



TRANSCRIPT

2023 Arctic Report Card Stakeholder Briefing

December 20, 2023

NOAA External Affairs

<https://www.noaa.gov/news-release/warmest-arctic-summer-on-record-is-evidence-of-accelerating-climate-change>

0:05

Hello everyone.

0:07

Welcome to NOAA's Briefing on the 2023 Arctic Report Card. Before we continue with the briefing, please note this webinar is being recorded if you do not wish to be recorded.

0:19

Please disconnect at this time.

0:22

If you'd like to ask a question, please use the questions tool in your goto Webinar window to type a question for our speakers, which will be answered during the Q&A portion of the agenda.

0:33

Please be sure to state or type your full name, title, organizational affiliation when asking your question.

0:42

The Arctic report card is an annual NOAA Technical Report that provides an up-to-date peer reviewed assessment of the current state of the Arctic environment. Now, this was the 18th annual report card. And since that first issue in 2006, the Arctic report card has evolved from a quick update on the Arctic Climate System to truly an international collaboration across borders and increasingly.

1:07

And it's a collaboration across cultures with Arctic indigenous peoples and community members, gaining a voice in the Arctic report card. And this diverse perspective is essential to understand the scale and complexity of the physical ecological changes observed across the Arctic, as well as their implications for societies within the Arctic and beyond.

1:30

This year's Arctic Report Card, featured 12 invited Essays, with 82 offers, authors from 13 countries contributing.

1:40

Now with that, I have the honor of welcoming NOAA's Chief Scientist, doctor Sarah Kapnick.

2:01

Uh!

2:44

Thank you, Rick. First, thanks to the editors of this year's report, Rick Thoman of the Alaska Center for Climate Assessment and Policy, and Twila Moon and Matthew Druckenmiller of the National Snow and Ice Data Center along with the coordinating editor, Sarah Tucker of NOAA OAR's Global Ocean Monitoring and Observing Program or GOMO. Production support for the report card came from NOAA OAR's Climate Program Office, Pacific Marine Environmental Laboratory, and Global Systems Laboratory, and annual funding for the editor board was provided by the Arctic Research Program within GOMO.

Every year, this report is a vital check-in on the status of the fastest-warming region on the planet, the Arctic.

3:08

We know what happens in the Arctic does not stay in the Arctic. its impacts on climate and ocean resources go far beyond the region.

3:17

The Arctic Report Card documents these rapid changes and impacts, such as how summer surface air temperatures for the warmest on record, sea surface temperatures continue the warming trends. And sea ice extent continue to decline.

3:30

There have also been Historic Exchange in the Western Alaska Salmon with record lows for Chinook and chum salmon, and record highs for sockeye salmon.

3:40

Salmon population declines has led to fishery closures, worsened use are complex, and had profound cultural and food security impacts in Indigenous communities.

3:50

NOAA is uniquely positioned to take on the challenges by providing more resources and tools to support adaptation and mitigation.

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The Arctic Report Card demonstrates the importance of effective collaboration across agencies, indigenous communities, and among nations to monitor change in this important region.

4:09

One example, Peatland Restoration and rewilding in Finland, demonstrate a globally relevant climate solution of carbon sinks, and points to the need for replication across impacted sites.

4:21

Rewilding requires partnership, recognition of Indigenous community rights, and the use of Indigenous knowledge alongside Western Science to succeed and avoid repeating past inequities.

4:32

Applying and centering Indigenous Perspectives and observations of Arctic Change in decision making can lead to more inclusive equitable community land responses.

4:42

NOAA recognizes that strong climate solutions demand digital, local knowledge and collaborations with tribes and communities.

4:48

This year, we continue expanding knowledge of the report card, the new chapter on Alaska Arctic Conservatory, and Knowledge Hub.

4:56

In August, we opened NOAA's, newly renovated port facility in Ketchikan - recognizing the growing importance of Alaska that's the blue economy and national security.

5:06

Now, I'll turn it back over to back for the authors report card to share more detailed information.

5:16

Alright, thank you very much, Dr. Kapnick.

5:19

So four of us will provide a short overview of just some of the highlights of this year's Report card.

5:26

I encourage you to check out the website as multiple resources, including a short headlines video with lots of evocative imagery and graphics, links to each essay. And if you're old school like me, a complete PDF.

5:41

You can also access all of the past editions of the Report Card from the website.

5:46

So I am Rick. I work as a Climate Specialist with the Alaska Center for Climate Assessment and Policy at the International Arctic Research Center at the University of Alaska Fairbanks.

