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"I start to doubt whether any of my actions will matter": youth activists' experiences and expressions of the emotions associated with climate change

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Abstract
This study provides insights on the ways that youth express and process the emotions arising from their involvement in climate action. The specific objectives were to: (1) understand the ways youth come to know, conceptualize and reflect on climate change, (2) explore how youth's emotions in response to climate change impacts their everyday lives; and (3) determine the modalities in which youth are expressing and processing such emotions. We used a grounded theory approach and the photovoice interview method to elicit participant's views on climate-change-related emotions and interviews were analysed using qualitative data analysis software according to a grounded theory approach. The study resulted in identifying key themes, as well as supports for youth experiencing difficult emotions associated with climate change.

Keywords Climate grief · Eco-anxiety · Emotional processing · Photovoice · Youth activism

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1 Introduction

Youth are increasingly taking on roles in environmental activism, such as the Fridays for Future movement and Global Climate Strikes, both of which were spearheaded by youth leaders. As a result of their involvement in difficult topics such as climate change and large-scale biodiversity loss, youth are experiencing increasing impacts to their social and mental wellbeing (Cianconi et al. 2020; Palinkas and Wong 2020; Vergunst and Barry 2022). There is no formally defined mental health disorder or diagnosis to describe the emotions that are often associated with an awareness of human-caused climate change. However, such emotional states have been associated with a variety of acute and chronic mental illnesses (Bourque and Cunsolo 2014; Cunsolo and Elis 2018). "Climate grief" is one of several general terms used to encapsulate negative emotions such as cognitive dissonance, sadness, and other forms of pain that people feel when experiencing loss associated with a changing climate. Related terms include "ecological grief" and "solastagia" (Randall 2009; Cunsolo and Elis 2018). Despite an emerging lexicon of words to encapsulate such emotions, the ways that people express and process climate grief are insufficiently developed (Pihkala 2018; Park et al. 2020). The knowledge gap regarding the expression and processing of emotions continues to exist in the literature at the cross-section of youth and environment (Neas et al. 2022; Jones et al. 2023), even with a growing literature on youth engagement and action (Zurba et al. 2020). Understanding how youth express and process such difficult emotions is crucial for contributing to health and educational interventions and community spaces that support people in discussing, visualizing, and processing feelings associated with loss (Moser 2012; Davenport 2017). In this study, we define 'expression' as describing or depicting emotions through words or visual representations such as art, and define 'processing' as engaging in actions that help with the integration of emotions. These processing actions may be similar or the same as the forms of expression, or can involve more inward processing, such as simply mentally reflecting.

The purpose of this study was to provide insights on the ways that youth express and process the emotions arising from their involvement in climate action. This purpose is supported by the following research objectives: (1) understand the ways youth come to know, conceptualize and reflect on climate change, (2) explore how youth's emotions in response to climate change impacts their everyday lives; and (3) determine the modalities in which youth are expressing and processing such emotions. In this study we consider youth to be young people between the ages of 15 and 24, based on the United Nations (UN) definition of youth (UN 2019).

2 Background: emotional impacts of climate change and youth activism

Canadians are already experiencing the impacts of climate change, including unpredictable and severe weather (Mekis et al. 2015), drought (Peng et al. 2011), wildfires (Hope et al. 2016), loss of shoreline (Vasseur et al. 2017), drastic reductions in the area and thickness of Arctic sea ice (Pearce et al. 2015), and influxes of invasive species (Burke and Carroll 2016). An exponential growth of global youth movements has coincided with the growing awareness of climate-change impacts (Cloughton 2021). Greta Thunberg, a young Swedish

activist, has argued passionately that action to stave off the climate emergency cannot be delayed further, and that political leaders should embrace radical social, economic, and ecological transformations (Kowasch et al. 2021). She inspired the climate protests of the Fridays for Future (FfF) movement, which started in late 2018 and have grown to be the largest in history (Kowasch et al. 2021; Zurba et al. 2020). The young activists of FfF received attention because of their continuous protests every week in many different locations worldwide, including Canada. There were reportedly more than 3 million people at the strikes on 20 and 27 September 2019, which took place in more than 150 countries (Fridays for Future 2019). Other influential, pro-environment youth initiatives have been spearheaded by local and Indigenous youth, such as Autumn Peltier, the Anishinaabe youth from Wiikwemkoong First Nation on Manitoulin Island, Canada (The Canadian Encyclopedia n.d.). These movements have created new spaces for youth voices to be heard (e.g., at United Nations events), and important shifts within environmental organizations are underway to accommodate and support youth engagement and leadership in the environmental sector (Zurba et al. 2023).

Environmental impacts have not only had significant effects on Canadian environments but have also affected peoples' mental and emotional health. There is no formal named disorder or diagnosis surrounding the emotions that are associated with a changing climate; however, such emotions have been associated with a variety of acute and chronic mental illnesses (Bourque and Cunsolo 2014; Cunsolo and Ellis 2018). Despite there being no formally defined diagnosis, it is now known that children and youth are disproportionately affected by the impacts of climate change, not only psychologically but also physically, socially and neurologically (Hickman et al. 2021). The severity of the impacts on youth from climate change may be affected by their generational position (e.g., 12 year old vs. 24 year old) and other demographic characteristics, such as their socio-economic background or belonging to a racialized group (Skeiryté et al. 2022). Enhancing understanding around how youth conceptualize climate change, think about their role in combatting climate change, and express and process thoughts and feelings about climate change is therefore necessary.

