Smithsonian
Scholarly Press

SMITHSONIAN CONTRIBUTIONS TO ANTHROPOLOGY • NUMBER 55

Laax̱aayík, Near the Glacier

Indigenous History and Ecology at Yakutat Fiord, Alaska

Aron L. Crowell

SERIES PUBLICATIONS OF THE SMITHSONIAN INSTITUTION

Emphasis upon publication as a means of "diffusing knowledge" was expressed by the first Secretary of the Smithsonian. In a formal plan for the Institution, Joseph Henry outlined a program that included the following statement: "It is proposed to publish a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge." The Smithsonian has adhered to this theme of basic research through the years in thousands of titles issued in series publications, first with Smithsonian Contributions to Knowledge in 1848 and continuing with the following active series:

- Smithsonian Contributions to Anthropology
- Smithsonian Contributions to Botany
- Smithsonian Contributions to the Earth Sciences
- Smithsonian Contributions to History and Technology
- Smithsonian Contributions to the Marine Sciences
- Smithsonian Contributions to Museum Conservation
- Smithsonian Contributions to Paleobiology
- Smithsonian Contributions to Zoology

Smithsonian Institution Scholarly Press (SISP) publishes small papers and full-scale monographs that report on research and collections of the Institution's museums and research centers. Manuscripts intended for publication in the series undergo substantive peer review and editorial board evaluation, as well as evaluation by SISP for compliance with editorial requirements. Each Smithsonian Contributions Series volume is licensed under a Creative Commons license based on copyright status of its content and is published online at https://smithsonian.figshare.com/ScholarlyPress. SISP prints limited quantities for official use, including for distribution via exchange mailings to libraries, universities, and similar institutions throughout the world.

SUMMARY OF REQUIREMENTS FOR SMITHSONIAN CONTRIBUTIONS SERIES

Visit https://scholarlypress.si.edu for comprehensive guidelines, specifications, and other author resources.

ABSTRACTS must not exceed 300 words.

TEXT must be prepared in a recent version of Microsoft Word; use a Times font in 12 point for regular text; be double-spaced; and have 1″ margins.

REQUIRED ELEMENTS are title page, abstract, table of contents, main text, and references.

FIGURES must be numbered sequentially (1, 2, 3, etc.) in the order called out; have components lettered consistently (in size, font, and style) and described in captions; include a scale bar or scale description, if appropriate; include any legends in or on figures rather than in captions. Figures must be submitted as individual TIF or EPS files.

FIGURE FILES must meet all required specifications in SISP's Digital Art Preparation Guide. Color figures are permitted.

TAXONOMIC KEYS in natural science manuscripts should use the aligned-couplet form for zoology. If cross-referencing is required between key and text, do not include page references within the key but number the keyed-out taxa, using the same numbers with their corresponding heads in the text.

SYNONYMY IN ZOOLOGY must use the short form (taxon, author, year: page), with full reference at the end of the manuscript under "References."

REFERENCES should be in alphabetical order and in chronological order for same-author entries. Each reference should be cited at least once in the manuscript text. Complete bibliographic information must be included in all citations. Examples of the most common types of citations can be found at SISP's website under Resources/Guidelines & Forms.

SMITHSONIAN CONTRIBUTIONS TO ANTHROPOLOGY • NUMBER 55

Laax̱aayík, Near the Glacier

Indigenous History and Ecology at Yakutat Fiord, Alaska

Aron L. Crowell

Smithsonian
Scholarly Press
WASHINGTON, D.C.
2024

ABSTRACT

Crowell, Aron L. *Laax̲aayík, Near the Glacier: Indigenous History and Ecology at Yakutat Fiord, Alaska*. Smithsonian Contributions to Anthropology, number 55, xxii + 207 pages, 168 figures, 13 tables, 2024. — Fiord glaciers of southern Alaska reshape landscapes as they advance and retreat in response to climate cycles, influencing coastal ecosystems by enriching marine food webs with minerals carried in meltwater and ice floes. On land, biodiverse forest ecosystems grow and mature as glaciers withdraw, connected to the sea by glacially fed rivers and lakes where salmon spawn.

For millennia, Alaska Native peoples have lived and thrived in these highly productive cryogenic biomes, harvesting bounties of plant and animal foods by employing complex ecological knowledge, adaptive technologies, and lineage-based social patterns of cooperation and resource sharing. A 1,100-year longitudinal study of the cultural ecology of Yakutat fiord in Southeast Alaska was conducted during 2011–2014 by the Smithsonian Institution's Arctic Studies Center and the Yakutat Tlingit Tribe to document Little Ice Age glacial retreat; settlement of the emerging fiord by migrating Eyak, Ahtna, and Tlingit clans; and utilization of the fiord's marine and terrestrial habitats by past and present residents.