5:57

I served as the Lead Editor on the 2023 Arctic Report Card, and as I have for a number of years as a co-author on the sea air surface temperature essay.

6:09

Zach Labe is a Postdoctoral Research Associate with Princeton University and NOAA's Geophysical Fluid Dynamics Laboratory and was a co-author on this year's sea surface temperature essay.

6:21

Jim Murphy works as a research fisheries biologist, NOAA Fisheries, Alaska Fishery Science Center, and was co-author on the essay divergent Responses of Western Alaska Salmon to a changing climate.

6:35

And Roberto Glenn-Borade is a Project coordinator and Community Liaison with the Alaska Arctic observatory a knowledge hub, better known as A-OK, and she was the lead author on the essay Working with Communities to observe the Arctic.

6:59

The Arctic, which for most report card purposes, comprises lands and oceans north of 60 degrees latitude covers an area of more than 13 million square miles. That's more than four times the area of the lower 48 United States. For the 12 months ending in September, this was the sixth warmest year and the warmest summer in records going back to 1900.

7:24

Now, as you can see on the graphic, on the left hand side of the screen there, summer was especially warm in north-west Canada, Northern Greenland, and far Western Siberia.

7:35

But some areas, including south-west Alaska and Iceland were not notably mild from the figure on the right, You can see that the Arctic summer temperatures have increased dramatically in the past 30 years, and even recent cool summers like 2018. And 2021 were warmer than any summer was prior to the early two thousands.

7:59

Now, related to those increasing temperatures, precipitation, that is rain. Plus, the water in melted snow is increasing. And for 2023 was the sixth highest, since 1941.

8:11

Just like temperatures, significant, regional, and seasonal differences are important part of the picture, while the Arctic as a whole was wetter than average, some areas were unusually dry, including Northern Canada during the summer.

8:30

Now, one of the reasons that the Arctic is warming faster than elsewhere in the world is a decrease in the length of a snow cover season.

8:38

In 2023, early spring Snowpack was generally above normal in both North America and the eurasian Arctic, but then a very mild weather produced rapid snow melt.

8:49

For northern North America, the May snow cover extent was the lowest of record. And the June average snow cover in Eurasia was near record low and was close to zero.

9:01

The interconnection between Early Snow melt, a dry summer and sustained record heat, set the stage for the most impactful wildfire season on record in Canada's north-west territories.

9:13

More than 16,000 square miles that's larger than the state of Maryland burn.

9:19

Two thirds of the residents of the north-west Territories were evacuated at some point during the summer, including nearly everyone from the capital city of Yellowknife.

9:29

Community of enterprise was destroyed by wildfire and smoke from the wildfires resulted in weeks of unhealthy air quality in northern Canada and beyond.

9:39

Now with that, I'll pass it over to Zach Labe, who provide an update on sea ice and ocean temperatures.

9:50

Thank you, Rick. Along with some of the climate trends over land that Rick just described, the Report Card Arctic Report Card, also documents changes in the Arctic Ocean itself.

9:59

By the end of this year's summer melt season, the total area extent of Arctic Sea ice dropped to the sixth lowest on record.

10:08

This is consistent with long term trends of declining sea ice levels that we're now observing in every single month of the year.

10:15

This loss of ice is particularly largess during the warm summer months, and especially, at the end of the melt season, in September.

10:22

One of the most striking statistics from our chapter in the Earth to report card on sea ice, is that the extent of September Sea ice has now been consistently lower than any September, prior to up to 2007.

10:36

This really highlights the nature of the dramatic changes that we've observed in the last decade or two across the Arctic.

10:44

Now, looking at the graphical map here, we can actually visualize the amount of sea ice that was left this summer. That's the color shadings that you see here, identified as sea ice concentration, or otherwise known as the fraction of the amount of ice.

10:58

So, if we compared this area of ice from this summer to an average over a 30 year period, like 1981 to 2010, This is equivalent to about 770,000 square miles of missing ice this summer that previously would have been ice covered.

11:16

Now, this is a really, really big number, so to give it some more context, this size or this area is equivalent to about three times the size of the state of Texas. Again, this would have been previously ice covered in past decades.

11:32

Along with the smaller amount of sea ice, we're also witnessing a reduction in the age of the ice.

11:38

In other words, instead of sea ice surviving this summer months, and gradually growing, becoming older over time, we're now watching more and more of this older ice not survive this summer.