3 Methods

In this paper, we used the grounded theory approach (Charmaz 2001, 2014) to elicit data from youth with the goal of understanding the thoughts and experiences that they associate with negative, climate change related emotions. Grounded theory emphasizes the systematic and iterative process of data analysis to develop theories or explanations grounded in empirical evidence. The photovoice method was used to engage youth in the development of a grounded theory that relates to "climate grief". The use of photovoice in the context of grounded theory "empowers people to develop a critical assessment and grounded theory of their reality, share this information with important stakeholders and promote change based on these insights" (Freedman et al. 2014; p. 1303). This research project went through a rigorous ethical approval process through Dalhousie University's Research Ethics Boards (REB) and is in accordance with the Canada Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans (Canadian Institutes of Health Research et al. 2022).

3.1 The photovoice interview method

We used the photovoice interview method to elicit participant's views on climate-change-related emotions. Photovoice is a participatory method, which involves participants creating photographs to record and reflect on issues significant to them, and ways in which they view themselves and others around them (Wang and Burris 1997; Strack et al. 2004; Keller et al. 2008; Mitchell 2011). It entails the combined use of photography, critical dialogue, and experiential knowledge (Sutton-Brown 2014), and has been noted as useful to prompt 'thick descriptions', which are deep expressions of personal experiences or events (van Manen 1990; Woodgate et al. 2017). Photovoice is accessible, engaging, and flexible for research that creates a safe space for participants to consider and explain difficult thoughts and feelings (Carruthers 2006; Cooke 2015; Pope 2014), such as those associated with climate grief.

Photovoice recognizes the importance of amplifying voices of marginalized groups that enable events and perspectives to be shared through photographs. This gives the researcher the opportunity to see the setting through the eyes of the participants and creates the potential for participants to share 'thick descriptions' (Mukubang and van Wyk 2020). Thick descriptions are highly detailed and layered accounts of people's experiences, and are highly appropriate for research that aims to explore meanings through collaborative and/or participatory research processes (Sankofa 2023). It has been used as a major approach for engaging youth in research because it has the most potential to create meaningful experiences and achieve knowledge translation (KT) for youth participants (Woodgate et al. 2017(1); Woodgate et al. 2017(2). It is viewed as a useful strategy for obtaining experiential descriptions from individuals (Badanta et al. 2021; Boamah et al. 2022) as an unobtrusive way of entering the worlds of participants.

3.2 Recruitment and demographics

Youth were recruited through social media, community groups, and organizations focused on climate change. In order to be eligible for this study participants were required to be 15–24 years of age and self-identify as a climate activist. Figure 1 is the graphic that we used to inform potential participants about the project and its requirements. We emailed potential participants with the research information, asking them to share this information with their friends and acquaintances. Youth who were interested in the study then reached out to the project team, had an introductory conversation to explain about the study and asked to read through a participant information sheet before they signed the consent form. After this, they were given up to two weeks to share their photographs with the research team, scheduling an interview to discuss their images.

Fifteen youth took part in the photovoice interview process. They were asked to take five pictures that represented climate change to them, and they were asked to talk and reflect on the pictures they took during an interview. Each participant took 5 to 10 photos resulting in a total of 88 photos taken for the project. Participants came from several provinces across Canada, including Nova Scotia, Manitoba, British Columbia, Ontario, and Alberta. Most participants belong to one or more equity seeking groups, including Women, 2SLGBTQQIA+ (two-spirit, lesbian, gay, bisexual, transgender, queer, questioning, intersex, asexual, and all other sexual orientations and genders), BIPOC (Black, Indigenous, and

