

MEANING ACROSS CONTEXT:
ORAL HISTORIES, BIG DATA, AND CLIMATE CHANGE



Julia Olson^{1*} and Patricia Pinto da Silva²

¹Independent researcher, c/o Ocean Associates, 4007 N. Abingdon St. Arlington, VA 22207, USA

²Social Scientist, NOAA Fisheries Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA 02543, USA

*Corresponding author: e-mail: jolsonanthropology@gmail.com

Early Online Release: This preliminary version has been accepted for publication in *Weather, Climate, and Society*, may be fully cited, and has been assigned DOI 10.1175/WCAS-D-23-0114.1. The final typeset copyedited article will replace the EOR at the above DOI when it is published.

© 2024 American Meteorological Society. This is an Author Accepted Manuscript distributed under the terms of the default AMS reuse license. For information regarding reuse and general copyright information, consult the AMS Copyright Policy (www.ametsoc.org/PUBSReuseLicenses).

MEANING ACROSS CONTEXT: ORAL HISTORIES, BIG DATA, AND CLIMATE CHANGE

Abstract:

The use of oral histories in social scientific approaches to climate change has enabled richly detailed explorations of the situated, meaning-laden dimensions of local experiences and knowledge. But “big data” approaches have been increasingly advocated as a means to scale up understandings from individual projects, through better utilizing large collections of qualitative data sources. This article considers the issues raised by such secondary analysis, using the NOAA Voices Oral History Archives, an online database with a focus on coastal communities and groups thought especially vulnerable to climatic changes. Coupling larger-scale methods such as text-mining with more traditional methods such as close reading reveals variations across time and space in the ways people talk about environmental changes, underscoring how memories and experiences shape understandings and the subtlety with which these differences are articulated and culturally inscribed. Looking across multiple collections illuminates those shared understandings, points of contention, and differences between communities that might be obscured if decontextualized, showing the importance of “small data” approaches to “big data” to fully understand the deeply cultural understandings, perceptions, and histories of environmental changes such as climate change.

1. Introduction

As the sense of urgency surrounding climate change intensifies—and recognition that its causes and consequences are often social, cultural, political, and economic in nature—the need for greater involvement and impact from social sciences has been increasingly voiced from ever greater quarters (e.g. Crate 2008, Agrawal et al. 2012, Weather 2014, Victor 2015). Although a variety of methods and approaches have been employed by social scientists, oral histories have played a particularly important role in climate work given their strength in grounding the meanings and relations between place and people in everyday practices (Williams and Riley 2020). The intimacy of qualitative methods such as oral histories enables richly detailed explorations of “unique cases and mechanisms” that complement macro-level approaches, helping to more fully answer why people believe or act in the ways that they do (Editorial, *Nature Climate Change* 2021:717).

As such, they illuminate the issue of scale: the tensions between the global scale at which climate change is usually analyzed and the situated, meaning-laden dimensions of local experiences and knowledge (Jasanoff 2010, Hulme 2015).

But oral histories are typically conducted in small batches for particular projects, which not only requires investment in time and relationship-building but risks insights being left singularly localized. There is thus a potential wealth of untapped information in larger collections of oral histories whether or not they were targeted at questions of climate. The challenge lies in finding ways to uncover, understand, and interpret relevant histories: charting changes in narrative and ideas over time and across cases. In this article, we consider lessons to be learned from recent approaches in the social sciences of climate change that “are changing the spatial and temporal scope of inquiry” through methodological innovations surrounding “big data” (Biehl et al. 2018:1).¹ While facilitating new larger-scale approaches to oral histories, this “computational turn” may also lead to false insights and spurious correlations without the grounding insights from smaller-scale studies (Lahsen 2022). In the backdrop of this push and pull between the micro and macro, we critically consider how to bring different collections of oral histories together to help us understand the “bigger picture” of climate change by scaling both up *and* across our understanding, linking communities to others experiencing change, looking in particular at the opportunities and challenges posed by diverse oral history collections. In short, our goals are to explore whether and how archived collections of oral histories might inform understandings of climate change; how best to approach the analysis of large and unconnected oral history collections, particularly for the typical user of oral histories without advanced programming skills in quantitative data science; and what one might hope to learn from such an approach.

¹ A common definition of “Big Data” is that which is “huge in volume, high in velocity, diverse in variety, exhaustive in scope, fine-grained in resolution, relational in nature, and flexible in trait” (Kitchin 2014: 68). Yet the term is also emergent and evolving, as new technologies and forms of data challenge older definitions. As Tinati et al. (2014: 664) write, “although the term may imply coherence and uniformity, 'Big Data' is not one thing but many, differentiated inter alia by content, structure, ownership and availability.” The emergence of Digital Humanities, for example, or other forms of large-scale, digitized qualitative data not only points to the ways that “new processing and interpretation methods” in qualitative disciplines become increasingly necessary (Kaplan 2015: 1), but also shows how notions of Big Data are restructured by analytics such as “scaling up” and data reuse that are enabling new connections between older infrastructures (Mauthner 2019: 672-673).

We used the large and diverse collections housed at the National Oceanic and Atmospheric Administration (NOAA) as a case study. The NOAA Voices Oral History Archives (<https://voices.nmfs.noaa.gov/>) was formalized in 2007 (with support from NOAA Office of Science and Technology and the Preserve America Grant Initiative) to identify, archive, and disseminate oral history recordings and transcriptions concerned with commercial fisheries in the United States, including interviews with fishermen, fishermen's wives, processing workers, and others involved in the harvesting and processing of fisheries resources. This publicly accessible online database, produced by NOAA scientists, external researchers, and non-profits, contains over 2300 oral histories involving more than 116 different collections, having expanded to reflect the entire NOAA portfolio, including topics from coral reef conservation to hurricane detection. A number of recent collections have looked at beliefs about and impacts from climatic change, while others focus on marginalized populations or communities considered especially vulnerable to such changes as rising sea levels and shifting resources, helping shed light on the perceptions, observations, and meanings associated with climate change in the context of fisheries and fishing communities in the United States. But while the collections in the Voices database are all focused on oceanic, atmospheric, or coastal issues to some degree they are also varied in terms of their aims, methods, and scope, bringing the issue of how best to analyze qualitative data from such a large corpus of oral histories, what Heaton (2008:39) refers to as amplified secondary analysis, to the fore. To this end, we first review the use of oral histories in the social science of climate change, and consider the issues raised by secondary analysis of qualitative data, before turning to the approach we adopted and what it has helped reveal about experiences of climate change.

2. Literature Review

a. Oral histories and the social science of climate change

Social scientific work in climate change has focused on such issues as the anthropogenic drivers of climate change (Jorgenson et al. 2018), the role of culture and traditional knowledge in adapting to change (Leonard et al. 2013, Makondo and Thomas 2018), and the assessment of differential, contested, and uneven vulnerability to impacts (Thomas et al. 2019). The increasingly urgent need for social scientists to more effectively "inform public opinion, motivate decisions, and strengthen climate adaptive and mitigative capacities" (Agrawal et al. 2012: 329) has also generated concern to better communicate

information about risk and support decision-making under uncertainty (Marx et al. 2007), enhance usability of knowledge through mutual engagement of scientists and decision-makers (Meadow et al. 2015), and build collaborative engagements with affected communities (Pearce et al. 2009, Turner and Clifton 2009, Sheppard et al. 2011). But social scientists have also studied the social relations and cultural politics of science production and policy-making in the climate sciences, including how issues like uncertainty preclude “reflexive engagement” in the development of climate models (Demeritt 2001), the conjoint issues of trust in science and effective participation (Lahsen 2007), and how the pursuit of more and better scientific data can hinder rather than compel practical action (Goldstein 2022).

The simultaneously natural and social dimensions of social-ecological systems (Ostrom 2009) like climate change have also prompted recent examinations to pursue more ontological concerns that challenge the dualistic framework separating society from nature and externalizing adaptation (Nightingale et al. 2020). Co-productionist work has underscored how diverse and plural ways of knowing provide novel ways of reframing environmental problems and solutions (Berkes 2009, Nightingale et al. 2020), how performative narratives of change unsettle prevailing notions of causality (Kurz and Prosser 2021, Pascoe et al. 2021), and how experimental and collaborative methods of co-producing knowledge move research from reaction to pro-action (Harris 2021, Zurba et al. 2022). Such studies reinforce the very different ways in which climate changes come to be both experienced and known. Indeed, greater attention to the inclusion of indigenous peoples and ways of knowing in climate research (Cochran et al. 2013, Smith and Sharp 2012) and the foregrounding of political-economic structures that produce marginality and vulnerability (Erickson 2020) not only brings environmental justice issues to the fore but in the process broadens the ideas and practices informing adaptation and mitigation (Marino et al. 2023)

Oral histories have figured prominently in this work. As Crate has written, “Oral history is a key source for understanding adaptive strategies and a people’s collective understanding of global climate change” as well as the sociocultural and cognitive ramifications from “how our research partners frame the local effects of global climate change” (2008:575). Compared to more traditional historical research, oral histories are narrator-driven and culturally-mediated acts of remembering and interpreting the past

(Thomson 2007), where “memory is not a passive depository of facts, but an active process of creation of meanings” (Portelli 1991:52). Its participatory impulse comes from a focus on history from “below,” a collaborative methodology of co-producing history with communities (Perks and Thomson 1998), and its challenge to conventional sources of expert and authoritative knowledge (Cruikshank 2001, Williams and Riley 2020). Oral narratives instead draw attention to localized frames of meaning embodied in everyday life: how “individual and collective memories interact,” affirming or questioning received wisdom, and the “tacit knowledge [that] underpins the community and is understood but frequently unacknowledged by members” (Nyhan and Flinn 2016:29). Like Haraway’s (1991) notion of “situated knowledge,” oral histories illustrate “how discourse on climate sits at an intersection of biography, culture and social structure” (Anderson 2008:76).

Given this tension between the personal and collective, Nightingale (2009:35) distinguishes two approaches to oral narratives in environmental history: seeking consistencies through key informants in order to document shared systems of local knowledge, versus exploring the politics of knowledge through much broader involvement. Emphasis on consistencies tends to assume “a system of knowledge exists at the local level [...that] can inform science” while a more biographical emphasis rejects decontextualized knowledge “to understand how different people interact with and view their environment.” For example, Riedlinger and Berkes (2001) found that oral histories with Inuit communities, and more broadly studies of traditional ecological knowledge (TEK), complemented scientific understandings of climate change in a number of ways, informing fine-scale environmental changes like shifting weather patterns and knowledge of historical baseline data in otherwise data-poor contexts. In their view, TEK and the oral histories revealing them were key to developing “more pluralistic and participatory” forms of Arctic science that included native communities. A focus on past adaptations to climatic variability is echoed in other studies using oral history to, for example, explore barriers to adaptation (Islam et al. 2014) or enhance community resilience-building (Janif et al. 2016). But Carothers et al. (2019) found mixed perceptions about salmon population changes in oral histories with Alaskan native fishermen, showing how changing commercial and subsistence practices were mediated by sociocultural and political-economic processes in the context of broader environmental and climatic change.

As Cruikshank argues, the danger in treating local knowledge as mere inputs into scientific research, “as ahistorical, timeless, abstract data” (2001:390), is in misreading how the social worlds in which knowledge is entangled can involve radically different notions of personhood and thus new ways of looking at environmental problems. “Information formulated as TEK tends to reify and reinforce a Western dualism—prying nature from culture—that local narratives challenge in the first place” (ibid.: 389). Instead, she writes “narratives have the power to create or to establish what they signify—in this case, a land that responds to humans in a reciprocal rather than a hostile manner. This constitutive part asserts the ongoing importance of human agency and human responsibility, a perspective that is frequently missing from detached scientific expertise” (ibid.: 391; also Pascoe et al. 2021). Such narratives shed light on how people understand their place in and relation to environment, ideas which shape behaviors and practices.