11:49

Now we care about the age of the ice is because this younger sea ice is generally thinner. That means it's more fragile, fragile, and vulnerable to breaking apart, especially if we see strong storm systems move into the Arctic, with high wind in high waves at the edge of the sea ice cover.

12:07

Sea ice this summer was particularly low north of the Alaskan coast in a region of the arctic called the Beaufort Sea and Chukchi Sea.

12:16

This can be directly tied to some of those unusually warm temperatures that Rick discussed from this past summer.

12:22

Again, we can look at the map on the graphic here, and compared the shaded coloring of the sea ice concentration.

12:28

Relative to those thin lines you see there, that's the extent of ice. In those past decades, like in 1981 to 2010, 1981 to 2020. Again, we can see that it's dramatically decreasing over time.

12:43

Other areas of low sea ice this summer were also found in the Canadian Arctic, where most shipping lanes around the north-west passage were effectively, ice free conditions, also along the Northern Sea route, and this is an area that stretches along the Eurasian coastline were also free of ice this summer for shipping travel.

13:06

Changes in the levels of Arctic sea ice are also directly linked to warming ocean waters. Now for the Arctic Report Card, we primarily focus on sea surface temperatures during the month of August.

13:18

We choose this month because this is when the sea ice melt from this summer is well underway and it's right before the free season begins, which is around late September.

13:28

Consistently, we find that in nearly all ice free areas of the Arctic that they are warming over the last several decades. We can see this here by the line graph on the right hand side of the screen, which shows the average sea surface temperature for the arctic ocean over the last several decades which you can see is increasing over time although there is some seasonal variability.

13:51

Unfortunately, warming ocean waters also contribute to a feedback loop that further accelerates Arctic warming, also known as Arctic amplification.

14:01

To briefly summarize this feedback, essentially as summer temperatures warm, more and more of this ice is melting away, and it's then exposing open ocean water which is this really dark surface that can now absorb more incoming sunlight or heat.

14:17

Then as the free season approaches, all of this added heat in the darker open ocean waters is then released in the atmosphere, which causes more warming, which causes more sea ice loss.

14:30

The amount of heat accumulation in the arctic ocean can also have severe consequences and impacts related to processes such as ocean stratification, primary productivity and affecting marine ecosystems in the availability of habitat habitats for marine life.

14:48

I'll now turn it over to Jim Murphy, who will also discuss more about marine ecosystems and especially Alaskan salmon.

14:59

Well, thank you, Zack. So, one of the topics we highlighted in the report card this year was the changes that have been observed in Western Alaska salmon abundance.

15:11

Sockeye salmon. Have reached record high abundance levels.

15:14

Their runs have been about 98% above average, and Sockeye are largely from the Bristol Bay watershed.

15:24

As you can see here in this graph outlines the watershed for Bristol Bay and they rear in freshwater lakes and have benefited from increased lake productivity with warming temperatures.

15:38

Conversely, chum salmon have reached record low abundance levels, and they've been about 92% below average. And Chum salmon are largely produced from the Yukon, the large watershed in Alaska, and Yukon territories, the Yukon watershed and Kuskokwim watershed.

16:01

So, there's a life history difference between each of these species: Chum salmon: don't rear in freshwater.

16:10

And.

16:11

And it's believed that they're unique foraging.

16:14

Strategy on gelatinous zooplankton has contributed to poor nutrition and reduce survival in marine habitats about Chinook salmon mm or also at record low levels thereabout, 81% below average.

16:32

Their survival has declined over the last 20 years and there have been multiple factors that have been identified to be contributing to their poor survival and includes factors like heat stress, disease, Vitamin Deficiency, And also, mm, hmm, predation in Marine habitats.

16:56

Chinook salmon have also declined in size which has resulted in an estimated 15% loss in the number of eggs that are carried by females.

17:13

So, the warming of freshwater and marine ecosystem is believed to be the source or the key factor in some of the changes that we've seen in Western Alaska salmon abundance.

17:25

It's the decline of Chinook and chum salmon.

17:28

That is of particular concern is it's resulted in closures of fisheries.

17:34

It's increased conflicts between user groups and it has had a profound cultural and food security impacts on local and indigenous communities throughout Alaska and the Yukon territory in Canada.

17:47

It's also prompted Congress to create the Alaska Salmon Research Task Force.

17:53

And this task force has been asked to develop a coordinated strategy for research to support conservation efforts for the salmon stocks as well as other Alaskan stocks that are critically low levels.

18:08

Now I'll turn the briefing over to Roberta who will address community responses to the changes in the Arctic.