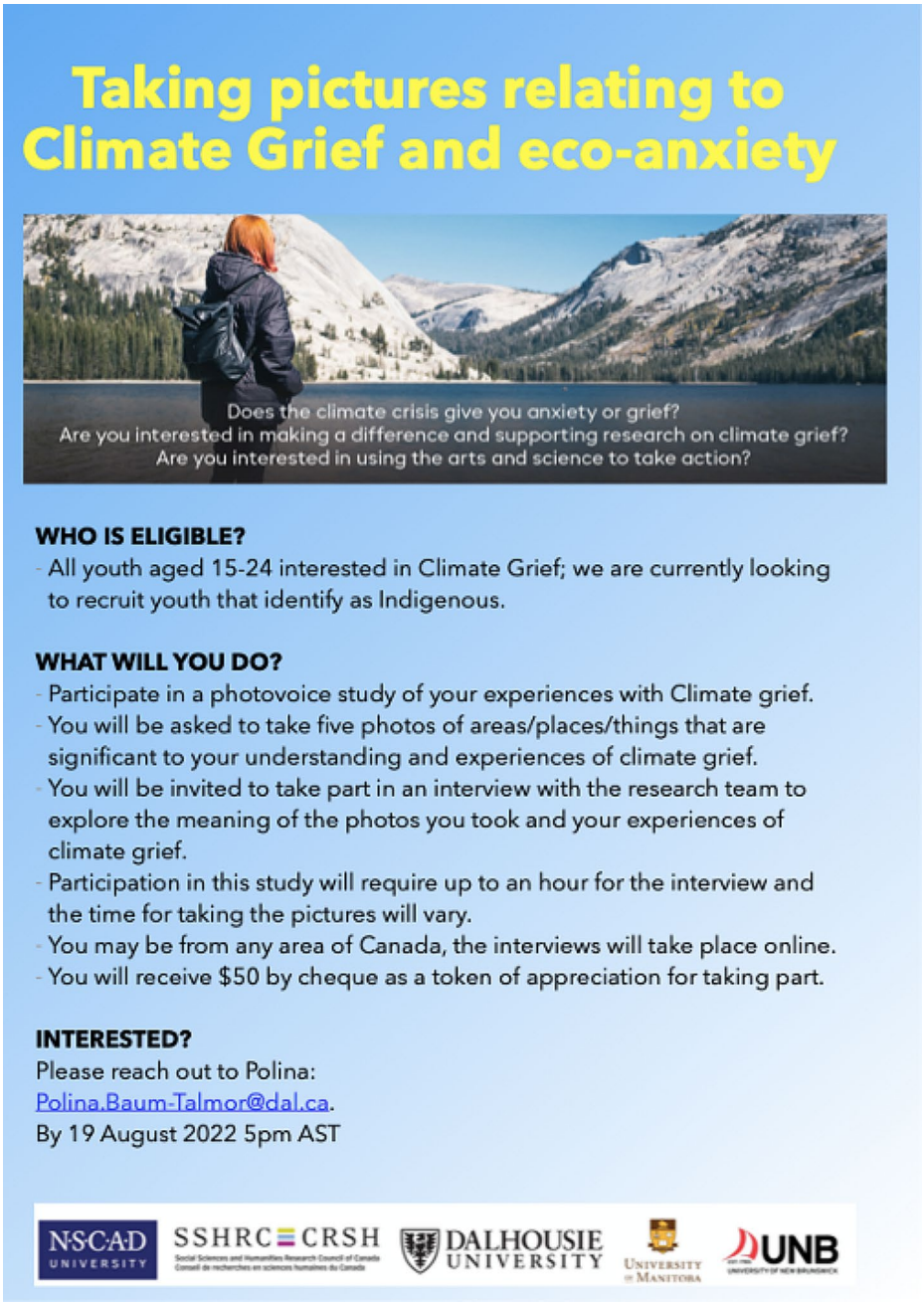

Fig. 1 Research recruitment poster used on social media and emails

People of Color), and People with disabilities. Table 1 summarizes the demographic characteristics of participants.

3.3 Data collection and analysis

Data were collected and analyzed between February and August 2022. Semi-structured interviews were conducted to explore the meaning and significance of the photos that were taken. Interviews were used as personal reference points where youth were supported in expressing their authentic thoughts and feelings (Woodgate et al. 2017(1). Interviews took place online and were recorded. Participants were encouraged to give detailed responses to facilitate the generation of new knowledge and guide the interpretation of their responses (Lincoln et al. 2011). The interviews conducted for the photovoice component took between approximately 40 to 90 min, where the majority lasted about an hour.

An interview guide was used and followed the same structure across all participants. The interview guide was divided into two parts, one focusing on general questions (i.e. 'ice breaker' questions, questions about participants' background and the representation of climate change and climate grief in their lives), followed by a set of specific questions relating to each of the photos they created (i.e. can you tell me about this picture, how is climate change represented in this picture). On one occasion, the participant asked to be interviewed with the camera turned off. This resembled a phone interview (Shuy 2001) in which the participant was asked the same questions, but the researcher often asked for clarification for aspects of their answers that were not clear (i.e., something that would be easier to gauge through body language). Common interview strategies, including the use of silences, calls for examples, and probing questions to extend participants' statements were used to facilitate discussion. The interviewer also worked to establish a safe, comfortable, and trusting research environment with no demands placed on participants to respond in a certain way. All interviews were digitally recorded and transcribed verbatim to preserve their authenticity.

Table 1 Participant demographics

Pseudonym	Age	Gender	Equity seeking groups (manually)	Location
Abby	22	Chose not to respond	Choose not to respond	Nova Scotia
Fay	16	Chose not to respond	Women, 2SLGBTQQIA+, BIPOC	Ontario
Elsa	20	Female	Women, 2SLGBTQQIA+, BIPOC, People with disabilities	British Columbia
Bobby	17	Female	Women, 2SLGBTQQIA+, People with disabilities	Ontario
Loki	21	Chose not to respond	Chose not to respond	Ontario
Bella	21	Female	Women	Alberta
Kyle	22	Chose not to respond	Chose not to respond	Nova Scotia
Miki	22	Chose not to respond	Chose not to respond	Nova Scotia
Rami	24	Female	Women, BIPOC	Ontario
Fargo	19	Female	Women, BIPOC	Alberta
Colin	21	Male	2SLGBTQQIA+	Nova Scotia
Fiona	15	Female	Women, 2SLGBTQQIA+	Ontario
Nella	21	Chose not to respond	Chose not to respond	Manitoba
Sofi	23	Female	Women, BIPOC	Ontario
Sam	25	Chose not to respond	Chose not to respond	Nova Scotia

To maintain participants' anonymity, pseudonyms were used. The data used to inform our analysis included photographs (i.e., content of photos) and interview transcripts. Data were analyzed in two stages. The first stage of analysis started through reflexive notes taken during the recorded interviews, where initial interpretations were noted. These notes were mostly written on paper that helped the interviewer to keep track of the follow up questions and important aspects of the interview. The second stage incorporated the code-and-retrieve method which involved methodical coding of the raw data. The concepts of "code" and "retrieve" are closely intertwined with the grounded theory approach in qualitative research (Charmaz 2014; Saldaña 2021). Coding plays a central role in grounded theory, identifying and categorizing patterns and concepts within the data. Through the process of open coding, we assigned initial codes to segments of data to capture key ideas, actions, and phenomena. These codes were then further refined and developed through axial coding and selective coding, allowing for the emergence of core categories and theoretical insights. The iterative nature of grounded theory analysis involves constant comparison, whereby codes and categories were continuously revised and redefined based on new data and theoretical insights. The retrieval aspect in grounded theory involved systematically returning to the coded data to extract relevant segments for further analysis and theoretical development. This method enabled us to move away from data description to data conceptualisation (Charmaz 2001) using Nvivo qualitative data analysis software. By analyzing participants' interview transcripts together with the accompanying photographs, specific themes and codes were formed, which enabled researchers to gain a deeper understanding of the data.