For Hulme (2015: 3), climate is intrinsically material and cultural, “an idea which mediates between the human experience of ephemeral weather and the cultural ways of living which are animated by this experience.” Everyday experiences and memories of weather thus are integral to how people come to know their world (Ingold 2010), shaping and localizing practices, identities, and senses of place (Pillatt 2012, 2016) while also personalizing ideas about climate change (Hall and Endfield 2016). Anderson (2008, 2010) examined how drought in the Australian outback “mythologized” settlers in a harsh and unpredictable environment as “rural battlers, shaping foundational narratives of struggle and hope” (2008:68). Such narratives not only helped interpret the past but materially grounded contemporary farming practices despite increasingly difficult conditions (Anderson 2010). Oral history narratives also play an important role in newer emphases on “storytelling” present-day experiences and future imaginations (Lejano et al. 2013, Fløttum and Gjerstad 2017, Veland et al. 2018). Harris (2021: 334), for example, argues storytelling that is sensitive to specific histories and experiences can build collaborative knowledge and action around abstract concepts like climate change even in places where expert knowledge is controversial, with engagement “less about exchanging facts than it is about finding ways to listen to people and help them make sense of their worlds, climate changed or otherwise”. These, as Goldman et al. (2018) contend, are the “different world-making practices” that confront researchers with questions about climate change that are at once

epistemological and ontological, pushing the boundaries of the politics of knowledge and the ways we approach climate change.

b. Reusing and recontextualizing secondary data

Oral histories are the product of multiple and negotiated relations of power: they are biographical narratives that both produce and interpret wider sociocultural structures, reflections on the past as seen from the present, and stories told by interviewees but co-produced with interviewers. Thus debate has arisen over the secondary analysis of oral histories and qualitative data more generally, with ethical, methodological, and epistemological issues about the value and feasibility of re-using data for new purposes (van den Berg 2008). Earlier uses of archival materials were limited in part by availability and confidentiality, and seen as of primary interest for longitudinal or historical studies (e.g. Ellen 1984). But the emergence of an online environment for archived materials, and funding and publishing stipulations to make original data more available, have increased both the extent of reusable material and the concern surrounding it (Heaton 2008).

Expected benefits from greater availability of secondary data range from testing the generalizability of individual cases through larger sample sizes, increasing scientific openness and integrity, to reducing burdens on research subjects and funding (Jones et al. 2018:2, 3). Within sustainability sciences, re-use of qualitative data is argued particularly important for understanding social-ecological relationships as they vary in time and space, to better inform policy and address critical environmental challenges (Alexander et al. 2020). As oral historian Joanna Bornat argues, revisiting previously collected data can “help us to see and hear different interpretations, make new connections, revising our perspectives” (2003:49), noting the unique insights provided by spontaneously arising topics. But critics have voiced a number of concerns, centering on “data fit,” i.e., whether data collected for one use can serve another, and context, i.e. how to interpret data collected in another time or by another researcher (Heaton 2008: 40). In an early critique, Mauthner et al. (1998:736) dismissed re-using their own data as naïve positivism, finding it too constrained by “the dynamic, dialectical and reflexive nature of a particular research encounter.” Arguably, the reuse of oral histories may pose fewer such ethical or epistemological constraints in that they are often created with the intention of public archiving and availability, unlike other forms of qualitative data (e.g. ethnographic fieldnotes) in which confidentiality, informed consent, and other data-sensitivity issues

preclude easy sharing (Jones et al. 2018:8-14; Peek et al. 2023). Indeed the more common view sees oral history as co-created and empowering personal narratives that, particularly in less narrowly-focused community-based projects, are not constrained by researcher agendas (Shopes 2002:592). Some even argue this dialectical nature of data construction implies “every reading and analysis of the records of the archive is enrichment: an extension” (Tureby 2013:64). Issues of fit, context, selection, and interpretation, moreover, are not just issues for secondary analysis: as Hammersley (2010:51) noted, “it is rare for these problems to be entirely absent in any kind of research. What are involved are matters of degree, and their significance depends upon purpose and circumstance.”

But with oral histories likened to conversations, ethical and methodologically-sound reuse entails knowing the context of an interview, such as when it was conducted and by whom (Grele 1987:571). Van den Berg (2008) suggested minimal guidelines for re-using textual data, including audiotapes or transcripts, access to the whole interview, and participant backgrounds. With qualitative data reuse becoming more common, accepted, and diverse, Bishop and Kuula-Luumi write that “practices are emerging to enhance methodological robustness, for example, by combining the breadth of quantitative scope with the depth of qualitative insight [...] find[ing] ways (as historians have long done) to use rich sources when available, yet still proceed carefully and creatively when they are absent” (2017:13). But the difficulty of assessing and interpreting context in secondary analysis becomes compounded with a large-scale oral history database housing multiple collections conducted by different researchers, with different communities, for different reasons, and at different times. A recent strategy has been to adopt and modify the tools and techniques more readily associated with quantitative and machine-assisted analysis of digital and networked “big data.” Within historical archaeology, for example, Brown and Shackel (2023) propose engaging with oral histories on a larger scale through “big data” techniques like text-mining, which help reveal easily-overlooked patterns and semantic associations across time and space. As Xiao et al. (2013:105) argue, key-phrase algorithms can “obtain a feel for the content of a collection, provide sensible entry points, and offer a powerful means of comprehending the document similarity.”

Yet machine-learning methods, models, and algorithms of “big data” ultimately rely on probabilistic notions of language and meaning, structural views inattentive to how meaning is situated, contingent, and negotiated. The transcription of oral narrative, upon

which large-scale approaches depend, also already involves interpretive decisions and cultural translations (Davidson 2009, McMullin 2023), while data itself can encode some worldviews to the exclusion of others (Bell 2021:8). As Lahsen (2022) notes, bigger is not always better; without the cultural insights and context provided by in-depth “small” studies, large-scale approaches risk “decontextualization, oversimplification, and attention to mechanical relationships and mere correlations” (2022:8; see also Ganascia 2015:3). Data, as Bell et al. (2021:3) write, are always “a partial snapshot of a part of a socio-political system, and knowledge of the broader human and ecological pieces of the system [is] critical for understanding which questions to ask, which assumptions to suspend, which data to collect and how to interpret them.” Using keywords about climate change to access a large qualitative database must contend not only with changing beliefs about climate change but also its changing terminology (with words like greenhouse and global warming supplanted by phrases like climate change), descriptions of environmental conditions that provide evidence of contemporary changes without any obvious lexical markers identifying them as relevant, and the subtle ways in which the absence of terms and themes, the unspoken, also constitute forms of data in their own right. For example, Hall and Endfield (2016:14) note that recall of primarily negative weather memories by older informants might reflect more difficult living conditions in the past than actual climatic changes, highlighting how technological changes mediate human-environment relationships. Boyd (2013:103-104) discusses this issue of natural language in the context of digitally searching oral histories for texts about segregation before such terminology was used. He describes a process of manually indexing text—about using separate water fountains, going to different schools, or sitting in different parts of a bus—and mapping it to the concept of segregation. This issue will be a familiar one in computational linguistics, and the natural language processing (NLP) that underlies most web-based search engines, in that it revolves around finding ways to identify intended meanings and accurately map queries to content. Large language modelling has sought to improve such algorithms by training models on textual data to look for patterns and relationships, but meaning remains essentially probabilistic and the notion of context is shallow.

To that end, Davidson et al. (2019) advocate an iterative “breadth and depth” approach for working with different collections of qualitative data; they argue that such a qualitatively-informed approach doesn’t simply scale up but creates new “assemblages” by

situating studies in relation to multiple contexts, moving between computer-aided methods such as text-mining and deeper, interpretive approaches to reading data. The first step in any such a process is “data wrangling,” i.e. transforming data into clean and usable formats. For an oral history corpus containing large amounts of data, especially if it has not been transcribed or organized with any meta-data, this can be a daunting task for which an automated process may be particularly welcome. For example, Rieping (2022) and Pandza (2023) both explore using various computational methods to make different oral history collections more accessible and amenable to analysis. Rieping (2022) examined NLP techniques for processing audio interviews and extracting meta-data, and machine-learning techniques like topic modelling for comparing interview content. Pandza (2023) also explored how NLP techniques might be used to organize an archive of oral histories without meta-data and classify interviews with topic modelling, but also detailed the degree of manual intervention necessary to ensure robustness: biases or inappropriate associations may inhere in pre-trained language models, data cleaning and careful oversight are necessary to enable reasonably coherent results and ensure false meanings are not imposed, while current applications require a degree of comfort in programming and coding skills such as Python.

Nonetheless, they illustrate the potential that NLP and other computational techniques might have in making oral history collections better utilized and accessible. As Pandza (2023: 32) writes, such methods are “a companion for enhancing close reading and discovering interconnections,” but not a replacement for them. Indeed, Guetterman et al. (2018) explicitly compared NLP and qualitative techniques in coding qualitative data, and found that NLP techniques on their own tended to miss important context and nuance, but were helpful for providing groundwork for qualitative coding by identifying major themes, and in helping to validate qualitative analyses through frequency counts and the potential use of larger sample sizes. Oral historians tend to stress the “slowness” of interpretive methods needed to understand conversation in its ethnographic context, what is both said and left unsaid: “insights gleaned from interviews are cumulative, obvious only after one has absorbed hours of talk. They also often lie below the surface of words [... but] thoughtfully considered, can open up an understanding of the local culture, those underlying beliefs and habits of mind, those artifacts of memory that propel individual lives, give coherence to individual stories, and perhaps extend outward to a larger significance”

(Shopes 2002:593). But to see patterns and make associations *across* collections of oral histories requires both a cogent means of entry and assessment, as well as appreciation for the context and culture within a given body of histories. As Edwards et al. (2021:1276) write, the speed with which new computational tools can process information “can prioritise quantitative knowledge by default,” necessitating methodologies that seek “to insert quality into the quantity default of ‘big data’ and to retain a form of analysis where computational text mining of large volumes of qualitative data sits alongside and is equal with ‘deep data’ research approaches.” We explore this tension in levels of analysis (Figure 1) further below, as we describe the methods we used and the insights they generated.

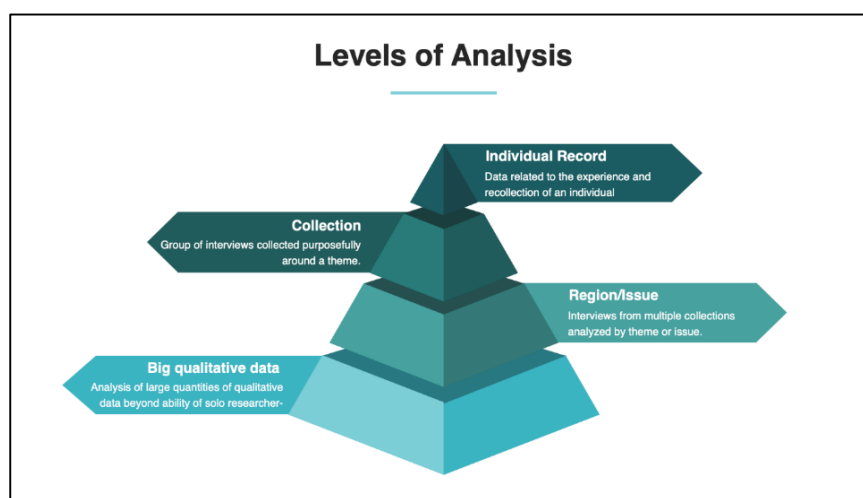


Figure 1: Levels of analysis in oral history data collections

3. Methodology

We drew from both “big data”-inspired approaches and more traditional qualitative ones: using a means of entering the full database to find relevant materials; gaining a “feel” for and overview of the selected histories, for which various text mining techniques can be well suited; and qualitative coding of the histories, to provide nuance and context. These are less discrete stages than iterative, mutually-reinforcing and informing strategies that create new assemblages of data and understanding, similar to the “breadth and depth” method advocated by Davidson et al. (2019). The oral histories in the Voices database generally contain meta-data detailing the conditions of the interview (name of interviewee and interviewer, date and location of interview, affiliation of the project, and a description of the interview); a written transcript, digitally available; and often audio and/or video clips. This enabled the use of keyword searches to pinpoint relevant collections and interviews, as

the Voices online search function searched both transcribed interview text and meta-data like titles and descriptions, rather than necessitating machine-learning techniques adopted by Rieping (2022) and Pandza (2023). The initial search terms were climate change, environmental change, sea level rise, global warming, hotter, and warmer. (Greenhouse was also used but resulted in all but one reference to actual greenhouses, with the one positive excerpt identified through other search terms). Interview collections were ranked by the percentage of interviews with positive search terms, resulting in seven collections of transcribed interviews in which at least half had a positive search term (to focus on experiences of climate change, we excluded scientist-only collections, though we retained collections with a mix of interviewees). The top three collections were selected for initial analysis, as well as two others to ensure geographical breadth (Figure 2): Long Island Traditions - Climate Change and Sandy (hereafter referred to as Long Island); Strengthening Community Resilience in America's Oldest Seaport (hereafter Gloucester); Women in Alaska Fisheries (hereafter Alaskan Women); Kings of The Yukon (hereafter Yukon); and Oral History of Monterey Bay Fishermen (hereafter Monterey Bay). Additionally, a sixth collection with few positive search terms, Georgia Black Fishermen (hereafter Georgia), was added to include consideration of other ways in which environmental changes might be discussed or experienced in vulnerable coastal populations.