18:19

Thank you, Jim.

18:21

Paġlagivsi! Uvaŋa Tuurraq. Naluagmiutun Roberta Glenn-Borade, Utqiaġvigmiuguruŋa. Inupiaġuruŋa. Aakaga Iqilan Akpik Aapaga Savik Glenn. Savaqtuŋa University of Alaska Fairbanks-mi. Hi everyone, my name is Roberta Tuurraq Glenn-Borade. I'm from Utqiaġvik. I'm Inupiaq. My mom is Arlene Iqilan Akpik, and my dad is Richard Savik Glenn. I work at the University of Alaska Fairbanks.

18:57

Indigenous people have been living in the Arctic for millennia, and have developed deep connections to the land and sea, laying the foundation for holistic understanding of marine, terrestrial, atmospheric, and sea ice systems.

19:13

These knowledge systems reveal widespread and unprecedented changes in the Arctic.

19:18

The Alaska Arctic Observatory and Knowledge Hub or what we call A-OK, for short.

19:24

It's a long term community based Observing Program which supports sustained and holistic environmental monitoring by Inupiaq observers in coastal Arctic Alaska.

19:35

A-OK focuses on *Nunaaqqit Savaqatigivlugich* or working with communities to provide a platform to share indigenous knowledge, observations, and expertise in the context of a changing Arctic.

19:51

Since the project began in 2006, there have been over 10000 observations to document changes in Arctic Alaska.

20:01

Inupiaq observers have noted sea ice loss, warmer air and ocean temperatures, changing wind patterns, and increased intensity and frequency of coastal storms that contribute to flooding and erosion.

20:15

These environmental changes have real impacts on community infrastructure, traditional activities, and access and availability of subsistence resources.

20:27

Our work is increasingly turning to our community partners to make use of these observations to support local priorities and needs.

20:37

Despite these rapid changes, A-OK communities are still able to go out hunting. Are still able to catch animals, and they're still able to live a lifestyle rich with cultural traditions.

20:49

Yes, there are challenges, but we shouldn't be labeling indigenous people in the Arctic as victims of climate change.

20:56

We don't subscribe to the idea that we're victims of our environment.

21:00

There's strength in sharing our voices, sharing our histories, our knowledge, our concerns, and our ideas for how to move forward and their strength and being proud that we have survived as a people to make it this far. To be able to continually thrive in our region. We've been living off the land and sea, and we don't plan on stopping soon, And, you know, there's strength in listening.

21:25

We're strong people with strong knowledge systems and strong ideas about how to move forward.

21:32

And when we come together, all of us were able to accomplish great things.

21:37

And that's the message I would like to leave with everyone here today.

21:46

Quyanaq Roberta and thanks to Jim and Zach. So now it's your turn, if you haven't already, please add your questions to the chat. We've provided you with a short overview of some of the highlights of this year's Report card, but I'm sure there's more that you'd like to know.

22:02

So go ahead and add your questions to the chat, and we'll do our best to answer them.

22:08

And we do have questions coming in, and so we'll start right at the top here.

22:13

And this first question, I think, is probably one that, one, that all of us can chime in on.

22:21

So the question is, can you describe some examples of how sea ice has changed wildlife behavior in the Arctic.

22:33

Jim, would you like to comment on that to start?

22:43

Well, there's been, as I mentioned, there's been a significant decline in the abundance of Chinook and chum salmon and both of these species are critically important for subsistence fishing.

22:58

And, um, so, there's, although the, the mechanisms or the processes in which temperature is altering their survival is not well understood.

23:10

It's, it's recognized that this is a result of environmental changes in freshwater and marine habitats.

23:25

Great.

23:27

Roberta, A-OK observers have certainly shared their observations of changes. What would you like to share with us on that front?

23:37

Yes. So the sea ice conditions are definitely affecting the location and abundance of different animals.

23:44

And one example that's coming to mind is from January to about March this year, there was a strong predominant westwind January to March that kept the ice close to just off the West side of town but the water was open northeastern, Barrow, a bootcamp, and that's where all the animals were.

24:05

So, that's, that's one example of the sea ice conditions affecting animals at least this year.

24:12

OK, great, Zach, anything from your perspective?

24:18

Yeah, I'll just add from a sea ice perspective, you know, a symbolic imagery of arctic climate change has been polar bears, and a specific example from this year is in the Hudson Bay of Canada. We've seen they had an earlier start to sort of their melt season during the springtime and they've had a very late start to their free season that's actually ongoing right now. And this has really affected sort of where polar bears have been located along the Hudson Bay. And in general, I'm not a biologist, but scientists who study polar bears. Really keep highlighting that with continued losses of sea ice, particularly the younger becoming from older to younger sea ice is going to continue to affect polar bear habitat, and that's availability.