4 Results

Following the objectives of the study and the coding protocol outlined above, the results fell into four major themes: (1) Ways youth come to know, conceptualize and reflect on climate change, (2) Emotions and impacts on the everyday lives of youth, (3) Modes of outward expression of thoughts and feelings related to climate change, and (4) Ways youth process thoughts and feelings related to climate change. These data presented under each of the major themes have natural interconnections and build on each other; therefore, there are often references to topics of previous themes in each (e.g., youth would describe their emotions in order to also describe how they were processed).

4.1 Ways youth come to know, conceptualize and reflect on climate change

At the start of the interviews, participants were asked what comes to mind when they hear the words "climate change". In many cases, participants addressed the complexity of climate change and ways it impacts their lives on a daily basis. For example, Kyle talked about the inaction in society, how people are "really struggling to grasp the scale and the shift that's happening*"* in relation to climate change. He continued to say that *"*I see it as a storm brewing and a feeling of inability to act on it or change our situations as a society." Kyle's bleak perception of climate change was shared by other participants who referred to the words "climate change" as evoking "negative feelings," and used words like "extinction," "habitat loss," and "urgency". Loki discussed the vagueness that accompanies hearing about climate change, referring to it as a "buzzword" and "a big and wicked problem". Despite the

vagueness, Loki noted the "sense of urgency involved" as something she encountered on a daily basis on the news and social media. The imminent nature of climate change combined with the vagueness of its definition often led to increased anxiety and stress that participants spoke about.

Once the initial perception of climate change was established in the interview, participants were asked to talk about their first encounter with climate change and the first time they remembered learning about climate change. Ways in which youth come to know and conceptualize climate change were generally identified as events that happened while they were in school, through media, or in discussions with family and friends. One example was Bobby's description of a significant moment in her life that marked the realization that climate activism was her passion (Fig. 2, A). Bobby explained that she "chose to do [the photograph] in a black and white filter because I felt like it was such a bright moment for me, but it had really dark aspects and kind of a feel of loneliness in my life."

Bobby mentioned that she feels "a tremendous pressure to know everything about the climate" and "a responsibility to advocate for the climate." She expressed feelings of alienation from her peers as a result of her activism, and described them as being "completely in denial of change, or [they] think I'm, you know, a little bit crazy." Bobby also mentioned feeling exhausted and "almost embarrassed" by the conversations she had with her peers.

Fig. 2 Photographs (portrait orientation) by youth climate activist participants

Other participants connected what they learned in school from teachers and how they eventually changed their behaviours. For example, Kyle stated how he learned about the connection between food production and climate change from his teacher and decided to take on a vegetarian diet and started cooking for himself.

Participants were also asked to reflect on their thoughts and perceptions about the future. For example, Abby talked about a picture she had taken of her cousins in Toronto (Fig. 2, B):

> I think teaching kids about what's going on but letting them know that there are things we can do to help is really important…Learning about these things, and then taking action is empowering… I definitely think about kids a lot when I think about climate change because it's a little unsettling to think about what kind of world younger generations will have.

Thoughts about the future and the future generation dominated the conversations with some participants, who talked about the kind of world people will face in 40 or 50 years. One example was when Miki talked about a picture she took during a protest in Halifax in 2019 (Fig. 2, C).

> This was an elderly individual who showed up to the climate strike, and their sign said 'I care about my grandchildren's future', and that just hit me really deeply. And I know that my grandparents do feel this way as well. And even [people of their] age are really concerned about if we have children, what kind of a world are our children going to grow up in? …But when these things seem to be totally out of your control, what are you to do other than bring it to the attention of leaders, or decision-makers.

Other participants were concerned about the older generation and felt that there was a lack of care. For example, Rami stated:

> "I do feel like we're going in the right direction in some respects, but I also feel worry because right now the folks that are very much not caring about environment or the impact of climate change… and I'm making assumptions here, but tend to be like the older population, whereas generally, I think the younger population right now feel very strongly about the environment and climate change.".

Similarly, Colin stated "I guess for a young person, if they consider having kids or anything, you have to consider if that's a smart idea. If it's a long term thing or if there's a planet for a long time". Elsa also noted how she felt that she cannot plan for the future due to uncertainty associated with the changing climate, noting that "I don't really think of anything long term anymore… because I'm so uncertain about what's going to happen…I mean, parts of where I live are supposed to be underwater, not for a while but still it's just something that I think about." Thoughts about the future brought up negative emotions for Elsa and others, which some described with 'dread,' 'scary,' 'uncertain,' 'frustrated,' and other similar terms. These feelings were often complex and even contradictory and were expressed in different ways.

4.2 Emotions and impacts on the everyday lives of youth

Some participants expressed powerful emotional impacts that climate grief had on their lives, which led to feelings of anxiety, guilt, and anger, feelings that endured consistently in their daily realities. For example, Fay shared how anxiety over the changing climate shaped every aspect of their life and impacted their lived experience, including regularly feeling overwhelmed by the climate crisis. Others felt that their daily or routine actions like flying had become charged with feelings of guilt and conflict, impacting other spheres of their lives. Fargo, for example, talked about her feelings of guilt when flying, and used a photograph she took of a plane's wing against the sky as an illustration (Fig. 2, D).

> Every time I see a plane I cry lately, cause I watched some documentary about how every time you get into a long plane ride, you melt a square meter of ice in the Antarctic'…now every time I get on a plane I'm always considering, is this necessary? Living in a different country than where most of my family is—that's really hard. Just this weekend, my dad's getting married, and I'm not going.

Fargo's flight-related guilt was common among other participants.