Applying principles of knowledge coproduction, this study joins oral ecological and historical knowledge shared by members of the community with scientific data from archaeology, archaeofaunal analysis, marine and terrestrial ecology, glaciology, subsistence surveys, and historical archives. Information and cultural perspectives from interviews conducted in English and Lingit with community scholars, hunters, and artists are presented alongside results of archaeological investigations at former villages and camps dating from the thirteenth century to the 1960s. Special emphasis is placed on hunting and consumption of harbor seals (*Phoca vitulina*), a cultural focus and principal subsistence species throughout Yakutat history. The study demonstrates the centuries-long construction and modification of a cultural niche, or integrated human role, within the ecosystem of Yakutat fiord.

Cover image: Disenchantment Bay, Alaska. Detail from Figure 166. © Smithsonian Institution.

Published by
SMITHSONIAN INSTITUTION SCHOLARLY PRESS
P.O. Box 37012, MRC 957
Washington, D.C. 20013-7012
https://scholarlypress.si.edu

Library of Congress Control Number: 2023946938

ISSN: 1943-6661 (online); 0081-0223 (print)

Publication date (online): 15 March 2024

♾The paper used in this publication meets the minimum requirements of the American National Standard for Permanence of Paper for Printed Library Materials Z39.48–1992.

DEDICATION

To Dee

Let maps to other, worlds on worlds have shown,
Let us possess one world, each hath one, and is one.

John Donne

Contents

Figures

Tables

Foreword

Dax̲ootsu yéi x̲at duwasákw, my name is Judith Daxootsu Ramos, *Yeil naax̲ x̲at sitee*, I am Raven moiety, from the Kwáashk'i K̲wáan clan, Tisk'w Hít (Owl House) from Yakutat, Alaska. My father's people are the L'uknax̲.ádi (Coho) Clan from Dry Bay, Alaska, and my grandfather is Eagle moiety from the Teik̲weidí (Brown Bear) clan, Ahrnklin River. I live and work on the land of Áak'w K̲wáan of the Lingít Aani (Tlingit people) in Juneau, Alaska.

Traditional people of today walk the road between ancestral and modern ways of life. We are practicing Christians but still hold to our traditional religion, which is the potlatch, or *ku.éex*. We live in a modern world economy yet harvest our food the way our ancestors did, using new technologies. The research in this book is my people's story of how we lived, and still live, from our traditional lands and waters.

OTHER WAYS OF SEEING

Indigenous knowledge and Indigenous science represent other ways of knowing, other ways of being, and other ways of acquiring knowledge that are not always acceptable from the Western point of view but are just as valid. Indigenous people have very long relationships with the places they occupy in this world. They have generations of knowledge about those places, acquired through patient observation and experimentation. That knowledge is needed to maintain balance with the environment and the land, and it is essential for it to continue.

The elders interviewed in this project were the last speakers of the Yakutat dialect of Lingit, the Tlingit language. Language carries knowledge, information, and ideas, and with the loss of original language these concepts become harder to understand. So much of our way of life is carried within the language, so we must restore and carry it on.

DU SHUKA, THAT WHICH CAME BEFORE US

Our people are deeply connected to place. In our ceremonies we recite the migration stories and sing the songs that tell our history. Tribal and clan history, cosmology, and oral traditions are all tied to the land where we live. Place is embodied in our *at.óow* (clan property) and passed on from generation to generation through ceremony, art, and song. This research documents my people's ancient connection to place through story.

The Indigenous people did not have a linear view of history. When the elders told the stories of our ancestor's lives and travels, or even Raven creation stories, there was no clear distinction between past and present, so there was always the question, "Well, when did that happen?" Through this research, Western science provides an understanding of how our history is connected to the passage of time.

HAA K̲USTEEYI, OUR WAY OF LIFE

We cannot live as our elders lived in the past. People like my parents and my grandfather and his generation, who grew up totally Indigenous, are gone, and our way of life has changed so much. The elders who still have the knowledge, who know the history and meaning of places on the land, and who were brought up at those places, are rapidly passing on. They knew the deep history connected to those names and could tell the stories, but with the loss of each elder a whole library of oral knowledge disappears. That is why it was so important to document as much of this information as possible while a few remaining fluent elders could still speak with us. It was important to preserve what we have for future generations and to teach them who they are.

WOOCH.ÉEN, WORKING TOGETHER

I would like to acknowledge all the people who worked together to make this project possible. It was inspired by my father, George Wooshjix̲oo Éesh Ramos, whose uncle taught him the names and locations of ancient sealing camps around Yakutat Bay and who said that the oldest camps are near the mouth of the bay while the most recent are near its head. This project also involved my mother, Elaine Chooshháa Abraham, who was a coprincipal investigator, my children, tribal elders, hunters, the Yakutat Tlingit Tribe, the Smithsonian Institution, Yakutat City and Borough, the Yakutat District of the National Forest Service, and many members of the Yakutat community.