Figure 2: Location of the selected oral history collections

Maxqda, a commonly available software for qualitative and mixed methods analysis of textual data, was used to conduct textual analyses and to manually code segments of text in the selected oral histories. As part of our objective was to explore easily accessible ways to use a large corpus of diverse oral history collections that challenge the use of traditional methods alone, we limited our exploration of more automated methods to those available in Maxqda. Word frequency counts and n-gram (word combination) analyses were employed to identify common words, combinations, and semantic associations that might offer other potential markers of relevance to climate change, as well as to look for differences across collections. Sentiment analysis, matching words to a pre-given dictionary, was also conducted to help detect possible differences in experience and perspective between and within different groups (Brown and Shackel 2023: 867) and for its potential as a validity check on qualitative coding (Guetterman et al. 2018). We used the sentiment dictionary created by Fioroni et al. (2021) to categorize distinct emotions of anger, anxiety, optimism, and sadness, as its smaller size and more targeted wordlist generated fewer errors and false hits.

The oral histories were then coded thematically in Maxqda through traditional qualitative grounded analysis (Corbin and Strauss 1990), an iterative process of coding and recoding data, to identify themes of interest. To better understand recollections in their cultural and political-economic context (cf. Nightingale 2009) and avoid treating data as discrete (cf. Mauthner et al. 1998), we sought to compare both within and across selected collections: we analyzed all the interviews in the selected collections, not just ones containing search terms, and interviews were coded for all subject themes, whether or not climate-related. This qualitative analysis was based on an open style of coding that arose in the course of reading oral histories and developing themes as they emerged from the data, and iteratively summarizing and recoding as the analysis progressed. Such an inductive strategy of analysis, coupled with our own ethnographic experience in such fishing communities and enhanced by the previous content analysis, enabled a general feel for the data from “slow reading,” and the differences between the collections that structured further textual analysis. Themes relevant to climate change, and extracts with search terms, were analysed for patterns and divergences among the different interviewees and different collections, as we compared these different ways of approaching and analyzing oral

histories as “bigger data” for what they could tell us about on-the-ground experiences and perspectives on climate change.

4. Results

a. Talking about climate change, in context

The search terms provided a first entry into the Voices database, but were used by different people and in different contexts, reflecting the diverse natural languages of environmental change (Table 1). None of the selected collections used the term “sea level rise,” and elsewhere it was generally used only by scientists or policy experts (in collections in which this was an expected concern, such as Alaskan Women, people talked about erosion rather than sea level rise, while in Gloucester and Long Island, talk centered on flooding). With “climate change,” scientists and policy experts also accounted for almost two-thirds of usages, and in the selected collections, it occurred most frequently in those with a research focus on climate change (e.g. Alaskan Women and Gloucester), usually in meta-data or interviewer prompts. But non-scientists made over half the usages of the term “global warming,” and within the coded narratives it was generally said without prompting. The term “environmental change” was primarily used in interviews with non-scientists, occurring in interviewer questions or meta-data rather than the natural language of the interviewees. In the selected collections, the use of hotter, where relevant, was always in proximity with the phrase climate change, while warmer was usually used in reference to specific impacts (such as warming waters).

Table 1: Overview of search terms

Search term	Interviews in database	Interviews in selected collections	Coded-excerpts	Coded-excerpts by collection and type (IQ=interviewer question; IRN=interviewer and narrator response; SN=narrator spontaneous)
Sea Level Rise	17	0	0	0
Climate Change	76	26	46	Gloucester: 13 IQ, 11 SN, 4 IRN Alaskan Women: 6 IQ, 5 SN, 4 IRN Yukon: 1 IQ, 1 SN Long Island: 1 SN
Global Warming	39	7	9	Gloucester: 4 SN, 2 IRN Alaskan Women: 2 SN Monterey: 1 IRN
Environmental Change	62	18	12	Alaskan Women: 7 IQ, 2 IRN, 1 SN Gloucester: 1 IQ Long Island: 1 IQ
Hotter	23	3	2	Gloucester: 1 IRN, 1 SN
Warmer	105	13	14	Alaskan Women: 6 SN, 1 IQ, 1 IRN Gloucester: 3 IRN, 2 SN Long Island: 1 SN

Overall word frequency counts (Figure 3) are dominated by words associated with fishing or indicative of environmental changes, unsurprising given the database focuses on collections relevant to NOAA and were chosen for their potential insight into climate change. However, isolating the more common n-grams associated with particular words of interest—environment, climate, nature, and warm—begins to paint a more nuanced picture (Figure 4). The Alaskan Women and Gloucester oral histories show the most concern with climate change and warming compared with the other selected collections; however, talk about environmental changes and natural resources is the greater focus in the Alaskan Women histories, while Gloucester histories more likely reference environmental regulation and notions of mother nature, suggesting that environmental changes are linked to quite different concerns and conceptualizations. And the far less frequent appearance of climate change in the other collections is also somewhat surprising, especially in collections like Long Island that were conducted to address climate change issues in the aftermath of significant hurricane damage (discussed in greater detail in the next section).

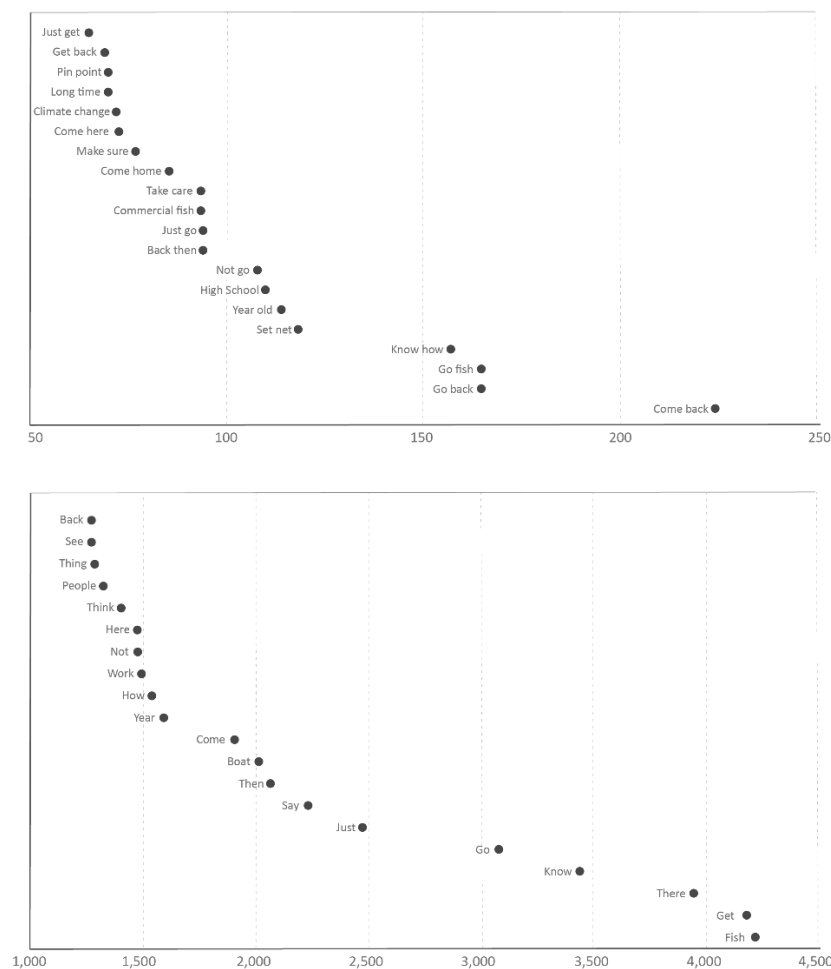


Figure 3: Word frequencies: most common word combinations and individual words, all selected histories

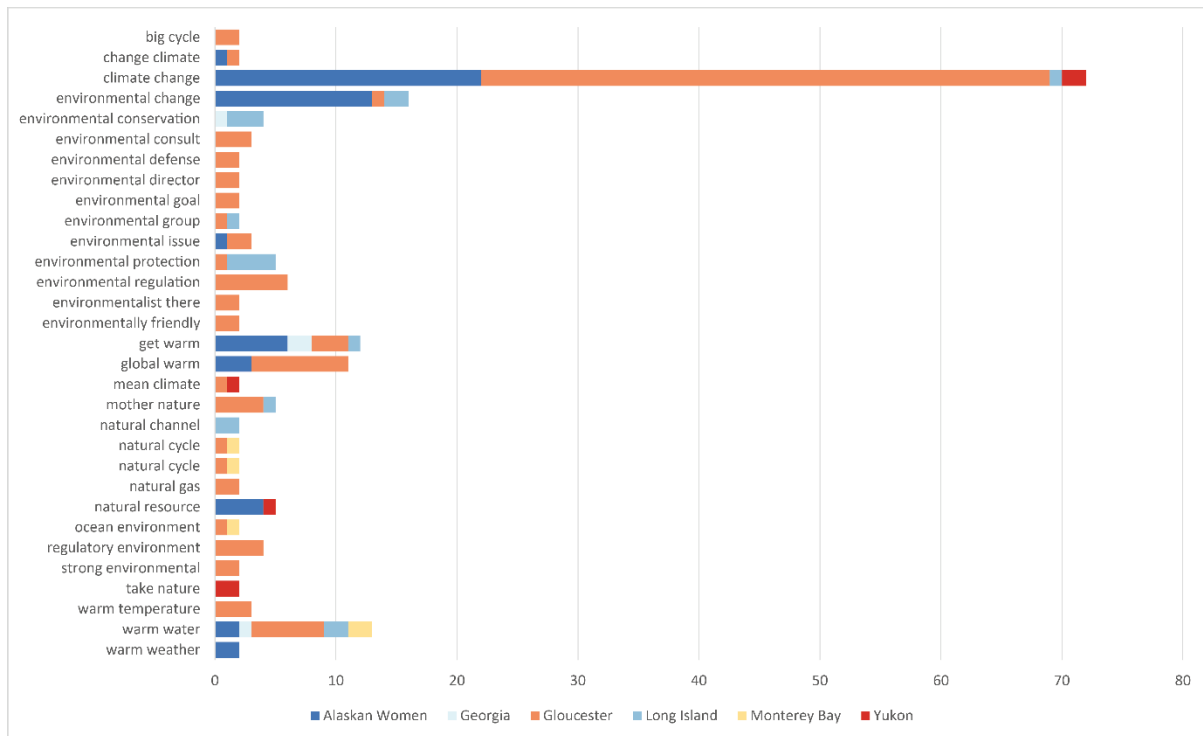


Figure 4: N-grams associated with the environment and climate change

We uploaded to Maxqda a pre-defined sentiment dictionary created by Fioroni et al. (2021), which tags selected words with four discrete emotions: anger, anxiety, optimism, and sadness. Although sentiment analysis is more readily associated with the analysis of short texts like tweets, and its reliability can vary widely (Hartmann et al. 2023), it has also been suggested as a promising means of pinpointing themes before doing qualitative coding or for providing a validity check after such coding (Guetterman et al. 2018). While a lexicon more tailored to different social and historical contexts would likely improve such analysis (Brown and Shackel 2023: 867), this more limited sentiment analysis of the oral histories suggests that anxiety-tagged words are highest in the Alaskan Women histories and prevalent in most of the collections (though to a lesser extent in the Yukon and Long Island); that anger-tagged words are more common in Gloucester and Long Island while sadness words more likely in Alaskan Women, Yukon, and Monterey Bay; and that overall both Alaskan Women and Gloucester were dominated by more negative sentiments than the others (Figure 5).