Several participants throughout the study tried to escape the feelings and realities of climate grief. Some specifically talked about being overwhelmed by reports in the news and on social media, while others felt climate grief was affecting other aspects of their lives. For example, Miki talked about feeling overwhelmed when she looked at maps:

> Most major cities in the world are located on coastlines, many of which are below 10 m above sea level and are at risk of being swallowed by the ocean in the next 10 to 20 years. It's kind of hard to even fathom that. Some of the places that I visited may not exist when I'm 45. And that's crazy to me.

Some also talked about seeing the Intergovernmental Panel on Climate Change (IPCC) reports and other climate related science and how it affected their stress levels.

Shock was also mentioned by participants in response to witnessing climate events such as flooding, forest fires and pollution. Bella, for instance, talked about the forest fires in British Columbia in 2021 (Fig. 2, E).

> Over a month we had sunsets that were hot pink, and that was because of the smoke and we had a large amount of smoke in Manitoba, a few provinces from BC and Alberta that were having these huge fires… That was quite shocking because I had worked in the summer before and I do not remember the forest fires last that long.

Bobby, for example, shared her sadness from witnessing personal experiences of flooding in her area which she associated with the changing climate:

> We do have really high water levels in my area already. And so when it floods, they overflow… It's incredibly saddening … I get nervous about it just because I've had my own personal experiences that have been not traumatizing, I guess, but has kind of led me to think of certain things like when I think of climate change.

This sentiment was present in other interviews, especially when participants reflected on being told stories of past days. Kyle shared a story about the ice and changes in climate that he heard:

> So our Inuit traditional stories, I can think of those stories that people have maybe taken for granted for so long. Having the ice thick enough and solid and in the condition that can be passed on for hunting, like walked on as a pathway… But now the children are listening to this story and trying to learn and trying to collect this knowledge and pass it on. They'll ask the storyteller or the truth keeper. Well, in your story, ice is still solid. Why isn't the ice solid at this time of the year? Why don't we do this hunt anymore? What has changed?

The negative emotions associated with death were also noted by Elsa in relation to the heatwaves experienced in British Columbia.

> At the end of June, we had a horrible heatwave. it was the worst heat wave in Canada… So many marine invertebrates, so many marine animals died… It smelled like everything was dead.
> When reflecting about practices in their day-to-day life, participants often talked about consumerism, including their own. Miki reflected on consumerism and how "We have become such a disposable society" and how change could come through "changing human behavior that would change the practices of industry, because if there's no demand, there's no need to supply it."

Despite the often-bleak display of the physical conditions relating to climate change, many participants noted hopeful emotions and Nature's resilience in the face of adversity, believing that Nature will persevere and adapt despite the extreme changes that are happening. Abby, for example, explained why she took a photo of bees and flowers (Fig. 2, F).

> It makes me hopeful when I see [the bees and Nature], just Nature doing its thing, it's definitely helpful seeing animals and plants and bees doing their thing, just going on about things as usual.

Similarly, Fay said:

> "It goes back to reminding myself that without this land, if we're just humans, the land doesn't need us. We need the land. Right? We need Earth, Earth doesn't need us.".

This positive view of Nature's resilience was a point of encouragement and source of hope for some participants, which helped them cope with their individual climate grief.

4.3 Modes of outward expression of thoughts and feelings related to climate change

The youth participants had different modes of outwardly expressing their thoughts and emotions in relation to climate change, and often stated that their emotions were connected

to their different forms of expression. For example, Fay discussed their feelings of anger, frustration, sadness, and burnout when she felt that she saw no evident results from her activism. She used a screenshot of several news headlines to represent this frustration and the persistence of climate change as an issue (Fig. 3, A).

> I've been involved with the climate movement for the past two years now… When I see headlines about an issue that we're campaigning for or against, it makes me [feel sadness]… It's anger but almost frustration and anxiety mixed together. Because we're doing so much… It's that feeling of almost helplessness.

The feelings expressed by Fay were common, and many young people exhibited similar sentiments of frustration with the system and larger corporations for not doing more for the environment. For instance, Rami, expressed her frustration by saying, "Sometimes I start to doubt whether any of my actions will matter. When it really is, in my opinion, the larger corporations and businesses that need to make these changes because they have the largest carbon footprint."

Some youth expressed how they felt proactive and inspired in the face of adversity, which motivated them to take action. Kyle, for example, decided to express his concerns for the climate by living off-grid. For others like Bella, the inspiration for her choice of occupation and education was attributed to the adverse impacts on the changing climate. She noted how she feels inspired in her area of study in environmental sciences as well as through acts of change she sees in everyday life, such as individual changes, the creation of environmental school clubs, and Sustainability Day.

In other cases, the youth participants talked about how expression of emotions related to climate change needed to be more radical. Miki talked about this in relation to a photograph of writing on a wall, and how it represented fear and the ways in which she talks about climate change (Fig. 3, B).

> If I phrase [the way I talk about climate change] in a negative way, it scares people too much… But there are some people that are not afraid to take a more radical approach to this and just be very brutally honest about what the effects could be, you know, climate change will kill your children. Not might, it will.

Some participants shared that expression was difficult for them and that they wish the feelings and reactions were something that could be turned off. For example, Bobby expressed 'terror' and feeling alone in what she described as "this big kind of doom over my head, and it's not that I don't want to know, it's just sometimes I wish I could turn that dial off". During her interview, Bobby noted several times how climate grief has impacted every aspect of her life, up to a point where she needed to 'take a break' from her climate activism in order to regain her emotional and mental health.