24:59

Great, thanks and I work a lot in the Northern Bering Sea region and certainly we have seen in the last several years, dramatic examples of how the loss of sea ice has really kicked off really a sea change so to speak in the ecology of the Northern Bering Sea.

25:23

During the extremely low ice years of 2018 and 19, we saw the loss of that cold bottom water in the Bering Sea on the continental shelf and really we saw those Southern Bering Sea species. Basically just an extension of the North Pacific.

25:43

Move into the previously Arctic more marine system and wholesale changes in in species.

25:53

Certainly the those years impacts to ice seals as well, impacts to walrus. So it's really, really changes to the sea ice are affecting wildlife in the water, on the water, on the ice and having a direct effect on communities throughout the throughout the Arctic.

26:20

So next question up is for Roberta.

26:24

With the observations, you mention, what can organizations do to support communities, how can funding and resources be better directed?

26:36

That's a great question and, um, I would say reach out to folks in the communities.

26:44

Certainly reach out to A-OK if you're interested in learning more about these A-OK observations and, and some of what we're trying to do to streamline those observations into decision making bodies and management entities.

27:01

Um, yeah, reach out to us.

27:07

OK, great, thanks.

27:09

All right, so next question, can you, will see who “you” is, speak to how changes in water temperatures And, and sea ice coverage may affect underwater noise, shipping, industry, et cetera in the Arctic.

27:27

Oh, I can certainly take a first stab at that. Well, the most obvious change of course is with less sea ice and thinner sea ice that is there, there is simply much more of that marine activity in the Arctic waters to the point now, where we have in the middle of winter these industrial sized, natural gas tankers. Thousand foot tanker's plowing through the Bering Strait in the middle of winter. Something that we had never seen before during the late summer and fall of course.

28:03

We have much more marine, shipping, and and marine traffic.

28:09

Whether it, whether it's commercial shipping, whether it's national security type shipping, whether it's all manner of ecotourism type vessels.

28:21

So there's just a lot more of that.

28:23

So certainly, from the, just from the producers of that undersea noise, the changes that we've seen just in the last 20 years, and many of them really being amplified in the last decade are are simply just have gone through the roof here so to speak.

28:43

Next question up is a question for Zach.

28:48

There's been enormous loss of Sea Ice in the Chukchi, and Bering Seas, how does this translate, Or does this translate to a loss of sea ice algae?

28:57

And thus primary production for the base of the of the food chain.

29:01

That is the sea ice algae, the Krill Leaders, and the Small fatty Arctic Forest Fish. And thank you from the Bering Strait Region.

29:10

Zack, you feel up to that one.

29:13

Yeah, I can make a comment immediately. Like I said, I'm not a biologist ... but I think the Bering Sea is really an area where we've seen all of these repercussions from sea ice loss. Like Rick mentioned, no loss of sea ice is impacting animals at all levels of the food chain at the top and the bottom both on the water and on land. And, I think some years particularly in the Bering Sea and Chukchi 29:37

If, you know, years that come to mind are like 2018 and 2019 where we saw significant losses, not just sort of the border seasons but also in the middle of winter. And what this really caused was sort of repercussions. Again, at all levels at the food chain, affecting seals, affecting the walrus and really just changing, you know, where their habitat would be for that winter. Where you would normally find walrus are seals. There would be no sea ice in some of these extreme years. So they would be moved to a new location. And I know this search for the walrus outlook that's produced isn't really documented this nicely and I remember reading from these years, like 2018 to 19 or like Where Are the Walrus? And again, it's because their habitat is missing and it's really being what we're seeing from this loss of sea ice in these regions along the Alaskan coastline.

30:30

All right. Great, thanks, Zach.

30:33

So, we have a, we have a, um, a question or comment from on the, the shipping question that we just addressed.

30:42

And this was, I assume, the tankers that we're talking about going through the Bering Strait were Russian Vessel's opting to use that route due to the embargo on eastern EU pipeline. And that is, I believe, and I could be wrong here, but I believe that is, at least not wholly the answer.

31:03

We saw this increase in these big natural gas tankers before the start of the Russia Ukraine war, and most of that is bound for China and in North Korea.

31:17

So, this actually, this predates the whole, whole current geopolitical situation.