Last, this project is about building relationships and trust between Western scientists and Indigenous people. It is hoped that future researchers will learn through this project about the proper way to conduct research in collaboration with Native communities. And for Indigenous people, it is important to understand what Western science is, what it means, and how it can help their communities. *Aantlein*, a big thank you, to Dr. Aron Crowell and the National Science Foundation.

Judith Daxootsu Ramos
University of Alaska, Southeast
2023

Preface

Fiord glaciers of southern Alaska reshape landscapes as they advance and retreat in synchrony with climate cycles, continually enriching coastal food webs with minerals carried in meltwater and discharged ice floes. Coniferous forests grow and mature on deglaciated land, their ecology linked to the sea by rivers and lakes where salmon spawn. For millennia, Alaska Native peoples have harvested bounties of plant and animal foods in these highly productive cryogenic biomes, aided by deep-seated cultural and ecological knowledge, diverse technologies for hunting, fishing, and ocean travel, and social practices of cooperation and resource sharing.

This 1,100-year longitudinal study of the cultural ecology of Yakutat fiord in Southeast Alaska was conducted in 2011–2014 by the Smithsonian Institution's Arctic Studies Center and the Yakutat Tlingit Tribe. Our objectives were to document Little Ice Age glacial retreat, settlement of the emerging fiord by migrating Eyak, Ahtna, and Tlingit clans, and utilization of its marine and terrestrial habitats by past and present residents. Today, community members harvest more than 100 varieties of fish, birds, sea mammals, land mammals, plants, and invertebrates and consume about 120 kg of wild foods per person each year, a way of life on the land made possible by the knowledge passed on from ancestral generations.

This community-based, collaborative study joins historical and ecological knowledge shared by Yakutat tribal members with scientific data from archaeology, marine and terrestrial ecology, glacial geology, and subsistence surveys conducted by the Alaska Department of Fish and Game. Information and cultural perspectives from interviews conducted in English and Lingit with community scholars, elders, and hunters are presented alongside results from archaeological investigations at former villages and camps that date from the thirteenth century to the 1960s. A special emphasis is placed on the hunting and consumption of harbor seals (*Phoca vitulina*), a cultural focus and principal subsistence species throughout Yakutat history. The study demonstrates the centuries-long construction and modification of an integrated human niche in the ecosystem of Yakutat fiord.

The research took place in Yaakwdáat K̲wáan, the homeland of the Yakutat people. It was undertaken with permission from the Yakutat Tlingit Tribe and in collaboration with members of the community, whose cooperation, hospitality, and contributions are gratefully acknowledged.

Laax̲aayík, Near the Glacier: Indigenous History and Ecology at Yakutat Fiord, Alaska

Introduction

Aron L. Crowell

WHERE GLACIERS MEET THE SEA

Glacial fiords along the coasts of British Columbia, southern Alaska, eastern Canada, Greenland, Norway, and Sweden have attracted human settlement for thousands of years (W. Fitzhugh 1972; Matson and Coupland 1995; Meldgaard 2004; Friesen and Mason 2016), in part because of the exceptional productivity of their marine food webs. Tidewater glaciers and glacially fed streams release mineral nutrients into the sea, spurring the growth of phytoplankton and increasing faunal populations at all trophic levels from zooplankton to fish, birds, and sea mammals (Renner et al. 2012; O'Neel et al. 2015; Arimitsu et al. 2016; Stempniewicz et al. 2017; Urbanski et al. 2017).

The terrestrial ecosystems of deglaciated fiords, particularly in the subarctic, also become vigorously productive over time. Glacial retreat uncovers barren land that undergoes biotic succession toward mature plant and animal communities (Mathews 1992; Chapin et al. 1994; Milner et al. 2007), and glacial watersheds provide spawning grounds for anadromous fish (Milner et al. 2000; Naiman et al. 2002). The closely linked marine and terrestrial ecosystems of glacial fiords emerge, complexify, and generate food resources capable of sustaining human communities as an integral part of the web of life. The influence of glaciers on the land and sea, and on the lifeways and worldview of Indigenous peoples, is profound.

The Gulf of Alaska, the setting for this study, is a notably productive and biodiverse marine ecoregion influenced by the circulatory engine of the Pacific Gyre and high-volume freshwater flows from rivers and glaciers that drive the Alaska Coastal Current (Hood and Zimmerman 1986; Fautin et al. 2010; Spies 2007). Its coastline was carved by Pleistocene glaciation, and remnant glacial tongues descend from montane ice fields to the heads of numerous fiords (Mann and Hamilton 1995; Figure 1).