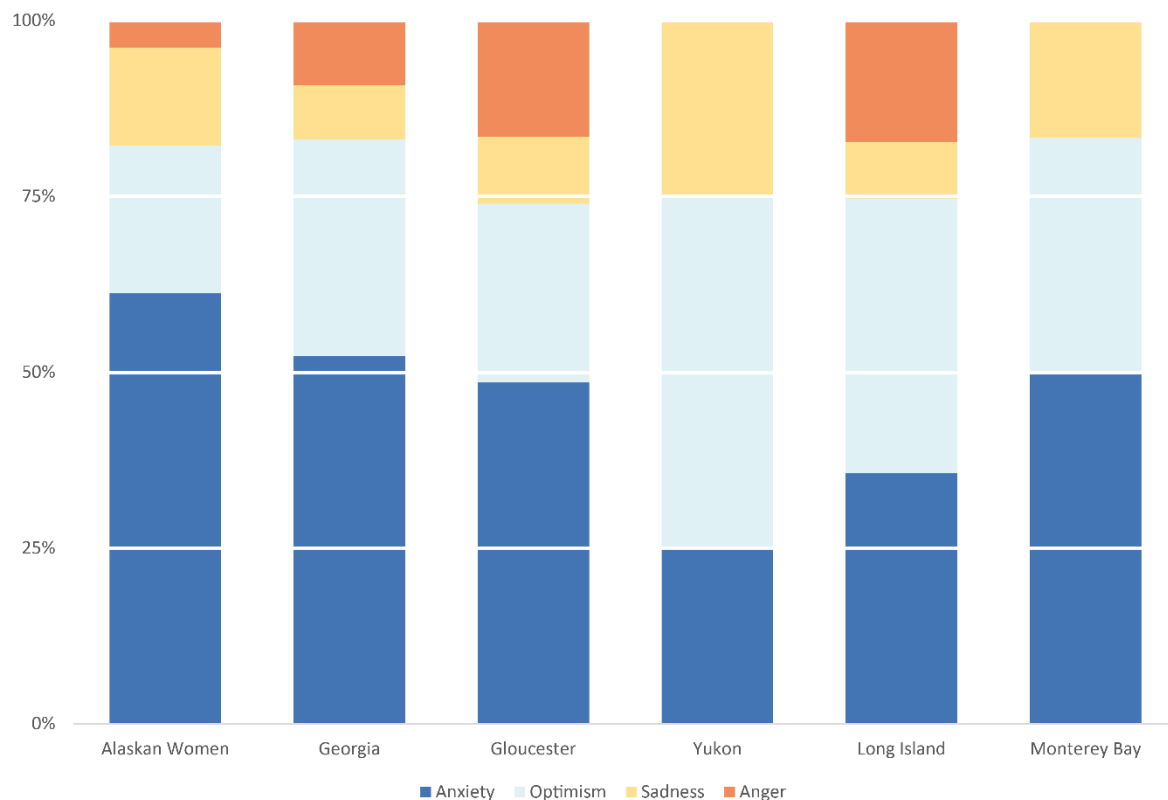


Figure 5: Sentiment analysis on oral history collections

Qualitative coding of the six collections resulted in a variety of themes, including such topics as family, community, heritage, and fishing practices. Four of these were potentially indicative of climate change: “environmental changes,” a broad code capturing any mention of observed changes in the natural environment, whether or not explicitly related to climatic changes; “climate change belief and behavior,” where interviewees discussed their beliefs or doubts about climate change and its causes; “cyclical,” a common folk theory of environmental change, which some interviewees used to explain their observations; and “weather,” another broad theme in which interviewees talked about weather and storms, whether or not they explicitly related their observations to climate change. One question then is the extent to which the search terms coincided with relevant themes, and vice versa. In excerpts containing a search term, the most frequent codes were those potentially indicative of climate change, climate change belief, or concerns about the future (Table 2). Overall however, search terms appeared in less than half of the excerpts with climate-associated codes: the code “environmental changes” had a search term in 47 of 121 excerpts (39%), cyclical in 12 out of 34 (35%), and weather in 9 out of 48 (19%). The exception was “climate change belief,” where 13 out of 17 excerpts (76%) contained at least one search term. Of course, themes like environmental changes and weather were both

broadly-coded themes that encompassed much more than climate, while climate change belief was specifically targeted. The likelihood of these excerpts containing a search term also varied by collection (Table 3), with those specifically directed at understanding perceptions of climate change, Alaskan Women and Gloucester, unsurprisingly more likely to contain such vocabulary, though not exclusively so.

Table 2: Type of coding applied to excerpts with search terms

	SEARCH TERMS				
	Climate Change	Global Warming	Environmental Change	Hotter	Warmer
Climate change codes	environmental changes (32); weather (4)	environmental changes (5)	environmental changes (10); weather (2)	environmental changes (1)	environmental changes (12); weather (5)
Climate change belief codes	climate change belief (10); cyclical (9)	climate change belief (4); cyclical (3)	climate change belief (1); cyclical (1)	climate change belief (1); cyclical (1)	climate change belief (1)
Change codes	future challenges (6); heritage and future challenges (2); culture and cultural change (2); diverse futures (1)	future challenges (1); culture and cultural change (1)	future challenges (2); culture and cultural change (2)	future challenges (1)	future challenges (3); culture and cultural change (1); income and diversifying (1)
Community and family codes	community (2); place/community (2); family (2)		community (1); place/community (1); family (1)		
Knowledge codes	TEK vs science (8); local knowledge (5)	TEK vs science (3); local knowledge (1)	local knowledge (1)		TEK vs science (2)
Fishing codes	regulatory impacts (5)	regulation context (1); regulatory impacts (1)			fishing and subsistence (1); regulatory impacts (1)
Emotion codes	care for nature (4); cynicism (2); danger and toughness (1); emotion (1); luck and fatalism (1); strength (1)	care for nature (1)	care for nature (2); emotion (1)		

Table 3: Number and percentage of excerpts positive for at least one search term

	Environmental changes	Climate change belief	Cyclical	Weather
Alaskan Women	23 of 47 (49%)	2 of 5 (40%)	1 of 1 (100%)	5 of 11 (45%)

Gloucester	20 of 28 (71%)	9 of 9 (100%)	9 of 18 (50%)	2 of 9 (22%)
Long Island	2 of 31 (6%)	1 of 2 (50%)	1 of 11 (9%)	2 of 26 (8%)
Georgia	0 of 6 (0%)	n/a	0 of 1 (0%)	0 of 2 (0%)
Yukon	2 of 7 (29%)	1 of 1 (100%)	0 of 1 (0%)	n/a
Monterey Bay	0 of 2 (0%)	n/a	1 of 2 (50%)	n/a

The differential fit between search terms and coded excerpts suggests that other terms might better reflect how people talk about environmental changes, which could help locate other oral histories relevant to understanding climate change (cf. Boyd 2013). N-gram analysis (Figure 6) of excerpts coded with “environmental changes” revealed a wide variety of word combinations (involving two or more words but excluding common ones), the most important of which directly involved environmental changes (with “climate change” the most frequent), followed by general terms indicating time and change, temperature and weather references, natural resources, and geographical references. The top individual words were change (46 occurrences), warm (27), storm (24), climate (23), weather (12), temperature (11), and degree (8). Working iteratively, we searched the full database of oral histories again, employing the new word combinations that appeared most relevant to climate change. The phrase “come back” was too general, generating over 1000 hits (in the selected collections, most instances of the phrase referred to coming back home after fishing or after living elsewhere, not to fish stocks coming back in abundance, for example), but “get warm,” “water temperature,” and “warm water” did identify additional and potentially relevant interviews. However, ranking again by collection resulted in no additional collections in which at least half of interviews had a positive search term, so the initial basis for selecting collections for qualitative analysis remained unchanged.

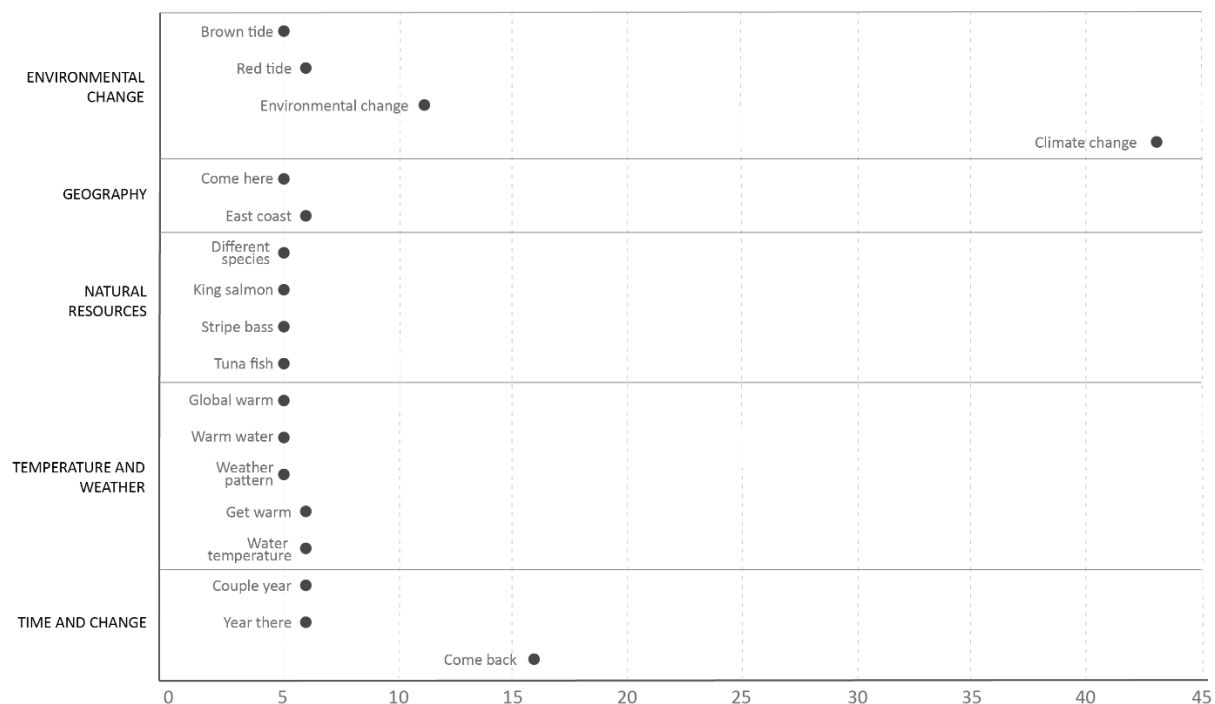


Figure 6: Most frequent (five or more) *n*-grams in excerpts coded "environmental changes," by subject reference of words.

