's OK, you don't have to know everything.

JM: So, did you have any other challenges in grad school?

JH: Yes, I certainly, I certainly did. I really, you know, we were just talking about imposter syndrome and I really struggled with other sort of mental health aspects. And this is something that's very passionate to

me now and you know, I'm speaking from a place of... I've worked really hard the past... I don't know, eight years, let's say? So, I'm in a place now where I'm feeling really good. So yeah, I like to talk about this to sort of shed light on some of the challenges that I did have. Grad school, obviously is wonderful. It's like such an opportunity for self-growth and development. But I found it really stressful. You know, imposter syndrome was one aspect, but you know, there's other things going on. You're under a lot of pressure to perform at a really high level, especially you know you mentioned this like if you're in a competitive or a toxic research group where you're not getting a lot of support or your supervisor isn't managing things well. I never had that experience. Thankfully, I always had wonderful, wonderful support. You know that can be... that can add pressure and there's like financial pressure. You know, I wasn't able to really make it through just on the traditional like graduate stipend or like the teaching assistantships. So, there's like, you know, a lot of financial pressure, which like sometimes for I know for lots of folks, they have to go elsewhere and like get additional work. And so, you're trying to like balance like work and grad school. The one thing for me was like stress management. Like I felt like I needed to get through quickly so I couldn't take breaks like even like, you know, when you have a thesis looming over you, it's like you feel guilty even just like taking an evening off to just relax and then that like compounds. For me at least, it yeah, I did. And then you know, we touched on this a little bit, but like if you're... there is a lack of support or guidance from your supervisor or from other aspects. You know, I was really lucky. My PhD supervisor was so available. Tony was fantastic and he really like, you know, we met every week. He really, like guided me and helped me through. I couldn't have... I wouldn't have finished if he hadn't been so supportive. So, I was really, really blessed there, but that's something to think about as well. If you're choosing a supervisor like how much support you're looking for and you as an individual need. Everyone's different and every supervisor is different and not everyone is supportive. So yeah, like, those are all, I mean, some specific aspects of graduate school. But like, I ended up having like a fairly severe mental health crisis during my PhD. I think like not that many people talk about it. There's still a lot of like shame and stigma. I ended up taking a month off and I really thought that I was going to have to drop out at one point. But I think that sort of the time that I took and then, you know, I saw and I'm still seeing like a professional, so I see a therapist and I do other sort of lifestyle related changes like I'm really careful about like work life balance and stress management making sure that like I'm not overdoing it and you know I'm taking lots of rest and stuff like that and I'm still working on that. I feel like I'm chronically in burnout. But after making those changes, like life is wonderful. And I'm also achieving more now than I was back then. So, I thought that like, oh, I can't take any breaks. I have to work so hard. All this pressure on myself. But really now not doing as much, I achieve more because I'm doing more like effective and meaningful work.

JM: Yeah, that's great. Well, thanks so much for sharing that. I listened to this podcast once that was talking about productivity and working productively versus working efficiently. And that's something that I would listen to quite a bit during grad school and even still now just like to learn skills with coping with stress and avoiding burnout and like kind of managing like what level of energy you're putting into certain tasks and if they're benefiting you. So, if I have anything to offer anybody who's listening, I find, like listening to those kinds of podcasts and those resources that are out there to help you with productivity and stress management are also really helpful, even if it's just finding like new tools or new coping skills. So yeah. Well, thanks so much for sharing that. Did you have anything specific that you use to kind of help cope with stress or deal with stress or manage it like any hobbies or anything outside of school that really helped you kind of leave that world behind for a little bit and come back to yourself?

JH: Oh yeah. I mean, I practice like daily meditation, which I think is like one of the things that's benefited me the most. Often for me, that's like sitting quietly or I use guided meditations. But sometimes like I love being outside. So just going for a walk in the forest. That's like ohh that just resets my nervous system. So that I use that and also you know exercise I find really helpful. So, and sometimes it's easier than other times, like if I'm in a burnout, it's really hard to like to even go for a walk sometimes. It's really hard and I find that brings me a lot of joy and it's also like it takes me out of my mind if I'm really stressing about something. You know it's so hard to be thinking about that if, like, I'm if playing a sport, or even if I'm running like I'm really focused on what I'm doing. So, I love exercise. Yeah. So, and I do lots of hobbies. I'm really strict now about my work life balance. So, at 5:00 PM, I leave my computer and I kind of leave it all behind because like for me that's a big red flag. It's like when I'm thinking about work all the time. Yeah, I got lots of hobbies. I think that's a really important, important thing as like... Our careers are marathons, they're not sprints, even grad school. A Masters is a little bit different, but a PhD is like at least five years. Sometimes people finish it a little sooner than that, like four year maybe, but... And I know in like in different countries, they're different lengths. But yeah, mine took me 5 years. And so like, you can't sprint through that.