Nearshore primary productivity is concentrated in these water bodies, including both individual fiord basins and the large glacial estuaries of Cook Inlet and Prince William Sound. Phytoplankton blooms develop in the Gulf of Alaska during summer (Figure 2) due to long hours of daylight and the influx of glacial and bottom-derived nutrients, with higher levels of primary production within fiords than in midocean or continental shelf waters (Sambrotto and Lorenzen 1986; Cooney 2007). Fish, marine mammal, and bird populations that flourish in fiord habitats have supported human

Alaska Director, Arctic Studies Center, National Museum of Natural History, Smithsonian Institution, 625 C Street, Anchorage, Alaska 99501, USA.
Correspondence: crowella@si.edu
Manuscript received 30 March 2022; accepted 26 June 2023.

FIGURE 1. Aerial view of Hubbard Glacier (Sít' Tlein), the St. Elias Mountains, and the head of Yakutat fiord. A plume of glacial sediment extends past Bancas Point (left foreground) and Point Latouche (right foreground). Copyright Don Pitcher / Alaska Stock Image 2150969.

societies for 10,000 years or more, and archaeological sites of all time periods cluster in these resource-rich zones (Erlandson et al. 1992; Crowell and Mann 1996; Crowell et al. 2003; Crowell et al. 2013b). Sustained by this abundance, Indigenous populations on the Gulf of Alaska coast were substantially larger than in the Alaskan or Canadian interior, and their societies were exceptionally complex, characterized by lineage-based corporate households, social ranking, disparities of wealth, warfare, and extensive trade networks (Townsend 1980; Matson and Coupland 1995; Ames 2003; Fitzhugh 2003; O'Neill 2014; Furholt et al. 2020).

AN INDIGENOUS ECOSCAPE

At Yakutat fiord in Southeast Alaska, glacial recession began shortly after the onset of the Little Ice Age (1100–1900 CE), gradually opening a 60-km-long ocean inlet for settlement by peoples from adjacent regions. Ahtna, Tlingit, and Eyak immigrants (Figure 3) adapted their foraging economies to the fiord's glacially influenced habitat and burgeoning ecosystem, a process that has continued to the present.

These settlers merged socially with earlier-arriving Eyak people who had resided since 900 CE on the ice-free Yakutat foreland, together forming a multicultural Na-Dene population knit together by shared principles of matrilineal kinship (De Laguna 1972, 1990a, 1990b; De Laguna and McClellan 1981). Oral traditions record that Chugach Sugpiat (Alutiit) people, most likely from Prince William Sound, also hunted in the fiord during the early stages of glacial retreat; however, their bilateral Inuit kinship system was incompatible, and they did not intermarry with Eyak, Ahtna, or Tlingit clans. Instead, relations with the Sugpiat were predominantly hostile and competitive, and they never become part of the permanent population (Birket-Smith 1953; De Laguna 1972:256–258).