Some participants talked about being 'excited' about climate change and seeking the opportunity to make a difference or feeling empowered by joining existing climate activist movements. For instance, Fiona stated:

> "I'm very lucky to have a place like Friday's for future Toronto where I can take my willingness to create collective action and put it into action with youth that are like

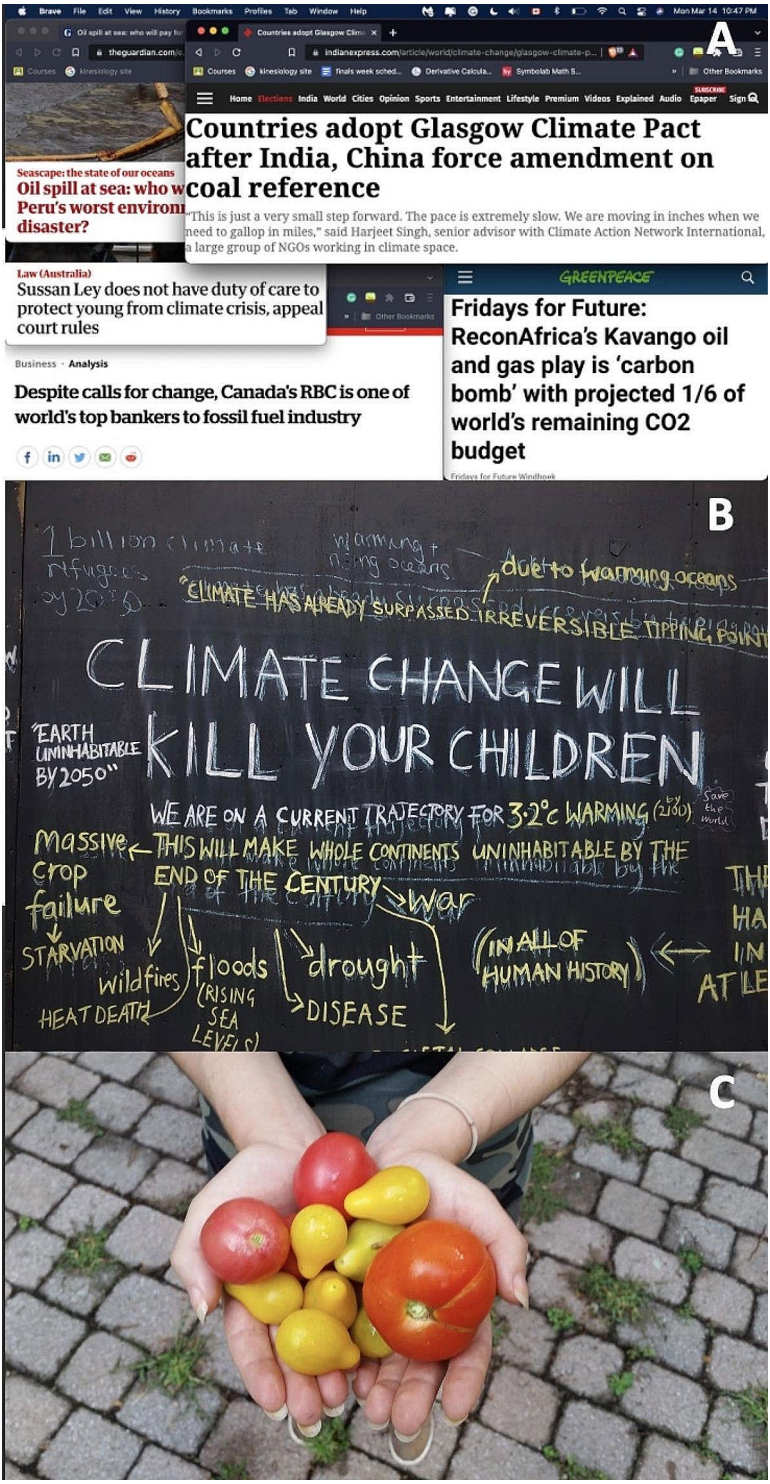

Fig. 3 Photographs (landscape orientation) by youth climate activist participants

> minded in terms of solving climate change and climate justice… In every action I take, and everything I do in the movement, I have a lot of hope. ".

Some participants enjoyed teaching others about climate science, the climate crisis, and actions they can take as a way of dealing with their own climate grief. Abby, for instance, mentioned this point when she was teaching her cousins about climate change and when she was teaching other youth in summer camp. Bella told us about her experiences with invasive species and how she enjoyed educating the general public about this subject, sharing the inspiration behind her actions:

> It was a mixture of science and then talking with the public, which was my favorite thing to do… talking about science to people in an easy to understand way and get them passionate about it.

Other participants talked about the actions of others, especially of people with power. Sam noted how "If [world leaders] don't take action right now, I don't feel hopeful". Participants also talked about how the scale of climate change affected how hopeful they felt. For example, Miki stated:

> I think that my generation is feeling really overwhelmed with what we have to take on in order to tackle climate change. And if we aren't able to make a breakthrough in the next couple of years, we will inevitably experience these changes around the world and there doesn't seem to be anything else we can do to slow it down or stop it. So, it's going to change our lives in some capacity. We just don't know exactly how yet. That doesn't make me hopeful for the future.

4.4 Ways youth process emotions related to climate change

Participants described several ways of processing and coping with the emotions they have encountered as a result of climate change. This involved actions that ranged in scale from short-term actions to long-term changes in lifestyle. In several instances, the modes that youth outwardly expressed their emotions (Sect. 4.3, above) were also described as the ways that youth processed their emotions. For example, having no one to turn to, Fay became more involved in helping others to deal with climate grief through education and training, such as through organizing events relating to climate grief and anxiety, meetings with students and school boards, and helping teachers to deal with students experiencing climate grief.