31:26

And so, without while that may be playing into it, it's certainly not the full the full answer there.

31:34

So a question for Jim.

31:37

Why are all the salmon smaller in size off the north-west Alaska coast?

31:48

Well the the the species that has had the largest decline in size is Chinook salmon.

31:55

Although, there is perhaps some declining size in sockeye and chum. The most pronounced decline as is chinook.

32:05

And the the biggest factor in their decline in size as they return to the river has been their age of maturation.

32:17

So, they are maturing earlier, not staying out in the ocean, quite as long, and that's contributing to their smaller sizes as a return to the river.

32:29

There also has been a decline in their size and age, but the, the biggest factor is age of maturity.

32:39

Great, thanks.

32:41

So, related to that question, and so, Jim, Roberta, you may wish to Comment on this, too, as well. Question is, How are communities adapting to this shift in salmon populations?

33:02

Go ahead. And Roberta.

33:05

Um, there are folks who certainly catch salmon in the A-OK communities that we work with. Again, we work with them...

33:19

However, salmon aren't a primary source of food for A-OK communities, and so the observations aren't always salmon aren't always part of that scope and so, I don't I don't know if I have the best answer for that one.

33:39

Yeah, and I think, um, the decline of salmon in the Yukon watershed has had a very profound effect.

33:49

And one of the things that is happening is they're subsistence hunting and fishing.

33:59

Is it shifting more towards wildlife? So it's like to get their food requirements.

34:07

They're shifting to other species, which does bring also conservation concerns for the other subsistence fishing or hunting and fishing activities.

34:23

I am sorry, I just want to also add We did post A-OK related workshop.

34:34

Led by Elizabeth Liby, she's doing her PHD in fisheries at U A F.

34:38

And, um, it was exploring the northward movement of Salmon into the Arctic and one surprising takeaway from that gathering was that.

34:50

And you bet people aren't that excited about seeing salmon in the Arctic because, um, they may be starting to move into the areas where we harvest our regular white fish.

35:06

And so, maybe the seminar, taking up their space.

35:12

You should you guys can look into Elizabeth. She's doing her. PHD. On Salmon in the Arctic.

35:19

Well, thanks very much, Roberta and Jim.

35:21

And I'll add, you know, as as, um, the authors I have in the essay, the loss of salmon and even the ability even for subsistence fishing in the Yukon and cause Drainages wanted affects a huge area.

35:39

Chinook salmon, of course, had traditionally been harvested all the way into Canada's Yukon territory for nearly the entire drainage of the Yukon River.

35:49

And, and Fish camp is, is really a very, very, very important part of culture.

35:58

And, though, the inability to that is, it's not simply a matter of replacing the calories with some other fish, it's it's or some other food source.

36:09

It's, there's a whole cultural aspect that is lost with this collapse of fish.

36:15

and, you know, so, Jim also talked about how, you know, sockeye have been ranked at record high levels, and you might think, oh, that's great for, for fishers in Bristol Bay and in one way it is, but there's now so many fish that the price of the fish is extremely low.

36:31

Um, and so it's, it's who's benefiting from this, this tremendous increase in, in fish in many cases.

36:41

It's not folks that are fishing in the Bristol Bay region, um, so all of these things have significant economic and cultural impacts in right here in Alaska.

36:56

So, it looks like we've got a number of other questions on the, on the salmon theme. So, I think we'll stay with that.

37:02

So, um, uh, question, what about the trawling in Bycatch, and I believe that that is briefly addressed in the essay, Jim.

37:17

Yeah, so, the bycatch of salmon in primarily the Pollak Fishing Fleet, although salmon are caught in.

37:28

Other fisheries as well, it's been a topic of concern for four decades, it's it's highly regulated.

37:39

It's very well monitored and this is part of some of the conflicts that will arise as the populations decline.

37:51

Um, and, but ultimately, the decisions in terms of Allocating salmon to the different user groups is is Decision made at the North Pacific Fisheries Management Council and and they they they try to find balance that works for for everyone.

38:15

And all the work that we've done on Salmon bycatch doesn't indicate that it's taking more than one or 2% of the salmon and so, it's it's Not really the cause of the decline in salmon abundance.

38:38

If thanks and also for you, Jim. Question. Why are salmon maturing earlier?

38:49

There's been a couple of things, a couple of directions that people have been looking at.

38:58

I think what emerges um, kind of at the forefront is the warming temperatures in the Bering Sea is is accelerating some of the growth rates of salmon and that's causing earlier maturation.