But the frequency of different word combinations did vary by collection, again indicative of potential differences in thematic content (Davidson et al. 2019:370). For example, though many of the frequent words are similar in the Alaskan Women and Gloucester interviews (Figure 7), the Alaskan ones suggest greater concern with geography, time and weather, while Gloucester focuses more on fishing. Sentiment analysis on excerpts coded with themes related to environmental change also paints a more nuanced picture (Figure 8). For Alaskan Women and the Yukon, environmental themes are marked primarily by anxiety and sadness, tempered by feelings of optimism concerning care for nature; Gloucester is dominated by emotion-tagged words reflecting anxiety; while tagged sentiments of optimism in Long Island center on care for nature while anger marks excerpts about climate change belief and behavior; little of the environmental-change related codes were associated with tagged sentiments in the other collections. In the next section, we explore the context for these differences further, looking at results from the qualitative analysis and thematic coding in greater detail, showing the importance of "small data" approaches for understanding the deeply cultural understandings, perceptions, and histories of environmental changes such as climate.

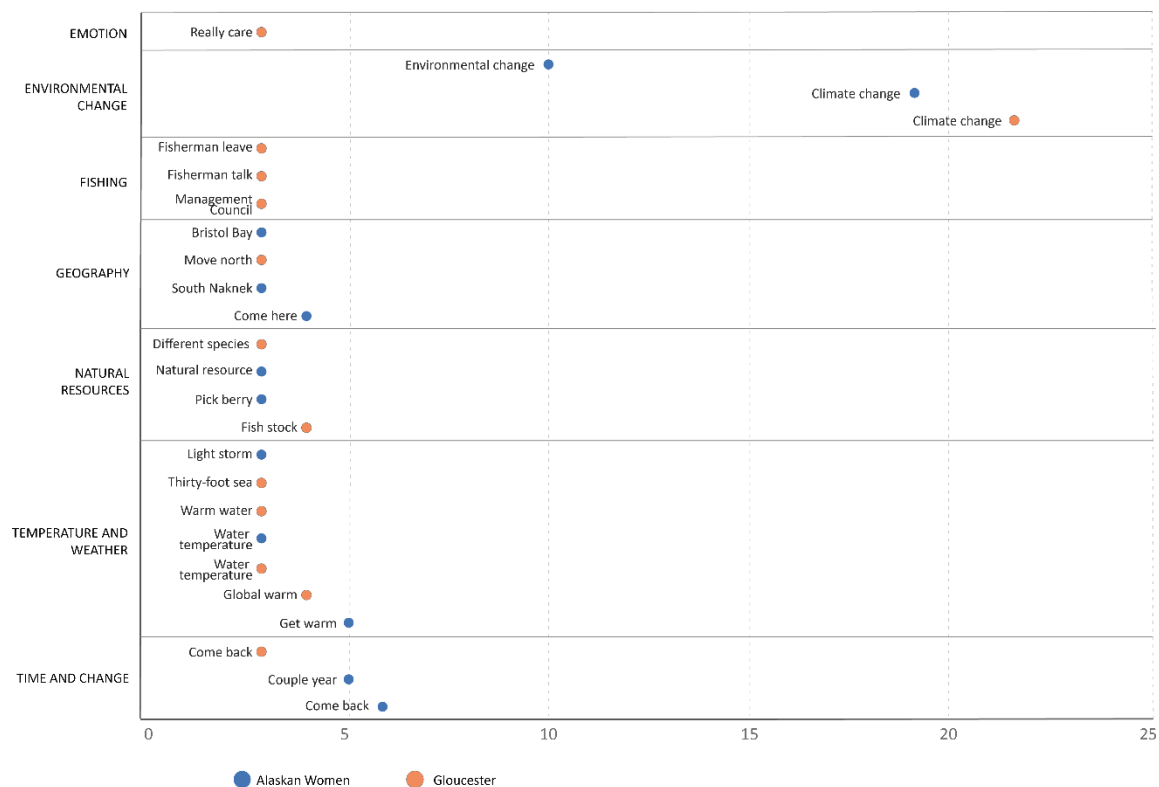


Figure 7: Most frequent (3 or more) n-grams, excerpts coded "environmental changes," Alaskan Women (blue) and Gloucester (orange).

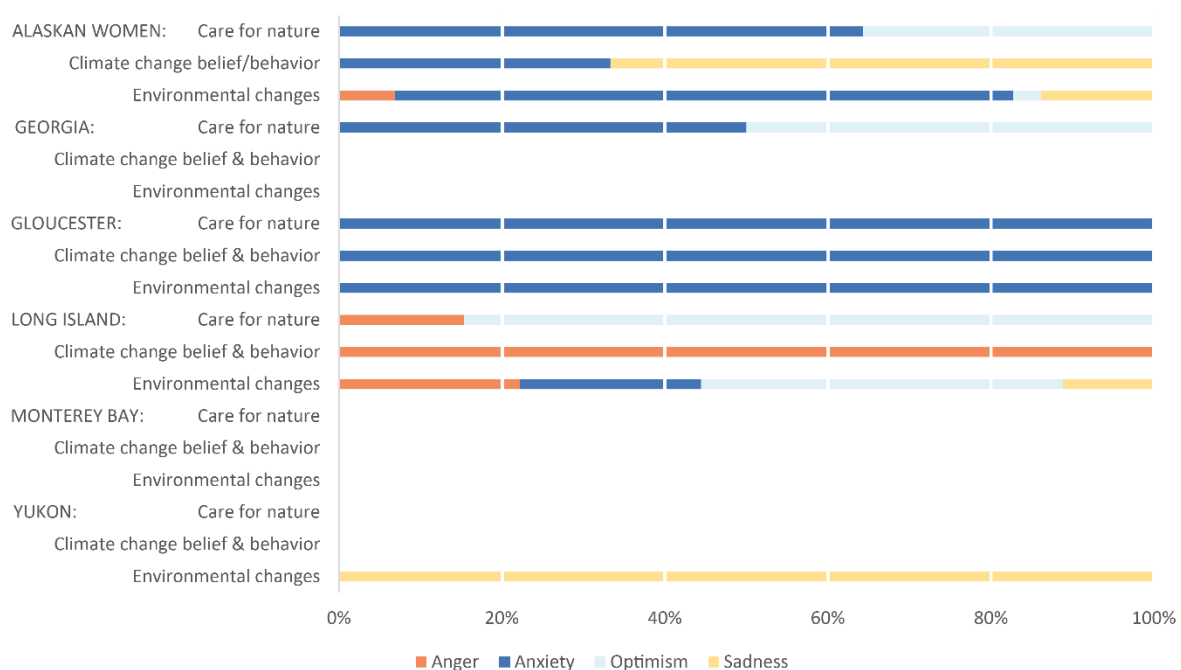


Figure 8: Sentiment analysis on environmentally-coded excerpts

b. Practice, meaning, and lived experience

The in-depth qualitative analysis—the slow reading of small data—revealed significant differences in perceptions and understandings of climate change, while the collection-by-collection analysis helped pinpoint those shared understandings, points of contention, and differences between communities, that might be obscured if decontextualized (cf. Nightingale 2009). The degree to which the terminology of climate change was adopted and accepted as the cause of observed changes also varied between interviewees and between collections, underscoring how people’s memories and experiences shape their understandings and the subtlety with which these differences are articulated and culturally inscribed. In the following, we examine the Alaskan Women, Gloucester, Long Island, and Georgia collections in more detail (Yukon and Monterey Bay had too few interviews) to show the importance of contextual understandings for situating oral history narratives.

The Alaskan Women collection comprises seventeen interviews with twenty-two women, conducted during 2017-2018 by social scientists at NOAA Fisheries Alaska and the Pacific States Marine Fisheries Commission, in collaboration with the Bristol Bay Native Association, in order to document the experiences of Native Alaska women engaged in commercial or subsistence fisheries in Bristol Bay. Most of the interviewees readily referred to their personal experience of environmental change, from changes in temperature and precipitation to changing harvests of salmon, berries, and caribou. Changes in ice levels, for example, impact how people travel in the winter and how villages are connected. “We still occasionally have caribou come into town. But it is noticeably warmer. I can’t take the dogs out like I could [...] the creeks are all open. You really can’t go very far. All the people who hunt are saying the same thing—they can’t go out and hunt, you know. Every winter’s different, but in the 30-some years I’ve been here, and it’s more than 35, it’s just getting warmer and warmer” (Shankle 2018:4). Interviewees linked climate change to impacts on their livelihood and their future cultural survival as Alaskan natives, tending to associate climate change as evidence of continued impacts from a dominant culture on their way of life. A sense of sadness permeated interviews, as well also indicated by the sentiment analyses, as one described how “the heat comes too fast, like the green ikiituk [wild celery] we call it, we go and they’re not growing very big. They supposed to grow in cool, rainy weather with a little bit of sun. These aren’t growing. The puyuraaq [wild raspberry], they used to be abundant down at Ekuk on the flat. They’re wild raspberries, they don’t even

grow anymore, because it's too hot and there's not enough rain" (Ingram 2017:5). But while climate change was viewed as an "us-versus-them" external threat, among which were also mentioned mining companies and foreign trawlers, the same histories might also speak positively of their own or their community's ethnically and culturally diverse backgrounds. Key to their concerns was their heavy involvement in subsistence fishing and the transfer of local environmental and cultural knowledge to younger generations, such that their "identity and sense of place were closely tied to everyday practices and experiences of living in fishing households and a fishing community" (Lavoie et al. 2019:4). Where identity is strongly anchored to place-based relationships, as Thompson and Ban (2022:232) write, the transfer of ecological knowledge, practice, and culture becomes integral to cultural survival. In these oral histories, the strong emphasis on family, kinship, and sharing relationships merged with active concern to sustain traditional lifestyles, with the practice of environmental knowledge, preparation of traditional foods, and local identities inextricably tied.

The Gloucester, Massachusetts collection consists of twelve interviews conducted between 2019 and 2020, in a NOAA Fisheries, Greater Atlantic Regional Fisheries Office effort to capture the experiences of life-long residents in this historical fishing community and understand their perceptions of climate change. These interviewees also stressed the role of families in their fishing businesses and the importance of a sense of place in constructing their identity as fishermen. But while the Alaskans viewed family and community actively maintaining a subsistence lifestyle, Gloucester interviewees tended to speak in the past tense about a working-class community and fishing way of life gone or going, nostalgia that "reveals something about what people feel about the present and future: what they care about, what they feel they have lost and would like to regain" (Rohse et al.2020:143). Critical to an understanding of their concerns is the decline of the groundfishing industry that dominates the Gloucester community and the distrust and anger that many direct to the regulatory environment and scientific models that inform it. Thus unlike the Alaskan interviewees, many in Gloucester expressed scepticism that climate change was the cause of environmental changes they had personally observed and agreed were happening (see also Fischer 2018). Many (though not all) saw climate change science as a threat for its potential influence on fisheries stock assessment models that could further squeeze their ability to fish. While Runnebaum et al. (2023) surveyed New England

fishermen and found the majority believed climate change was occurring (and among the most vulnerable and likely to believe were groundfishermen), the oral histories show the subtleties in these beliefs, with many fishermen acknowledging changes such as warming waters but proffering explanations different to climate change models. Instead, they interpreted the changes they witnessed as evidence for the cyclical nature of oceanic resources, a natural up-and-down of “mother nature” they had experienced all their working lives and believed scientists to reject. As one stated, “The oceans are warming, but the Earth goes through how many cycles in a thousand-year period? Hot cycles, cold cycles, stormy cycles. I think it’s just a cycle. How much of it is being contributed by CO₂, I don’t know. It’s not helping, but I think what’s happening now would have happened anyway” (Cottone 2019:27). This lived experience of a fishing industry radically restructured in recent years, as Anderson (2008:74) has written in a different context, “heighten[ed] local identity-based responses to the contemporary experience of change,” constructing place-based identities as Gloucester fishermen in sharp contrast to scientific explanations of climatic and oceanic changes and as the lens through which impacts were interpreted.