For some participants, the use of humor was a way of dealing with hopelessness and despair. For example, Abby talked about her experience as a youth guide in a summer camp:

> "If there was a forest fire nearby we would just joke, 'Oh, you know, can't wait for the whole world to do that'… understanding this is something that affects us, but using humor to kind of deal with it… I think it does help in the sense of like, knowing that other people also are worrying about these things.".

As mentioned earlier, some participants processed their emotions and felt empowered by making comprehensive changes to their lives, such as Kyle's decision to live off grid. Kyle described himself as an avid gardener and explained his attempts to be as ecological and sustainable as possible. Kyle talked about a photograph of tomatoes that he grew (Fig. 3, C).

> My understanding of these [food] systems is one that fills me with dread for the climate… It's an overwhelming amount of different systems and companies and groups that make it possible for us to have the grocery tomato, but in reality might be a kind of chain and ball or our own demise as a species…[Rather than thinking in terms of 'carbon footprint I think about] the positive impact of making a large footprint of impactful change and addressing issues and empowering others to do the same.

Other participants described actions they took in their personal lives as a way of gaining control and trying to cope with a situation outside of their control which often brought feelings of frustration, helplessness and despair to their lives. Sofi, for example, shared scientific reports about climate on social media, while Sam has been taking several small actions to cope with his climate grief, including the planting of trees and using reusable bags when he goes shopping. Other participants mentioned driving less, composting food waste, gardening, growing their own food, and using recycled materials for clothing and building, among other things. Rami, for instance, shared how she participated in litter cleanups with her local community and turned off the lights during certain hours on Earth Day.

Some participants talked about the mixed impacts of participation in activism on their ability to process their emotions, while others felt that such experiences are powerful, inspirational, and to some extent, cathartic. For example Fiona stated:

> When I go to protests, I have my megaphone, and it's always really nice to be able to yell at the top of my lungs at the government or banks. I think that's really impactful. I think a lot of youth in the climate space can relate to being able to just literally yell.

Families provided inspiration for many actions taken by youth. Many participants also mentioned the importance of being part of a community that supported them in their activism and how this was especially important for them being able to process their emotions. One example is Nella, who noted how her upbringing influenced and inspired her actions, coming from "genuine passion for the environment." Fiona also stated, "Finding the communities and finding the people that are like minded to myself… They help inspire me every day to take action." Rami also stated, "When you are in any movement, when you feel there are numbers and there's large numbers, it motivates you." While some participants took personal actions and participated in environmental activism in their daily lives, others took more direct action by participating in citizen science activities like taking samples and monitoring wildlife. For instance, Elsa described how she shifted her actions from directed protests and climate strikes to doing "hands on kind of work" on a smaller scale, including "restoration work or monitoring marine invertebrates in a park".

Talking and communicating with similar-minded people was the most cited way of dealing with climate grief. Abby, for instance, noted how it "helps being around other people that understand these issues". In a similar way, Bobby talked about how it helped her to know that she was not alone in her climate grief:

> It is incredibly helpful to me, being seen, not alone. If it's digital, I feel I find solace in the fact knowing that there are other people who experienced this and that will help me push forward because they'll motivate me and be like, 'No, your work is important. You're important to this movement. And we need you. We need everyone'. And so that motivation, and that kind of perseverance for other people is incredibly inspiring to me.

Several participants also discussed engaging with the arts. For example, Bobby noted how she finds the combination of climate science and art "comforting" and "an incredible way" to get people engaged. Art, in her view, provides an "emotional representation to something that is so factual." Participants like Bella, Bobby, Colin and Elsa emphasized the importance of making climate science accessible to the general public through the use of art, among other things, as a way of inspiring people to care more about the environment and take big or small actions on climate change.

Disconnecting from different forms of climate expression and activism (e.g. news about climate change and activism) was also important for participants who often found that the best way to process and cope was to connect with Nature. Simply by going outside to find spaces that make them feel a connection to Nature, participants could ease some of the negative emotions they were feeling. Fay talks about these outdoor experiences: "I made a pact with myself that I'm going to go out at least once every two days and at least touch some [trees] outside because that touch is just so necessary."

While many of the interviewees expressed strong feelings about climate change that could be described as positive to negative, others expressed indifference or nihilism about the climate for different reasons. For some youth, this was seen as a way of dealing with climate grief and eco-anxiety. Bobby, for instance, related this to people becoming "too comfortable*"* with climate change impacts. Kyle said he had accepted that "humanity will not be able to make a large impact" and that he was thinking of ways to "at least be safe and be able to sustain himself." Other participants expressed feelings of futility. Loki, for example, said:

> Climate change is inevitable; we're not going to reverse it… If we do "solve" climate change, then that's going to be another giant problem because climate change is so complex that the idea of solving it would be false.

Colin also referred to feelings of inevitability and said "the situation is pretty much in a lot of ways too late, or we can never go back". Participants also reflected on their own roles (e.g., as previously mentioned above in the quote by Rami), the roles of governments and corporations, and abilities to change the future.

5 Discussion and conclusions

The aim of this study was to provide insights into the experiences of young people who face climate grief, the negative feelings and emotions arising from the concern associated with climate change. Photographs and statements by Canadian youth involved in climate activism revealed experiences and emotional responses to climate change that were complex and entangled with different places, experiences, and memories. Difficult emotions that youth

participants expressed could be related to many aspects of life, including school, family and social settings, and interactions with different media (e.g., social media, news, national and international environmental reports). Furthermore, negative emotions were present for participants regardless of whether they had been directly impacted by climate change (e.g., by witnessing the consequences of a forest fire) or had learned about it indirectly through schoolwork, reports, news, or social media. Both types of impact produced a variety of emotional reactions and responses.