39:13

There's also concern that harvesting large kings disproportionately might be altering their genetics and losing the capacity of the stocks to produce large fish, but that is no more of a long term concerning trend. Whereas, the more recent changes in sizes are tied more to warming in the marine environment.

39:44

OK, great.

39:46

All right. Let's see, I think I think we don't have any other salmon related questions.

39:52

So, we'll move on different topic, and this is a This is a good question.

39:58

What were some of the challenges faced this year for the Arctic report card, with observations considering the extreme weather conditions, Zach, take a stab at that.

40:13

Yeah, and I think observations are always tricky in the Arctic, really due to a sort of a lack of observations on the ground. So, for temperature data, for example, you know, we don't have weather stations necessarily on the Sea ice. So we rely on these datasets to sort of take observations from the land areas and sort of interpolate over the ocean, and we also rely on data from shipping cruises that do fieldwork in the Arctic in sort of. They can take weather station observations. So, it's always tricky looking at data in the Arctic, so we also rely on satellite observational data that can provide us at least a couple of decades worth of data.

40:53

Some other challenges I know from this year were like on the Greenland ice sheet, which experienced quite a bit of surface melt whom they even had rain at this sort of the top of the ice sheet at Summit. So, there were certainly challenges in the very large extent of Surface Melt on the Greenland ice sheet, and recording all of those observations.

41:13

Trying to understand, you know, what is the difference between sort of the long term trends were observing versus these extreme conditions. You know, these peaks and melting conditions are warm, so observations and gathering, this data is always tricky, and the Arctic report card really tries to summarize that information together.

41:32

All right, Great, thanks, Zach.

41:33

I'll add, you know, this year, in the Arctic report card, I think, for the first time, in our 18 years, we included, uh, a brief sidebar, in the executive summary, just a report on the extreme wildfire in Northern Canada.

41:52

And certainly, you know, with most of the north-west Territories, being happy to be evacuated.

41:59

You know, what we reported was what was available from the federal agencies, but, you know, when you're concerned about getting out of your town, you know, with, with fire, encroaching, the data is very preliminary. It's already being revised. Now that, now that the things are things are getting back to normal.

42:21

And so we will see changes in those final numbers Because of the direct impacts of this extreme weather on people that are charged as part of their job with gathering. Some of this very important information.

42:37

So, um, and as Zach said, always in the Arctic gathering information is difficult even in the best of times, and then you throw in life threatening conditions, it just makes it that much more difficult.

42:56

Alright, Let's see here.

43:01

OK, let's see.

43:05

This will be for Roberta, I believe, What is an essential tool resource used as part of working with Indigenous communities for monitoring trends in Arctic regions?

43:21

Um. Good question.

43:24

So, we work with ... observers in four communities in Alaska.

43:30

And each of the observers send in observations in different ways. We have one observer that writes in a journal and mails that to U A F every month, once a month.

43:43

We have one observer who uses a phone app on their smartphone to document observations and then people who take photos and send over e-mail on daily to weekly.

43:56

And so I think the essential to our tools and resources are the observers who are going out and documenting those observations. And we don't use a lot of instrumental things.

44:14

We do have a CTD that we deploy in Kotzebue sound every year under the ice too, to monitor ocean temperature, salinity and productivity.

44:26

Um, and so that maybe that's a tool that we're using, but as far as, know, the core of our work, it's people.

44:37

And that's been the best answer I have.

44:41

Great, thank you very much. And just for just for clarity, could you, could you spell out what CTD means?

44:49

Conductivity, temperature at depth.

44:54

So it's a it's an underwater instrument that's measuring things like temperature and salinity as well.

45:01

Yep. All right, great.

45:04

Let's see here. We're running towards the time, to our time here. Let's see, I think we can get in a couple of more. We've got another salmon question. Um, so, Jim, are there any indications that salmon are having trouble finding food or not finding the best foods that they want or need?

45:28

Yeah, one thing that's kind of important to keep in mind is that the bidding strategies for each species of salmon is quite different.

45:37

So, there's not going to be like a universal pattern that would be applicable to all species.

45:45

But I some of the work that we've been doing in the Northern Bering Sea studying the juveniles we've, we've identified that the amount of food in the stomachs of salmon has declined with warming temperatures.

46:01

So, that, in part, probably points, to reduce the amount of food, that they're able to find it, but, there's other complications, because they, then the metabolism will be higher at warmer temperatures.