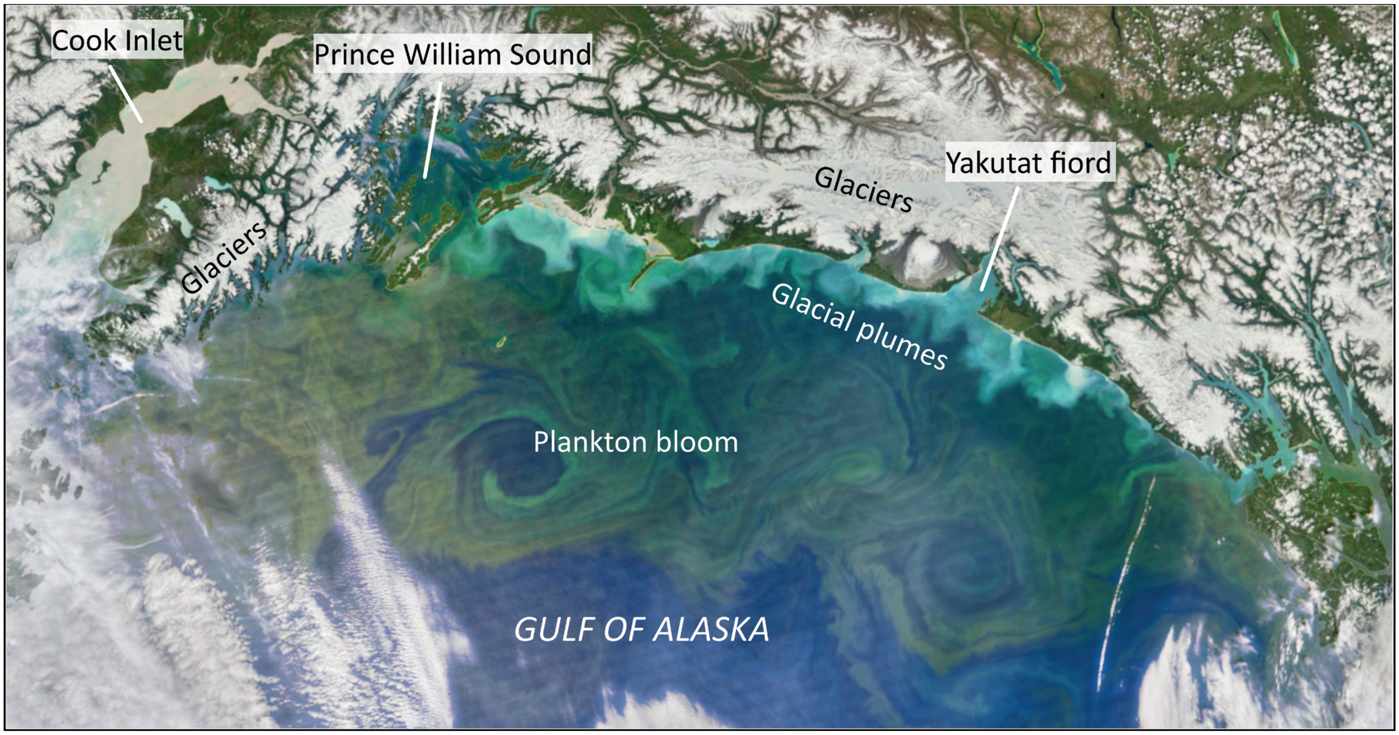

FIGURE 2. Glacial sediment enters the Gulf of Alaska from multiple coastal fiords, stimulating the summer growth of plankton. Plankton, shown in green, is carried by currents and eddies over the continental shelf, on 9 June 2016. Visible Infrared Imaging Radiometer Suite (VIIRS) satellite photograph by Norman Kuring, courtesy of the National Aeronautics and Space Administration. https://earthobservatory.nasa.gov/images/88238/bloom-in-the-gulf-of-alaska

Ancestral settlements were concentrated in the outer portion of the fiord, where marine resources are the most varied and prolific due to ocean mixing and enrichment by glacial nutrients (Figure 4). Most year-round villages were located on the western Yakutat foreland, where an ancient coastal rain forest supports diverse plant and animal communities and productive salmon streams and where marine resources are accessible nearby. In contrast, use of the more recently deglaciated and less productive inner fiord was seasonal and largely focused on the hunting of harbor seals (*Phoca vitulina*) at the Hubbard Glacier ice floe rookery. Summer seal hunting camps extended from Knight Island to Disenchantment Bay, shifting progressively northward as Hubbard Glacier retreated.

Indigenous place names reflect these linked processes of environmental change and human settlement (Figure 4). The name Yakutat comes from Yaakwdáat ("the place where canoes rest"), a Tlingit toponym derived from the Eyak name Di:ya'quda't, or Ya.gada.at, "a lagoon is forming" or "mouth of a body of salt water," referring to the enlargement of open water during glacial retreat (Thornton 2012:18; Deur et al. 2015:23). Yaakwdáat specifically denotes Yakutat Bay, the wide outer part of the fiord facing the Gulf of Alaska. A Tlingit name, At'éik ("behind it" or, metaphorically, "the heart") signifies the narrow inner portion north of Point Latouche, known in English as Disenchantment Bay (Thornton 2012:21). The entire body of water is Laax̱aayík, a combined Eyak–Tlingit word meaning "near the glacier" (Thornton 2012:18).

The multilingual overlay of place names reflects the sequence of migrations during glacial retreat (Thornton 2012; Ramos 2013). Names of Sugpiat origin are confined to a few locations near the mouth of the fiord, while Eyak names are numerous on the foreland and along the shores of Yakutat Bay as far as Knight Island, consistent with the early Eyak presence and territorial expansion at a time when ice still extended partway down the fiord. The Ahtna arrived in about 1500 CE, and Yakutat Bay place names in that language were still in use during the nineteenth century according to Russian cartographer Teben'kov (Davidson 1901). However, none are remembered today, a loss that may be the outcome of sociolinguistic competition among the Ahtna, Eyak, and Tlingit languages. Tlingit and combined

FIGURE 3. A Tlingit man (left) with a musket, wearing sealskin pants and a trade cloth shirt. A Copper River Ahtna man (right) with bow and arrows, dressed in caribou skin clothing ornamented with porcupine quill embroidery, 1880. From Ivan Petroff, *Report on the Population, Industries, and Resources of Alaska*, 1884 (pl. 6)..