The Long Island collection was also motivated by climate change but directed at recording the experiences that local residents, and especially local fishermen known as Baymen, had of Hurricane Sandy, which hit the eastern seaboard US in 2012. Interviews with nine residents were conducted from 2015-2016 by a local non-profit heritage center. Like the Alaskan women, Long Island residents lived and worked close to shore; their narratives richly detailed knowledge of and concern about the environment, their vulnerability to extreme weather, their localized adaptation to seasonal fisheries, and their love of their way of life, all of which were deeply rooted in place and family. But only one interviewee spoke specifically of climate change, adding after a discussion of the storms he had experienced that “maybe it’s cycles, maybe it’s climate change. Whatever it is, you have to get with the program and deal with it, especially if it’s what you do for a living. My office is out in the boat, on the water. Every day it changes” (Jefferies 2015:10). Storms and their aftermath were discussed extensively in other interviews given the focus of the project, but as Aisher writes, storms are dynamic “sites of more-than-human sociality” that facilitate such “more-than-human” reflection (2022:59). The lived experience of dealing with coastal storms and navigating the sound provided a lens through which to understand and respond to the far more devastating impacts from Hurricane Sandy. But what the histories also

recounted was the degree to which localized practices were literally sedimented in the built environment (such as traditional bay houses built in the marshes), and while residents were quick to rebuild their communities, their vulnerability to the threats from future storms has been intensified by, for example, planning policies that required rebuilding damaged homes in exactly the same places (cf. Endfield 2014:306).

Such vulnerability is also highlighted in the Georgia collection, a collection of nineteen interviews conducted by NOAA and Savannah State University researchers during 2009-2015. The project sought to document the history of and decline in fisheries by African-Americans in an area settled predominantly by Gullah Geechee speakers (a unique African-origin Creole language and culture) and under new threat from gentrification and resource loss (Hoskins-Brown 2020). Interviewees discussed the racism and exploitation they had experienced, the necessity of risk-sharing strategies amongst extensive kinship networks, the fatalism engendered by such conditions, but also their pride in community and heritage. “We had to work for everything we get and we ain’t got nothing on a silver plate like ya’ll young people got now. Everything now all you got to do is just get your education and reach out it’s there. It’s there for you [...] But God make a way. He will make a way out of no way. That’s right. All you got to do put your trust in God” (Butler 2012:9). Like Long Island, the Georgia Black Fishermen communities were located in low-lying areas especially vulnerable to climate change and sea level rise. But the Georgia interviewees also lacked accumulated capital after years of racism and more recently gentrification (see also Grace- McCaskey et al. 2021), their localized knowledge and self-sufficiency were core elements of Gullah Geechee culture (Hoskins-Brown 2020) but less transferable to other places or livelihoods, and their close-knit community and cultural traditions likely disrupted if uprooted. Such elements come together to frame cultural understandings and responses to environmental changes, and remind us of the deep-seated social justice issues involved in more fully understanding climate change: “Climate and culture act symmetrically upon each other, but with outcomes which reveal the unequal distributions of power, wealth and gendered agency in the world. The ‘impacts’ of climate or climate change are therefore contingent and emergent and hence always political” (Hulme 2015: 7).

5. Conclusions

Voices from oral history help shed light on the on-the-ground perceptions and lived experiences of climate change, providing not only the long-term perspectives needed to

contextualize such observations but reflexive ones rooted deeply in particular social and cultural worlds. Such voices also help us to understand the diversity of needs and values, perceptions of risk, and ways of knowing and acting in the world that climate science and policy can and must learn from if it is to support communities in an uncertain future. As Goldstein (2022) has shown, the increasing uncertainty and corresponding inaction engendered by the pursuit of ever more precise “hard” physical data makes it even more important to recognize and value the important role that lived experiences, perceptions, and emotions can play in understanding and responding to environmental change, and in the pursuit of alternative futures more generally. Scientific measures of weather, as Pillatt (2012, 2016) found, do not necessarily match unambiguously with lived experiences, but it is through these experiences, in their “diversity, variability and historical particularity [...] that widespread, long-term social and environmental change is both constituted and contextualized (2012: 65). Oral histories provide a unique lens into the individual experiences and interpretations of such phenomena as environmental changes like climate change, but such uniquely personalized responses never arise out of a cultural vacuum. Even in oral histories conducted at a time of greater awareness and attention to climate change, understandings of climate change were mediated through identities and experiences informed by culture, history, and power differentials. Here scale is particularly important: as Hulme (2015: 2) writes, “*Ideas* about climate are always situated in a time and in a place.” Thus by looking at histories together by group or region, or looking across space and/or time, one can begin to see patterns of similarity and dissimilarity through which the contours of culture (and its discontents) become more apparent. Comparing across collections also helps better understand the wider range of experiences than one interview or collection alone.

We approached a large corpus of varied oral history collections using some of the tools of “big data” for gaining entry to potentially relevant histories and getting an initial feel for their similarities and differences, coupled to the methods of traditional qualitative analysis to “slow read” them, contextualizing and situating their narratives. Our point-of-entry was through the “natural language” of environmental changes, but we could also have looked for histories conducted at different times in one geographic area to chart changes over time, or focused more narrowly on specific environmental changes. Nonetheless, gaining such entry was a necessary step, without which the collections would not have

gained their “new” value from being compared and analysed together, highlighting the different ways in which cultural groups living in specific ecosystems with their own unique values, social, political context will understand, experience, and ultimately adapt to climate changes in different ways. For example, while many of the Gloucester interviewees voiced scepticism of climate change as an explanation, when seen in conjunction with the Alaskan Women interviews, with whom they shared many features, it becomes clearer that their recognition of climatic changes is just as palpable. However, experiences of groundfishing declines and a history of mistrust in governmental regulations and scientific resource management have sedimented identity-based responses that favor different explanations for environmental change that are suspicious of climate change messaging and information, such that impacts and vulnerabilities from climate change co-emerge in particular political economies. This has implications not only for how communities perceive change and evaluate risk, but also for how work in management, adaptation, and resilience-building might more effectively and reflexively engage and communicate (Adger et al. 2013, Marino et al. 2023). As Maltby et al. (2023:9) write, despite the “inherently future focused” nature of climate policy, “historical reflections and interrogations are important to examine how past legacies may shape future responses and the drivers of potential barriers and enablers.”

Necessitating such understandings are both the qualitative data sources to inform them and the different readings they demand. Sustainability science has shown increasing interest in the co-production of knowledge, including to better achieve climate resilience (e.g. Mills et al. 2023). Such transdisciplinary approaches to knowledge require the incorporation of the tools of social scientists. To communicate information about climate change and help communities understand the risks they might face, it is first necessary to attend to the varying contextual factors that shape how climate change is experienced and understood. For example, the tendency to frame understandings of environmental change using specific language—such as the Alaskan Women narratives that talk about erosion rather than using the terminology of sea level rise—has direct implications for how climate services can better communicate with impacted communities. But the telling of stories in oral history, and making these collections visible and connected to each other, is part of an even bigger process of learning and change. The very process of oral history interviews, or the storytelling narrative it engenders, raises awareness in the course of reflecting on and

assessing one's own experiences and knowledge. This effect is multiplicative as interviews among different people, and collections in different times and places, become connected through analysis and dialogue. Lejano et al. (2013:69) argue "The public needs to encounter those already acting on or affected by climate change [...] to turn the abstract knowledge of climate change to tangible, everyday reality and to have people then tell their own stories of living with climate change." Oral histories bear witness to change, seen through individual biographies imprinted with culture and context. As such, they demonstrate the different and inextricably cultural ways of living, knowing, understanding, and talking about climate change, richer accounts of the past and present that inform socially and environmentally resilient approaches to the future.

Acknowledgements

We would like to thank Molly Graham, Min-Yang Lee, Sarah Wise, and our reviewers for their thoughtful comments and suggestions, which pushed us to articulate our arguments with far more rigor, and to Molly for her tireless work in managing the Voices archive. We thank Dianna C. Parker, Director of the NOAA Heritage Program, for her interest in and support of using oral histories to understand environmental changes. Finally, we are grateful for the support that Tammy Murphy, Mike Simpkins, and Jon Hare have given this work at NOAA Fisheries. This work was funded by the Heritage Program, Office of Communications, NOAA Fisheries. The scientific results and conclusions, as well as any views or opinions expressed herein, are those of the authors and do not necessarily reflect those of NOAA or the Department of Commerce. Any misunderstandings are of course our own.

Availability Statement

The NOAA Voices Oral History Archives, including transcripts, recordings, and descriptive information, is publicly available at <https://voices.nmfs.noaa.gov/>. Maxqda, the software used for textual analysis, is commercially available at <https://www.maxqda.com/>.

References

Adger, W. N., J. Barnett, K. Brown, N. Marshall, K. O'Brien. 2013. Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change* 3: 112-117, <https://doi.org/10.1038/nclimate1666>.

- Agrawal, A., M.C. Lemos, B. Orlove, J. Ribot. 2012. Cool heads for a hot world – Social sciences under a changing sky. *Global Environmental Change* 22(2): 329-331, <https://doi.org/10.1016/j.gloenvcha.2012.02.003>.
- Aisher, A. 2022. How a Storm Feels: Storying Climate Change in the Eastern Himalayas. In *Cooling Down: Local Responses to Global Climate Change*, ed. by S. M. Hoffman, T. H. Eriksen, P. Mendes, Berghahn Books, <https://www.jstor.org/stable/j.ctv29sfz9v.8>.
- Alexander, S.M., K. Jones, N.J. Bennett, A. Budden, M. Cox, M. Crosas, E.T. Game, J. Geary, R.D. Hardy, J.T. Johnson, S. Karcher, N. Motzer, J. Pittman, H. Randell, J.A. Silva, P. Pinto da Silva, C. Strasser, C. Strawhacker, A. Stuhl, N. Weber. 2020. Qualitative data sharing and synthesis for sustainability science. *Nature Sustainability* 3: 81-88, <https://doi.org/10.1038/s41893-019-0434-8>.
- Anderson, D. 2008. Drought, Endurance and 'The Way Things Were': The Lived Experience of Climate and Climate Change in the Mallee. *Australian Humanities Review* 45: 67-81, <https://doi.org/10.22459/ahr.45.2008.04>.
- Anderson, D. 2010. Drought, Endurance and Climate Change 'Pioneers' Lived Experience in the Production of Rural Environmental Knowledge. *Cultural Studies Review* 16(1): 82-101, <https://doi.org/10.5130/csr.v16i1.1439>.
- Bell, G., M. Gould, B. Martin, A. McLennan, E. O'Brien. 2021. Do more data equal more truth? Toward a cybernetic approach to data. *Australian Journal of Social Issues* 56(2): 213-222, <https://doi.org/10.1002/ajs4.168>.
- Berkes, F. 2009. Indigenous ways of knowing and the study of environmental change. *Journal of the Royal Society of New Zealand* 39(4): 151-156, <https://doi.org/10.1080/03014220909510568>.
- Biehl, P.F., S. Crate, M. Gardezi, L. Hamilton, S.L. Harlan, C. Hritz, B. Hubbell, T.A. Kohler, N. Peterson, J. Silva. 2018. Innovative tools, methods, and analysis: Social science perspectives on climate change, part 3. Washington, DC: USGCRP Social Science Coordinating Committee, https://www.globalchange.gov/sites/globalchange/files/Methods_SSCC.pdf.
- Bishop, L., A. Kuula-Luumi. 2017. Revisiting Qualitative Data Reuse: A Decade On. *SAGE Open* 7(1): 1-15, <https://doi.org/10.1177/2158244016685136>.
- Bornat, J. 2003. A Second Take: Revisiting Interviews with a Different Purpose. *Oral History* 31(1): 47-53, <https://www.jstor.org/stable/40179735>.