46:14

So, A it's not exactly just reduced food abundance, but the one thing that's happened with Chum Salmon is they feed on gelatinous zooplankton And what's so different about gelatinous plankton, compared to fish as prey source is there can be large variation in the quality of that trade, kind of a five fold difference, depending on the species, or the life stage of gelatinous zooplankton.

46:48

And when the species that are of poor quality increase in abundance, it causes the: the nutrition you might say, of their diet to decline.

47:02

So, chum salmon are in particular susceptible to changes in food quality.

47:10

And, yeah, we so, we've been able to show that that just feeding on some of those poor quality prey is causing the fat stores or the condition of chum salmon to decline.

47:27

OK, excellent.

47:29

All right, so, question, and I can take this one, can you speak about fire and permafrost disturbance observations in 2023?

47:40

Will new components like wildfire be considered in a future Arctic report card given increasing frequency? So great question.

47:50

So, as far as the impacts of the 2023 wildfires on things like permafrost, those are pretty grounded intensive type work and so that that kind of work will be being done in the coming seasons.

48:05

The Arctic park report card, that we really have three different kinds of essays, we have what we call our Vital signs. Things like temperature, things like sea ice, that report, on every year, wildfire comes into that category that we call our indicators where that we report on less frequently than yearly. We've had wildfire essays in both 2017 and 2020. Obviously, between the 2023 wildfire in Canada, 2022 extreme wildfire in Alaska 2021 in Siberia.

48:42

We are due for another wildfire essay and good that we're going to see that in 2024.

48:50

Um, so, we do try to, over, because this is an annual publication, we do try to cover a very broad range of topics over the years, in a way that we can't do every single year.

49:07

Alright, let's see. I think we're almost out, and it looks like we got one more question from the chat here.

49:14

Um, it's almost time to talk about climate change at the dinner table with relatives.

49:22

What is the one major takeaway you'd like to leave us with the challenges we're facing in the Arctic and a positive action for the future?

49:31

And, I'll start there with Zach.

49:35

one takeaway, yeah, I'll keep my answer is simple when you know climate change in the Arctic, it's happening now and we're witnessing the effects when ecosystems and when people that live in the Arctic and in for reaching from the Arctic.

49:50

And I think one positive note about that is we often get asked about sea ice and what the future of it looks like in, whether we're going to see an ice free summer. And I think the good news is, from the modeling side of things is we're not necessarily locked into an ice free summer and the decisions we make going forward in the future about greenhouse gasses and how much is emitted over time can still sort of limit to a reduce the probability. And ice free, Arctic.

50:18

And to me that is a really positive note that we're we're not necessarily doomed to this possibility yet.

50:27

All right, to Zach's right on my screen is Roberta.

50:34

Yeah, I think I just would like to reiterate my earlier remarks, which is a message of strength.

50:44

You know Indigenous people in the Arctic are strong.

50:47

We don't have a, We have a positive mindset about the future and we recognize that moving forward requires a diverse group of people and so it, we just need to come together. And I would say don't talk problems, Talk solutions.

51:08

Jim?

51:11

Yeah, yeah, just to reiterate what's already been said.

51:14

You know, it's it is you know, climate change is is is here now it's it's it's affecting or ecosystems.

51:24

And it's having an effect on communities not just on the coasts but throughout Alaska.

51:31

And it's, it's the it's accepting that this change is occurring now.

51:38

And developing good communication and strategies for how to account for this and to you help communities with their resilience to, to these changes in the ecosystem.

51:57

All right, Thank you three of you for your responses. I will add there.

52:03

Good thing about going last is all the important things have already been said, right?

52:07

Um, people of the Arctic are, are resilient. We will, we will get through. We will go on.

52:16

Um, and as Zach said, you know, we all have a part to play. None of us can do this by ourselves.

52:24

But all of us have a hammer, something that we can contribute to getting through this too.

52:32

Too adapting to mitigating we know why the Arctic and the world is warming and we know what we need to do.

52:41

And so I think, um, I think that is really The message that I try to leave is. there is hope.

52:49

But hope is not a solution.

52:52

We all need to do what our part.

52:58

So, with that, I think we will wrap it up. I'd like to thank everyone for your questions.

53:05

I'd particularly like to thank our panelists here, and doctor Kapnick, NOAA communications and last reminder: the Annual Arctic Report Card is available online at [arctic dot NOAA dot gov](http://arctic.dot.NOAA.dot.gov). There's a link right at the top there that you can get that, and it's also in the chat there. So, thanks again, everyone. We look forward to working together in the future, and happy holidays. Thank you

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