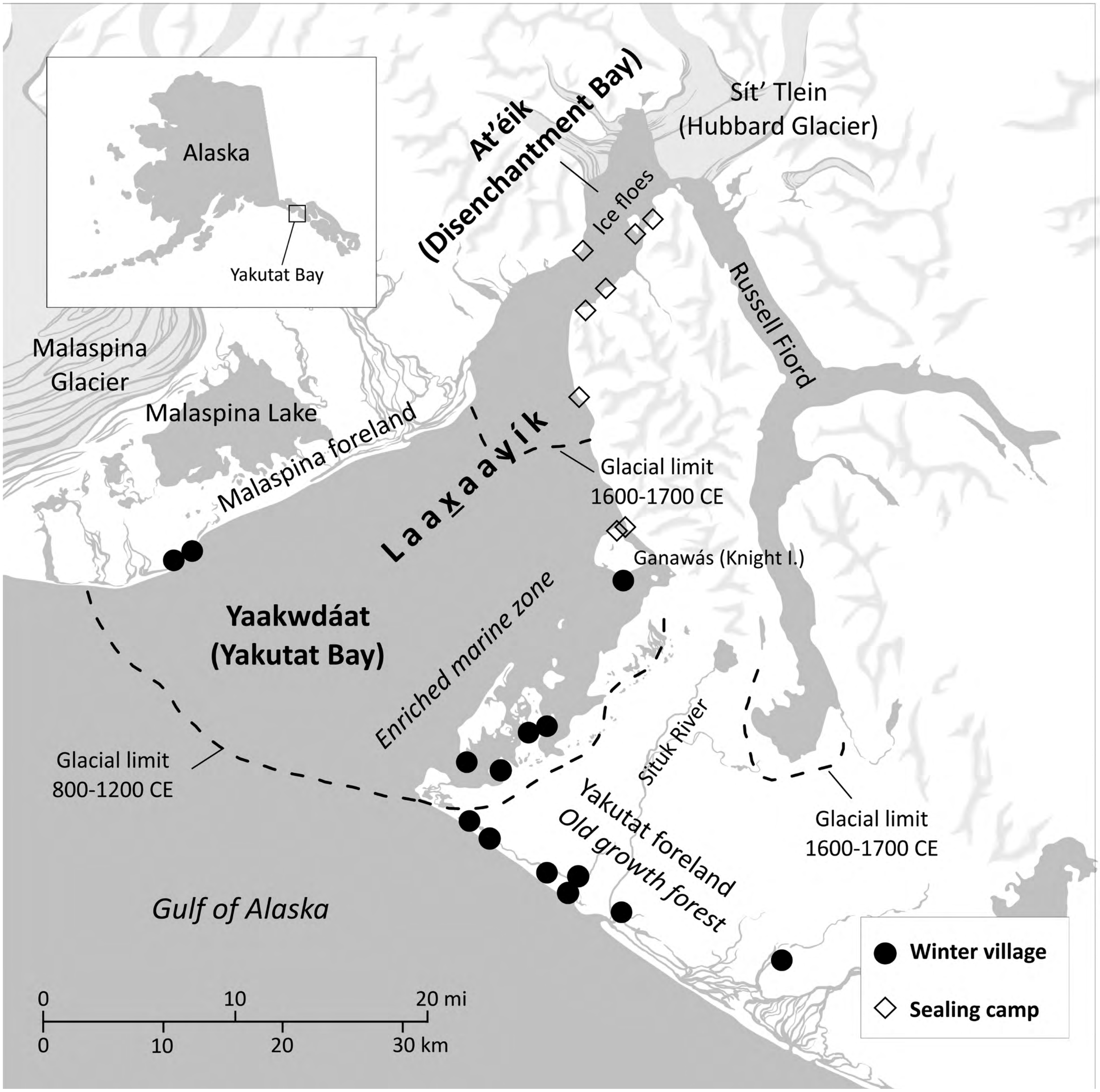

FIGURE 4. Laax̲aayík (Yakutat fiord) showing topography, selected place names, glacial limits, and Indigenous settlements, 800–1900 CE. Winter villages (black dots) cluster in outer Yaakwdáat (Yakutat Bay) and on the Yakutat foreland; sealing camps (diamonds) extend from Ganawás (Knight Island) to At'éik (Disenchantment Bay). © Smithsonian Institution.

Eyak–Tlingit names are preserved everywhere from the foreland to Disenchantment Bay, a distribution consistent with the arrival of Tlingit clans in the eighteenth century after the ice had largely withdrawn (Thornton 2012).

From an anthropological perspective Yakutat fiord may be described as an *ethnohistoric landscape* on which centuries of Indigenous history are memorialized by place names, oral traditions, and archaeological traces of ancestral settlements (Krupnik et al. 2004; Thornton 2008, 2012; Crowell et al. 2013a; Crowell 2022; Pratt and Heyes 2022). Yet this term does not convey the close, enduring, and dynamic relationship between people and the fiord environment that lies at the heart of the present study. From this perspective, aligned with the discipline of historical ecology, the fiord is an *ecoscape*—an integral marine and terrestrial biome with which North Pacific Indigenous residents have interacted for some 60 generations (Crumley 1994; Balée 1998; Lidicker 2008; Crumley et al. 2017; Keeley et al. 2021). Human and environmental influences are reciprocal: "Landscape and place-making are co-evolutionary processes between people and land—including upland, intertidal and subtidal lands—that inhabitants, along with other species and geological processes, conceptualize, utilize, cultivate, and thus shape over time" (Deur et al. 2015:20). Further, "People's connections with their biophysical worlds are manifest in the landscapes they inhabit. In iterative relationships, both active and passive, and informed by culture-specific worldviews, people shape and are shaped by their landscapes" (Lepofsky et al. 2019:449).