JM: I'm glad to hear that you were able to change that narrative in your head and that you're doing a lot better now. That's great. Do you want to talk a little bit about the research that you're doing now?

JH: Yes, absolutely. So, after my PhD was over... Well, actually even before I finished my PhD, my current supervisor, Jackie Dawson approached me to do some work on the side for her. So, it's called research assistantship. So, you can do that sort of while you're a graduate student. So, I did that. I started working with her while I was finishing the last year of my PhD. And I really enjoyed working with Jackie. I just like Jackie as a person. She's fantastic, but Jackie, she's doing really, really niche research that is one that's really practical for policymakers. And then she also works with... on like the interface between physical sciences and human sciences, in like a really cool way. So, I was just really inspired by the research she was doing, so I, you know, I was really scared to again like switch fields, right. So, like switching fields again from permafrost to Arctic shipping and starting, you know, a whole new set of literature, I didn't know anything about shipping at all. So, it was scary, but I'm really enjoying the research that we're doing and I've been getting involved in some really cool projects.

JM: So, what's your research question that you're looking at right now?

JH: I'm working mostly on a project that's... we're looking at the potential impacts of shipping in the Canadian Arctic. So, you know, ship traffic in the Arctic in general has been increasing in the last, you know, several decades. Because as climate change is happening and the sea ice is melting, there's more accessibility to shift in a sort of a more positive way that could increase employment and other economic opportunities for Inuit and Northerners. But you know what sort of we're focusing mostly on is like the potential that it may also increase risks related to, you know, environmental sustainability, cultural sustainability and then other things like safety and security and then also like sovereignty issues as well, especially with the geopolitical issues going on right now, so there's lots of areas of concern. And so, the project that we're working on, there's a couple main themes. One of them is and one of the biggest sort of impacts of concern, is pollution. So, a big one that people are concerned about is the potential for oil spills. So, you know, the ship has an accident and then it leaks fuel. What impact that will have on sort of the relatively pristine Arctic environment? So that's a big risk, big concern, and then you know other types of pollution, black carbon emissions. So, when ships use heavy fuel oil like HFO they burn that in their

engines. It emits black carbon and so that can, you know, fall out on in the water or on the ice, on the land. So, what impacts does that have. And then the fuel also leaves residue. So even if it doesn't like the ship doesn't crash and there's an oil spill. Even just burning the fuel leaves residue. So, you know that's a concern. And then there's also ship sourced microplastics, so this is sort of a new hot topic. So, we've got team members working on that. One of the big things is when cruise ships do their laundry and then they dump the gray water into the ocean, sort of, all those microfibers are going in. And then sort of one of the new things that we're looking at - we have a PhD student joining our team in September - the paint that ships use on their hulls has microplastics in it and so you know when especially ships in the Arctic, if they're like crunching against the ice that, you know, paint gets chipped off and it's getting into the environment. So, some really neat sort of contamination, pollution, stuff that we're working on. The other two sort of major risks that we're exploring are the impact of underwater noise from ships on marine mammals who have evolved to use sound in their sort of in their way of life and the noise pollution from especially big ships is causing major issues with the marine mammals, like in particular marine mammals relocate to different areas and that you know that has impacts on Inuit who use... country food is a really important cultural, and you know health aspect for Inuit. So that that has cascading impacts. And then the third thing, is the introduction of non-indigenous species. They used to be called invasive species, you know, so that's a big issue in all like... I know you know again coming from Ontario myself like the Great Lakes... you know invasive species is a big issue and that's you know that's potentially happening in the Arctic now as these little critters and things either cling to the hulls of the ships, or they're in the ballast water. So ships take in water internally, to help sort of with stabilization and other things. So that's called ballast water. And so, these critters are in there or on the hulls of the ships, and then they're transported from one location to another. So, if the ships coming up from the South and going North, all of these species that have never been in the Arctic before then, like, transported there so that can have major impacts on the environment. And so, yeah. And so those are those are the three main themes. And then all of those things have been cascading impacts and risks on the environment and then for Inuit health and well-being. So yeah! So that's what I'm working on these days.