- Boyd, D. 2013. OHMS: Enhancing Access to Oral History for Free. *The Oral History Review* 40(1): 95-106, <https://doi.org/10.1093/ohr/ohr031>.
- Brown, M., P. Shackel. 2023. Text Mining Oral Histories in Historical Archaeology. *International Journal of Historical Archaeology* 27: 865-881, <https://doi.org/10.1007/s10761-022-00680-5>.
- Bruns, A. 2013. Faster than the speed of print: Reconciling 'big data' social media analysis and academic scholarship. *First Monday* 18(10), <https://doi.org/10.5210/fm.v18i10.4879>.
- Butler, P. 2012. Oral History Interview with Primus Butler by Dionne Hoskins on July 17, 2012. In the collection "Georgia Black Fisherman," NOAA Voices Oral History Archives, <https://voices.nmfs.noaa.gov/primus-butler> (last accessed: August 25, 2023).
- Carothers, C., T.L. Sformo, S. Cotton, J.C. George, P.A.H. Westley. 2019. Pacific Salmon in the Rapidly Changing Arctic: Exploring Local Knowledge and Emerging Fisheries in Utqiagvik and Nuiqsut, Alaska. *Arctic* 72(3): 273-288, <https://doi.org/10.14430/arctic68876>.
- Cochran, P., O.H. Huntington, C. Pungowiyi, S. Tom, F.S. Chapin, III, H.P. Huntington, N.G. Maynard, S.F. Trainor. 2013. Indigenous frameworks for observing and responding to climate change in Alaska. *Climatic Change* 120(3): 557-567, <https://doi.org/10.1007/s10584-013-0735-2>.
- Corbin, J., A. Strauss. 1990. Grounded Theory Research: Procedures, Canons, and Evaluative Criteria. *Qualitative Sociology* 13(1): 3-21, <https://doi.org/10.1007/BF00988593>.
- Cottone, A. 2019. Oral History Interview with Al Cottone by Molly Graham on August 02, 2019. In the collection "Strengthening Community Resilience in America's Oldest Seaport," NOAA Voices Oral History Archives, <https://voices.nmfs.noaa.gov/al-cottone> (last accessed: August 25, 2023).
- Crate, S.A. 2008. Gone the Bull of Winter?: Grappling with the Cultural Implications of and Anthropology's Role(s) in Global Climate Change. *Current Anthropology* 49(4): 569-595, <https://doi.org/10.1086/529543>.
- Cruikshank, J. 2001. Glaciers and Climate Change: Perspectives from Oral Tradition. *Arctic* 54(4): 377-393, <https://doi.org/10.14430/arctic795>.
- Davidson, C. 2009. Transcription: Imperatives for Qualitative Research. *International Journal of Qualitative Methods* 8(2): 35-52, <https://doi.org/10.1177/160940690900800206>.

- Davidson, E., R. Edwards, L. Jamieson, S. Weller. 2019. Big data, qualitative style: a breadth-and-depth method for working with large amounts of secondary qualitative data. *Quality & Quantity* 53: 363-376, <https://doi.org/10.1007/s11135-018-0757-y>.
- Demeritt, D. 2001. The Construction of Global Warming and the Politics of Science. *Annals of the Association of American Geographers* 91(2): 307-37, <https://doi.org/10.1111/0004-5608.00245>.
- Editorial. 2021. Powers of qualitative research. *Nat. Clim. Chang.* 11: 717. <https://doi.org/10.1038/s41558-021-01153-z>.
- Edwards, R., E. Davidson, L. Jamieson, S. Weller. 2021. Theory and the breadth - and - depth method of analysing large amounts of qualitative data: a research note. *Quality & Quantity* 55: 1275-1280, <https://doi.org/10.1007/s11135-020-01054-x>.
- Ellen, R.F. 1984. *Ethnographic Research: A Guide to General Conduct*, volume 1 in Research Methods in Social Anthropology, London: Academic Press.
- Erickson, B. 2020.: Anthropocene futures: Linking colonialism and environmentalism in an age of crisis. *Environment and Planning D: Society and Space* 38(1): 111-128, <https://doi.org/10.1177/0263775818806514>.
- Endfield, G.H. 2014. Exploring Particularity: Vulnerability, Resilience, and Memory in Climate Change Discourses. *Environmental History* 19(2): 303-310, <https://www.journals.uchicago.edu/doi/10.1093/envhis/emu004>.
- Fioroni, S., A. Hasell, S. Soroka and B. Weeks. 2021. Constructing a Dictionary for the Automated Identification of Discrete Emotions in News Content. Open Science Framework (OSF) Preprint, Center for Open Science, <https://doi.org/10.17605/OSF.IO/CBM9E>.
- Fischer, A.P. 2018. Pathways of adaptation to external stressors in coastal natural-resource-dependent communities: Implications for climate change. *World Development* 108: 235-248, <https://doi.org/10.1016/j.worlddev.2017.12.007>.
- Fløttum, K., Ø. Gjerstad. 2017. Narratives in climate change discourse. *Wiley Interdisciplinary Reviews: Climate Change* 8(1): e429, <https://doi.org/10.1002/wcc.429>.
- Ganascia, J.-G. 2015. The Logic of the Big Data Turn in Digital Literary Studies. *Front. Digit. Humanit.* 2:7, <https://doi.org/10.3389/fdigh.2015.00007>.
- Goldman, M.J., M.D. Turner, M. Daly. 2018. A critical political ecology of human dimensions of climate change: Epistemology, ontology, and ethics. *Wiley Interdisciplinary Reviews: Climate Change* 9(4): e526. <https://doi.org/10.1002/wcc.526>.

- Goldstein, J.E. 2022. More data, more problems? Incompatible uncertainty in Indonesia's climate change mitigation projects. *Geoforum* 132: 195-204, <https://doi.org/10.1016/j.geoforum.2021.11.007>.
- Grace- McCaskey, C.A., S.C. Pearce, L. Harris, M. Corra, K.J. Evans. 2021. Finding voices in the floods of Freedom Hill: innovating solutions in Princeville, North Carolina," *Journal of Environmental Studies and Sciences* 11: 341-351, <https://doi.org/10.1007/s13412-021-00701-5>.
- Grele, R.J. 1987. On Using Oral History Collections: An Introduction. *The Journal of American History* 74(2): 570-578, <https://doi.org/10.2307/1900139>.
- Guetterman, T.C., T. Chang, M. DeJonckheere, T. Basu, E. Scruggs, V.G.V. Vydiswaran. 2018. Augmenting Qualitative Text Analysis with Natural Language Processing: Methodological Study. *Journal of Medical Internet Research* 20(6): e231, <https://doi.org/10.2196/jmir.9702>.
- Hall, A., G. Endfield. 2016. "Snow Scenes": Exploring the Role of Memory and Place in Commemorating Extreme Winters. *Weather, Climate, and Society* 8(1): 5-19, <https://doi.org/10.1175/WCAS-D-15-0028.1>.
- Hammersley, M. 2010. Can We Re-Use Qualitative Data via Secondary Analysis? Notes on Some Terminological and Substantive Issues. *Sociological Research Online* 15(1): 47-53, <https://doi.org/10.5153/sro.2076>.
- Haraway, D. 1991. *Simians, Cyborgs and Women*. New York: Routledge.
- Harris, D.M. 2021. Storying climate knowledge: Notes on experimental political ecology. *Geoforum* 126: 331-339, <https://doi.org/10.1016/j.geoforum.2021.08.011>.
- Hartmann, J., M. Heitmann, C. Siebert, C. Schamp. 2023. More than a Feeling: Accuracy and Application of Sentiment Analysis, *International Journal of Research in Marketing* 40(1): 75-87, <https://doi.org/10.1016/j.ijresmar.2022.05.005>.
- Heaton, J. 2008. Secondary analysis of qualitative data: an overview. *Historical Social Research* 33(3): 33-45, <https://doi.org/10.12759/hsr.33.2008.3.33-45>.
- Hoskins-Brown, D.L. 2020. Tales of Landings and Legacies: African Americans in Georgia's Coastal Fisheries. *Cult Agric Food Environ* 42: 36-50, <https://doi.org/10.1111/cuag.12248>.
- Hulme, M. 2015. Climate and its changes: A cultural appraisal. *Geo: Geography and Environment* 2(1): 1-11, <https://doi.org/10.1002/geo2.5>.

- Ingold, T. 2010. Footprints through the Weather-World: Walking, Breathing, Knowing. *Journal of the Royal Anthropological Institute (N.S.)* 16(S1): 121-39, <https://doi.org/10.1111/j.1467-9655.2010.01613.x>.
- Ingram, J. 2017. Oral History Interview with June Ingram by Anna Lavoie and Kitty Sopow on June 5, 2017. In the collection "Women in Alaska Fisheries," NOAA Voices Oral History Archives, <https://voices.nmfs.noaa.gov/june-ingram> (last accessed: August 25, 2023).
- Islam, M.M., S. Sallu, K. Hubacek, J. Paavola. 2014. Limits and barriers to adaptation to climate variability and change in Bangladeshi coastal fishing communities. *Marine Policy* 43: 208-216, <https://doi.org/10.1016/j.marpol.2013.06.007>.
- Janif, S.Z., P.D. Nunn, P. Geraghty, W. Aalbersberg, F.R. Thomas, M. Camailakeba. 2016. Value of traditional oral narratives in building climate-change resilience: insights from rural communities in Fiji. *Ecology and Society* 21(2):7, <http://dx.doi.org/10.5751/ES-08100-210207>.
- Jasanoff, S. 2010. A New Climate for Society. *Theory, Culture & Society* 27(2-3): 233-253, <https://doi.org/10.1177/0263276409361497>.
- Jefferies, T. 2015. Oral History Interview with Tom Jefferies by Nancy Solomon on November 3, 2015. In the collection "Long Island Traditions - Climate Change and Sandy," NOAA Voices Oral History Archives, <https://voices.nmfs.noaa.gov/tom-jefferies> (last accessed: August 25, 2023).
- Jones, K., S.M. Alexander, N. Bennett, L. Bishop, A. Budden, M. Cox, M. Crosas, E. Game, J. Geary, C. Hahn, D. Hardy, J. Johnson, S. Karcher, M. LaFevor, N. Motzer, J. Pittman, H. Randell, J. Silva, P. Pinto da Silva, J. Smith. 2018. Qualitative data sharing and re-use for socio-environmental systems research: A synthesis of opportunities, challenges, resources and approaches. SESYNC White Paper, <https://doi.org/10.13016/M2WH2DG59>.
- Jorgenson, A.K., S. Fiske, K. Hubacek, J. Li, T. McGovern, T. Rick, J.B. Schor, W. Solecki, R. York, A. Zycherman. 2019. Social science perspectives on drivers of and responses to global climate change. *Wiley Interdisciplinary Reviews: Climate Change* 10(1): e554, <https://doi.org/10.1002/wcc.554>.
- Kaplan, F. 2015. A map for big data research in digital humanities. *Frontiers in Digital Humanities* 2(1): 1-7, <https://doi.org/10.3389/fdigh.2015.00001>.
- Kitchin, R. 2014. *The Data Revolution: Big Data, Open Data, Data Infrastructures & Their Consequences*, Thousand Oaks, CA: Sage, <https://doi.org/10.4135/9781473909472>.

- Kurz, T., A.M.B. Prosser. 2021. Understanding the social dynamics of climate change through analyses of discourse. *Current Opinion in Psychology* 42: 71-75, <https://doi.org/10.1016/j.copsyc.2021.03.010>.
- Lahsen, M. 2007. Trust Through Participation? Problems of Knowledge in Climate Decision Making. In *The Social Construction of Climate Change: Power, Knowledge, Norms, Discourses*, M.E. Petenger, Ed. Burlington, Vermont: Ashgate, pp. 173-196, <https://doi.org/10.4324/9781315552842>.
- Lahsen, M. 2022. Evaluating the computational (“Big Data”) turn in studies of media coverage of climate change. *Wiley Interdisciplinary Reviews: Climate Change* 13(2): e752, <https://doi.org/10.1002/wcc.752>.
- Lavoie, A., J. Lee, K. Sparks, G. Hoseth, S. Wise. 2019. Engaging with Women's Knowledge in Bristol Bay Fisheries through Oral History and Participatory Ethnography. *Fisheries* 44(7): 331-337, <https://doi.org/10.1002/fsh.10271>.
- Lejano, R., J. Tavares-Reager, B. Berkes. 2013. Climate and narrative: Environmental knowledge in everyday life. *Environmental Science and Policy* 31: 61-70, <https://doi.org/10.1016/j.envsci.2013.02.009>.
- Leonard, S., M. Parsons, K. Olawsky, F. Kofod. 2013. The role of culture and traditional knowledge in climate change adaptation: Insights from East Kimberley, Australia. *Global Environmental Change* 23(3): 623-632, <https://doi.org/10.1016/j.gloenvcha.2013.02.012>.
- Makondo, C.C., D.S.G. Thomas. 2018. Climate change adaptation: Linking indigenous knowledge with western science for effective adaptation. *Environmental Science and Policy* 88: 83-91, <https://doi.org/10.1016/j.envsci.2018.06.014>.
- Maltby, K.M., S. Kerin, K.E. Mills. 2023. Barriers and enablers of climate adaptation in fisheries: Insights from Northeast US fishing communities. *Marine Policy* 147, <https://doi.org/10.1016/j.marpol.2022.105331>.
- Marino, E.K., K. Maxwell, E. Eisenhauer, A. Zycherman, C. Callison, E. Fussell, M.D. Hendricks, F.H. Jacobs, A. Jerolleman, A.K. Jorgenson, E.M. Markowitz, S.T. Marquart-Pyatt, M. Schutten, R.L. Shwom, and K. Whyte. 2023. Chapter 20: Social systems and justice. In *Fifth National Climate Assessment*, ed. by A.R. Crimmins, C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock. U.S. Global Change Research Program, Washington, DC, USA. <https://doi.org/10.7930/NCA5.2023.CH20>.