For Yakutat residents, the fiord is an intimately known home where a rewarding and sustainable way of life is guided by traditional knowledge. In Judith Ramos's words, "The Indigenous people have a long relationship with places they have occupied. . . . They have generations of knowledge that has been acquired by patient observation and experimentation and passed on to their descendants" (J. Ramos, 29 July 2014, interview reference number IN-48). People grow up learning about the land and how to harvest and steward its resources; in elder Lena Farkas's memories of her childhood, "They all worked together. Everybody, the women, they were busy, cleaning fish, picking berries, putting up whatever the men brought home for winter use. The men, they were taught, the uncles taught them how to fish, how to hunt, everything; how to take care of whatever they got" (L. Farkas, 16 June 2012, IN-13A).

This immersive connection with an abundant land is expressed in the *sacred ecology* of the community (Berkes 2012; Ramos 2020). In an oral tradition shared by elder Elaine Abraham, glacier and mountain spirits adopted the people of the Ahtna Kwáashk'i K̲wáan clan when they arrived at Yakutat after migrating from the Copper River, showing them "how to live" and secure food in the unfamiliar coastal environment (E. Abraham, 11 June 2011, IN-2). Tradition bearers say that the spirit of Sít' Tlein ("big glacier," Hubbard Glacier) shelters the harbor seals (Tlingit, *tsaa*) during spring when they give birth to their pups on ice floes, waiting until the seals are "ready" before opening up the ice pack to release them to the hunters (Maggie Harry in Harrington 1940; E. Abraham, 11 June 2011, IN-2; Ramos 2020). Hunters' rituals and prayers recognize an interconscious, telepathic connection between human and animal beings and are based on the belief that animals cooperate in the hunt, giving their bodies to feed the community (De Laguna 1972:361–362; E. Abraham, 17 June 2012, IN 13B). Kai Monture, Elaine Abraham's grandson, described this spiritual worldview from the shore of Disenchantment Bay (Figure 5):

> We are standing at the mouth of Shaanáx̲ Tlein, the "big valley," which is facing At'éik. In my language that means "the heart." That's what we call Disenchantment Bay. Behind me you can see K'wát' X'áat'i, that means "egg island" in our language. The Westerners call it Haenke Island. Behind that you can see Sít' Tlein, "big glacier," which the Western people call Hubbard Glacier. To the left of Sít' Tlein is Sít' Kusá, which means "narrow glacier," and we believe that she is one of Sít' Tlein's wives. And in between them, behind that valley, between the two glaciers is Sít' T'ooch', "black glacier," which is another one of Sít' Tlein's wives. Sít' Tlein, we believe, is the owner of At'éik. He is a powerful glacier and a powerful spirit. This entire bay and land around the bay belong to him. Our people, when we come up into At'éik, Disenchantment Bay, we always pay homage to Sít' Tlein as the owner of this area. We do a prayer to him asking that he give us permission to enter into his land and that he protect us. We also give him an offering. We give him *g̲ánch*, tobacco, because we believe he's a male spirit, as well as food. Just as an offering, so that he'll let us come into his land and hunt the seals, which he protects. All the icebergs in the bay we believe are generated by Sít' Tlein to protect the seals because they're part of his domain. So, when we come here, we're asking for permission to both enter and hunt the seals from him. (K. Monture, 29 July 2013, IN-32)

As in prior generations, contemporary Yakutat residents rely on harbor seals, salmon, shellfish, berries, and dozens of other wild foods for the greater part of their diet, following hunting, fishing, and gathering practices that reflect ancestral patterns and provide a guide for interpreting the past (Mills and Firman 1986; Deur et al. 2015; Sill et al. 2017; Figure 6). Harvest locales for different species correspond to areas of peak seasonal productivity and reflect underlying ecosystem structure (Milner et al. 2007; Arimitsu et al. 2016; chapter 2, this volume). Extensive knowledge of the fiord's plants, animals, and natural systems is maintained by current generations, as are traditional social rules that govern the harvesting and sharing of subsistence foods (Goldschmidt and Haas 1998; Ramos and Schroder 2001; Ramos and Mason 2004).