JM: Yeah, I was just going to say that's a really broad research program. Oh, my gosh, I didn't even... I didn't realize that Jackie's lab was doing all that work.

JH: Yeah Jackie's doing lots of really, really cool stuff and I'm very lucky to be a part of it. And just a reminder to everyone that you know, this isn't just us. We have a whole team and yeah, like we have lots of different colleagues in lots of different organizations who are also like part of these projects. So, it's great.

JM: Before we started talking about all the research that you're doing with Jackie, you mentioned that her work is very practical for policymakers. What did you mean by that? Like, how do you do research that's... the outcome is more practical for policymakers. What does that entail?

JH: Yeah, good question. So often if you're doing research that's targeting policy makers, the purpose is different and then the products at the end of the research are different. Policymakers are just interested in different things. So, I would say policymakers are often interested in questions that come from like a specific goal or a mandate versus like, as you know, scientists were often sort of conducting like pure science or thinking about really broad questions for like the sake of understanding something more generally. And so, like, we don't necessarily have a specific goal in mind. It's almost, yeah. Like, sort of like, seeking knowledge just for the sake of knowledge sometimes. Especially in like fields like engineering, they're often like obviously have a sort of a specific target or a specific goal. And then in terms of like the

outputs, policymakers are looking for, I would say like concise outputs that they can then like use for evidence-based decision making. So, you know they don't want to read like a 100 page really detailed, you know, whatever. So, they want sort of like concise, really specific outputs and so often, like what we do is instead of just publishing something in a journal and then, you know, expecting people to find it there. I'll write up a report like a short report on results, and then circulate that widely or, you know, pass it on to colleagues. So yeah, I would say policymakers are, they're looking for more like transparent and accessible outputs. So, it's just like a slight shift. The research itself, I would say doesn't change. It's just the way that you present it and really just making sure that it gets to the policymakers because I think that's sort of the path in the past, we just as scientists, we just sort of expected, we just did our thing and then expected it to sort of trickle there, but I think it's like just like really making the effort to like, collaborate and make sure that your research is getting into the hands of the people who make the decisions.

JM: Right. So that's what I was going to ask. So those... let's say you're writing up a technical report off of an article. How do you like... are there already decision makers kind of involved in the conversation at the start of the project, or how do you figure out who needs to be given that report or who to circulate that report to?

JH: That's a good question. It depends. So sometimes we get approached by different governmental departments to answer. We basically get contracted to do research projects. So, then you know, obviously you have a specific set of criteria that like the government department has like asked you to investigate and they have a specific output that they want. So that's sort of like one way and then so you write a report and then you give it to them. So that's like one sort of very specific thing. I just finished a project last year where I wrote a one page like data summary and then like my project was about like using weather, water, ice and climate information. So, like let's say, like a weather forecast on your phone like so while ship operators are operating in the Arctic, what sources are they using for that kind of information and how can it be improved? So that was my sort of my first main project during my postdoc. So, after I did the research, I did the analysis I wrote up this web page data summary and I knew from like the experience doing the research, like what government organizations to target. Environment and Climate Change Canada does a lot of forecasting, so I circulated it to either colleagues that I have in ECCC. Or, you know, there's a whole directory like I went on and found different names and e-mail addresses and just sort of tried to circulate it as widely as I could and then so yeah, like Transport Canada, obviously when you're dealing with anything shipping related. So, I sent again, sent it to colleagues in Transport Canada. I sent it to colleagues in DFO. So I sought out the different organizations and people to send things to and people are generally really receptive.

JM: Yeah, I would hope so. I mean, it makes sense. Instead of having to again go sift through maybe two or three articles looking for one answer to a question, if you're given a technical part and the answer is in black and white. That's great, you know.

JH: And often too. So like I mean, I finished that project and I still haven't published the paper because it takes a really long time to write journal articles and get them published, so they get the data faster than waiting for the actual publication. So it works in everyone's favor.

JM: All right, well, that was my last question. Was there anything else that you wanted to talk about before we wrap up?

JH: No, I think we really covered everything.

JM: Yeah, I think that was really great.

JM: A huge thank you to the wonderful Jean Holloway for sharing her experience, insights and knowledge. No two experiences in academia or even in life are going to be the exact same. I'm sure many of us can relate to impostor syndrome, jumping around a few disciplines to find what suits us, and dealing with mental health issues. The more that we can share these stories with one another, the better we can support each other. Once again, I'm your host, Julia Macpherson, and this has been Arctic Minded.