- Marx, S.M., E.U. Weber, B.S. Orlove, A. Leiserowitz, D.H. Krantz, C. Roncoli, J. Phillips. 2007. Communication and mental processes: Experiential and analytic processing of uncertain climate information. *Global Environ. Change* 17: 47-58, <https://10.1016/j.gloenvcha.2006.10.004>.
- Mauthner, N.S. 2019. Toward a Posthumanist Ethics of Qualitative Research in a Big Data Era. *American Behavioral Scientist* 63(6): 669-698, <http://doi.org/10.1177/0002764218792701>.
- Mauthner, N.S., P. Odette, K. Backett-Milburn. 1998. The Data are Out there, or are They? Implications for Archiving and Revisiting Qualitative Data. *Sociology* 32(4): 733-745, <https://doi.org/10.1177/0038038598032004006>.
- McMullin, C. 2023. Transcription and Qualitative Methods: Implications for Third Sector Research. *Voluntas* 34: 140-153, <https://doi.org/10.1007/s11266-021-00400-3>.
- Meadow, A.M., D.B. Ferguson, Z. Guido, A. Horangic, G. Owen, and T. Wall. 2015. Moving toward the deliberate coproduction of climate science knowledge. *Weather, Climate, and Society* 7(2): 179-191, <https://doi.org/10.1175/wcas-d-14-00050.1>.
- Mills, K.E, D. Armitage, J.G. Eurich, K.M. Kleisner, G.T. Pecl, K. Tokunaga. 2023. Co-production of knowledge and strategies to support climate resilient fisheries. *ICES Journal of Marine Science* 80(2): 358-361, <https://doi.org/10.1093/icesjms/fsac110>.
- Nightingale, A. 2009. Oral History, Ecological. In *International Encyclopedia of Human Geography*, ed. by R. Kitchin, N. Thrift, New York: Elsevier, pp. 34-36, <https://doi.org/10.1016/B978-008044910-4.00486-7>.
- Nightingale, A.J., S. Eriksen, M. Taylor, T. Forsyth, M. Pelling, A. Newsham, E. Boyd, K. Brown, B. Harvey, L. Jones, R.B. Kerr, L. Mehta, L.O. Naess, D. Ockwell, I. Scoones, T. Tanner, S. Whitfield. 2020. Beyond Technical Fixes: climate solutions and the great derangement. *Climate and Development* 12(4): 343-352, <https://doi.org/10.1080/17565529.2019.1624495>.
- Nyhan, J., A. Flinn. 2016. Chapter 2: Why Oral History? In *Computation and the Humanities: Towards an Oral History of Digital Humanities*, Cham, Switzerland: Springer International Publishing, https://doi.org/10.1007/978-3-319-20170-2_2.
- Ostrom, E. 2009. A general framework for analyzing sustainability of social-ecological systems. *Science* 325(5939): 419-422, <http://dx.doi.org/10.1126/science.1172133>.

- Pandza, C.M. 2023. Using Natural Language Processing to Organize and Analyze Oral History Projects. Master's thesis in Oral History, Columbia University, New York NY.
- Pascoe, S., W. Dressler, M. Minnegal. 2021. Storytelling climate change – Causality and temporality in the REDD+ regime in Papua New Guinea. *Geoforum* 124: 360-370, <https://doi.org/10.1016/j.geoforum.2019.09.014>.
- Pearce, T.D., J.D. Ford, G.J. Laidler, B. Smit, F. Duerden, M. Allarut, M. Andrachuk, S. Baryluk, A. Dialla, P. Elee, A. Goose, T. Ikummaq, E. Joamie, F. Kataoyak, E. Loring, S. Meakin, S. Nickels, K. Shappa, J.I. Shirley, J. Wandel. 2009. Community collaboration and climate change research in the Canadian Arctic. *Polar Research* 28(1): 10-27, <https://doi.org/10.3402/polar.v28i1.6100>.
- Peek, L., M.A. Painter, G. Eosco, A.M. Agather, J. Mote, C. Shivers-Williams, J. Tobin, J. Breeden, and Open Data Workshop Participants. 2023. *Final Report of the Workshop on Open Data and Reuse in Social Science Weather Research*. Natural Hazards Center, University of Colorado Boulder. Available at <https://hazards.colorado.edu/research/weather-ready-research/open-data-workshop> (last accessed January 19, 2024).
- Pillatt, T. 2012. From climate and society to weather and landscape. *Archaeological Dialogues* 19(1): 29-42, <https://doi.org/10.1017/S1380203812000049>.
- Pillatt, T. 2016. Life in the weather-world: examining an eighteenth-century 'ecological perspective.' *World Archaeology* 48(4): 586-602, <https://doi.org/10.1080/00438243.2016.1220869>.
- Riedlinger, D., F. Berkes. 2001. Contributions of traditional knowledge to understanding climate change in the Canadian Arctic. *Polar Record* 37(203): 315-328, <https://doi.org/10.1017/S0032247400017058>.
- Rieping, H.A. 2022. Audio Segmenting and Natural Language Processing in Oral History Archiving. Master's dissertation in Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge MA.
- Rohse, M., R. Day, D. Llewellyn. 2020. Towards an emotional energy geography: Attending to emotions and affects in a former coal mining community in South Wales, UK. *Geoforum* 110: 136-146, <https://doi.org/10.1016/j.geoforum.2020.02.006>.

Runnebaum J.M., L.K. Nelson, S.J. Harper, R.J. Bell, G.S. Smith, A.C. Cullen, M.J. Cutler, P.S. Levin. 2023. Harvester perceptions of climate vulnerability: Contributions to building climate resilient fisheries. *Front. Mar. Sci.* 9:1049445, <https://doi.org/10.3389/fmars.2022.1049445>.

Scruggs, L., S. Benegal. 2012. Declining public concern about climate change: Can we blame the great recession? *Global Environmental Change* 22(2): 505-515, <https://doi.org/10.1016/j.gloenvcha.2012.01.002>.

Shankle, A. 2018. Oral History Interview with Anne Shankle by Sarah Wise and Kim Sparks on July 29, 2018. In the collection "Women in Alaska Fisheries," NOAA Voices Oral History Archives, <https://voices.nmfs.noaa.gov/anne-shankle> (last accessed: August 25, 2023).

Sheppard, S.R.J., A. Shaw, D. Flanders, S. Burch, A. Wiek, J. Carmichael, J. Robinson, S. Cohen. 2011. Future visioning of local climate change: A framework for community engagement and planning with scenarios and visualisation. *Futures* 43(4): 400-412, <https://doi.org/10.1016/j.futures.2011.01.009>.

Shopes, L. 2002. Oral History and the Study of Communities: Problems, Paradoxes, and Possibilities. *The Journal of American History* 89(2): 588-598, <https://doi.org/10.2307/3092177>.

Smith, H.A., K. Sharp. 2012. Indigenous climate knowledges. *WIREs Climate Change* 3(5): 467-476, <https://doi.org/10.1002/wcc.185>.

Thomas, K., R.D. Hardy, H. Lazrus, M. Mendez, B. Orlove, I. Rivera-Collazo, J.T. Roberts, M. Rockman, B.P. Warner, R. Winthrop. 2019. Explaining differential vulnerability to climate change: A social science review. *Wiley Interdisciplinary Reviews: Climate Change* 10(2): e565, <https://doi.org/10.1002/wcc.565>.

Thompson, K.-L., N.C. Ban. 2022. "Turning to the territory": A Gitga'at Nation case study of Indigenous climate imaginaries and actions. *Geoforum* 137: 230-236, <https://doi.org/10.1016/j.geoforum.2021.11.006>.

Thomson, A. 2007. Four paradigm transformations in oral history. *The Oral History Review* 34(1): 49-70, <https://doi.org/10.1525/ohr.2007.34.1.49>.

Tinati, R., S. Halford, L. Carr, C. Pope. 2014. Big Data: Methodological Challenges and Approaches for Sociological Analysis. *Sociology* 48(4): 663-681, <https://www.jstor.org/stable/24433725>.

- Tureby, M.T. 2013. To Hear with the Collection: the contextualisation and recontextualization of archived interviews. *Oral History* 41(2) 63-74, <https://www.jstor.org/stable/23610425>.
- Turner, N.J., H. Clifton. 2009. "It's so different today": Climate change and indigenous lifeways in British Columbia, Canada. *Global Environmental Change* 19(2): 180-190, <https://doi.org/10.1016/j.gloenvcha.2009.01.005>.
- van den Berg, H. 2008. Reanalyzing Qualitative Interviews from Different Angles: The Risk of Decontextualization and Other Problems of Sharing Qualitative Data. *Historical Social Research* 33(3): 179-192, <https://doi.org/10.17169/fqs-6.1.499>.
- Veland, S., M. Scoville-Simonds, I. Gram-Hanssen, A.K. Schorre, A. El Khoury, M.J. Nordbø, A.H. Lynch, G. Hochachka, M. Bjørkan. 2018. Narrative matters for sustainability: the transformative role of storytelling in realizing 1.5°C futures. *Current Opinion in Environmental Sustainability* 31: 41-47, <https://doi.org/10.1016/j.cosust.2017.12.005>.
- Victor, D. 2015. Climate change: Embed the social sciences in climate policy. *Nature* 520(7545): 27-29, <https://doi.org/10.1038/520027a>.
- Weaver, C.P., S. Mooney, D. Allen, N. Beller-Simms, T. Fish, A.E. Grambsch, W. Hohenstein, K. Jacobs, M. A. Kenney, M. A. Lane, L. Langner, E. Larson, D. L. McGinnis, R. H. Moss, L. G. Nichols, C. Nierenberg, E. A. Seyller, P. C. Stern, R. Winthrop. 2014. From global change science to action with social sciences. *Nature Climate Change* 4(8): 656-659, <https://doi.org/10.1038/nclimate2319>.
- Williams, B., M. Riley. 2020. The challenge of oral history to environmental history. *Environment and History* 26(2): 207-231, <https://doi.org/10.3197/096734018X15254461646503>.
- Xiao, L., Y. Luo, S. High. 2013. CKM: A Shared Visual Analytical Tool for Large-Scale Analysis of Audio-Video Interviews. 2013 IEEE International Conference on Big Data, <https://doi.org/10.1109/BigData.2013.6691677>.
- Zurba, M., M.A. Petriello, C. Madge, P. McCarney, B. Bishop, S. McBeth, M. Denniston, H. Bodwitch, M. Bailey. 2022. Learning from knowledge co-production research and practice in the twenty-first century: global lessons and what they mean for collaborative research in Nunatsiavut. *Sustainability Science* 17: 449-467, <https://doi.org/10.1007/s11625-021-00996-x>.