Negative emotional responses included feelings of sadness, uncertainty, anger, frustration, and hopelessness and these seemed to dominate the narratives of youth who took part in the study. Although the vast majority of emotional responses to knowing about climate change can be considered negative, there were also some positive feelings of hope and connection when in the company of others who had similar experience, thoughts, and feelings. Youth's emotions towards climate change complement those expressed by children elsewhere (Léger-Goodes 2023; Strife 2012). However, unlike children, youth channeled their emotions towards seeking out others who are like-minded to form connections that lead to activism and making behavioral changes to address climate change in their personal lives.

Connecting with others, such as like-minded peers and teachers, allowed participants to feel more understood and less alienated about their feelings. Being with and talking to other people provided an important way for participants to process their emotions. A sense of community provided emotional support, much as it does for other types of anxiety and demands on their coping mechanisms that youth must endure (Woodgate et al. 2020). Through connecting with others and being part of a community, participants could express their emotions and feel legitimized or even empowered (e.g., Fiona's above quote about being with like minded people). Youth often associated their emotional reactions with their choices to join climate movements and scientific groups and activities. They also connected their emotions to lifestyle choices, such as becoming vegetarian or reducing greenhouse gas emission by reducing consumption and travel. However, thinking about choices often resulted in additional emotional stress. For example, having to choose between seeing family and reducing carbon emissions from flights would engender feelings of guilt, no matter what one decided, leaving participants in a no-win situation.

Humor and laughter were helpful at times for building connection and coping with uncertainties and feelings of helplessness. Most participants also talked about the restorative quality of Nature and how simply *being in Nature* had a noticeable impact on their emotional wellbeing. By examining the contributing factors, emotional impacts, and potential strategies for addressing climate grief, this research deepens our understanding of the emotional toll of the climate crisis. It shows the need for societal recognition and support for individuals experiencing climate grief, as well as the importance of fostering resilience and empowering individuals to channel their emotions into meaningful action. Our findings support research indicating that resources are needed for youth across therapeutic and other settings, such as at school (Kelly 2017; Pihkala 2020) and later in life. The insights about the lived experiences of youth, and how they come to know about, express, and process their emotions can serve as key features for developing resources and interventions for youth in various educational and/or therapeutic settings (Table 2). Youth also expressed the urgent need for systemic change to create an environment in which they can imagine a flourishing future. Many youth identified the need for increased government action to address the

Table 2 Supports for youth experiencing difficult emotions associated with climate change

Support	Description
Sense of community and connecting with others who are also concerned/like-minded	It was important that youth did not feel alone in their emotions and actions. Community came through peers, as well as through teachers and other forms of mentors. Community could be found in-person, as well as through being aware of networks, including those that were online.
Humor	Humor could ease the experience or processing of difficult emotions. Humor could be either unrelated or directly related to the climate crisis.
Hope	Even when times and emotions felt bleak, hope was important continuing with climate activism and daily life. Hope was complex and not always related to expecting positive change.
Creative/arts-based modes of expression	Creative self-expression was important for processing emotions. Arts-based approaches (i.e. photography) were supportive of youth being able to express their emotions on their own terms.
Direct forms of action	Taking direct action, for example through activism or lifestyle changes, made youth feel like their voices were at least being partially heard and created a sense of community. It was, however, also important for youth to take breaks from their activism when they felt it was too much.
Spending time in Nature	Nature was cathartic and provided opportunities for youth to reflect in ways that at times helped them to transcend their negative emotions. Being in Nature with peers also contributed to a sense of community.
Systemic changes on various scales	While the previously listed supports contributed to the wellbeing of youth, they often stated that their wellbeing will not be sustainable unless systems (i.e. social, environmental, economic) systems change drastically to curtail the current climate crisis.

climate crisis and biodiversity loss, the need for much stronger regulation of corporations, as well as a broader rethinking of capitalist systems and values.

The key features are derived directly from the statements of the participants and are perhaps the most important contribution of our research (i.e., they are not insights found in previous studies that identified the research gap), but also include a finding that relates to our research approach. Participants often expressed that they enjoyed the photovoice process and found it to be helpful to use images as a foundation to tell stories and express emotions. Resources used in educational and therapeutic settings could use creative or arts-based approaches to facilitate expression and create personalized pathways for helping youth.

In the context of this research, it is important to acknowledge several limitations. Our sample size could have been larger. While our study provided valuable insights, a larger sample would have allowed for a more comprehensive understanding of climate grief as it is perceived by youth. A larger sample could have provided greater diversity in terms of age ranges, gender, affiliation, and location, enabling a more nuanced analysis of how these factors may influence the perspectives and experiences of youth. Additionally, a larger study could have explored the relationships between these demographic characteristics and their impact on the perceptions of young individuals, enabling researchers to identify potential variations in experiences, contributing to a more robust understanding of climate grief through the use of the photovoice method. Therefore, future research endeavors should aim to address these limitations by expanding the sample size and incorporating a more in-depth examination of the intersectionality between youth perspectives, experiences, and identity characteristics such as their belonging to specific equity-deserving groups.

Furthermore, the findings of our research relate to a demographically diverse group of youth living across Canada. Future research could explore whether or not supports available for youth share similar features in different place-based or cultural contexts. The research could also be extended to include other forms of equity, diversity and inclusion criteria, such as accessibility, reconciliation, and decolonization for BIPOC communities.

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Data availability The datasets analysed during the current study are not publicly available due the ethical protocol that was followed in order to protect the identities of participants.

Declarations

Ethics approvals This study received approval from the Dalhousie University Research Ethics Board (Certificate #2021–5604).

Consent for publication All authors have agreed with the content of the manuscript and all gave explicit consent to submit. There was no need to obtain consent from any authorities at their institutes/organizations where the work has been carried out, before the work is submitted.

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