Inspired by community interest in exploring and documenting this heritage, the present study follows the long arc of the Yakutat people's culturally constructed relationship with their land from 900 CE to the present. Historical ecology traces the

FIGURE 5. Kai Monture regards Sít' Tlein (Hubbard Glacier) at Disenchantment Bay, July 2013. For the people of Yakutat, Sít' Tlein is the provider and protector of harbor seals and a spiritual guardian of the human community. Photo © Smithsonian Institution.

"complex relationships between our species and the planet we live on, charted over the long term" (Crumley 2007:2) with a methodology that integrates local ecological and historical knowledge with scientific data from archaeology, ecology, and other scientific disciplines (Crumley 1994; Balée 1998; Crumley et al. 2017; Fitzhugh et al. 2019). The specific frame of analysis is *human niche construction*, which emphasizes the role of human knowledge, culture, and agency in fashioning a sustainable way of life within, and as part of, an ecosystem (Hardesty 1972; Laland and O'Brien 2010; Odling-Smee et al. 2013). At Yakutat, niche construction entailed (1) the intergenerational transfer of ecological, historical, and sacred knowledge as the conceptual basis for human interaction with the biome; (2) development of effective technologies for coastal life including hunting weapons, fishing gear, watercraft, clothing, and tools; (3) construction of a built environment that included winter villages, summer hunting and fishing camps, storage structures, and fish weirs; (4) modification of the trophic web by selective harvesting and consumption of plants and animals, governed by Indigenous resource management practices; and (5) participation in a cooperative, lineage-based mode of production and social economy, similar to other Northwest Coast societies.

ARCHAEOLOGY AND ORAL TRADITION

Human habitation in Yakutat fiord may have begun as early as 10,000 years ago (Davis 1990), but traces of these early millennia have been erased by repeated glaciation. As a result, the fiord's archaeological sites fall within the Northwest Coast Late Period (1500–200 years before present) and extend into the era of Western colonialism that began in the eighteenth century (Davis 1990; Matson and Coupland 1995; Moss 1998, 2004; Table 1). Yakutat's archaeological sites preserve extensive cultural and ecological information and contribute to the story of the community and its relationship to the natural environment.

This study defines three stages of Indigenous migration and settlement that occurred as the Yakutat fiord glaciers made their most recent retreat: the Eyak Period (900–1500 CE), Ahtna Period (1500–1700 CE), and Tlingit Period (1700–1900 CE). Sites founded by the Eyak were located on the unglaciated Yakutat foreland and included Diyaaguna.éit, established by 774 (933) 1025 calibrated (cal.) CE (Beta Analytic Radiocarbon Dating Laboratory [Beta] 31473; Davis 1996; Figure 7). After the glaciers retreated from the mouth of the fiord, Eyak people occupied the Spoon Lake 3 site on the west side near Point Manby in about 1045 (1257) 1406 cal. CE (Beta 96769; chapter 4, this volume). Ahtna sites were established on Knight Island by 1454 (1509) 1631 cal. CE (Paleoresearch Institute [PRI]-15-039-8; chapter 5, this volume), the oldest radiocarbon date from Tlákw.aan. Tlingit Period settlements were built from the Yakutat foreland to Disenchantment Bay during the eighteenth and nineteenth centuries, reflecting the complete withdrawal of glacial cover by that time (chapter 6, this volume).

FIGURE 6. George Ramos Sr. gathering wild celery (*Heracleum lanatum*) on Krutoi (Jack Ellis) Island in Yakutat Bay, 2014. Photo © Smithsonian Institution.

Yakutat oral traditions are an important source for community history (Swanton 1909; Harrington 1940; De Laguna 1952, 1972; Emmons n.d., 1991; Goldschmidt and Haas 1998; Thornton 2012), and oral traditions frequently support—and are supported by—scientific evidence of the past (Crowell 2022). Across northwestern North America, the historicity of oral traditions recounting wars, migrations, the founding of clans and villages, glacial movements, volcanic eruptions, and other momentous events has been affirmed by studies comparing them to data from archaeology, geology, and paleoecology (Cruikshank 1981, 2001; Moodie et al. 1992; Marsden 2001; McMillan and Hutchinson 2002; Martindale 2006; Monteith et al. 2007; Connor et al. 2009; Crowell and Howell 2013; Crowell et al. 2013a). Tlingit oral accounts known as *shkalneek* are recognized within the culture as true histories of "what really happened" as opposed to more ancient *tlaag*ú, or myths (De Laguna 1972:210–211; Hymes 1990; Thom 2003; Edwards 2009).

These considerations underlie the historical methodology of this volume, which is to weigh and compare Indigenous historical knowledge and scientific information, seeking a balanced synthesis that incorporates the distinct values and potentials of each (Cruikshank 2001; Whitely 2002; Dods 2004; Crowell and Howell 2013; Crowell 2022). Oral traditions are vivid spoken testimonies that reflect Indigenous worldviews and preserve a wealth of detailed information about the people and events of past centuries. Yet they are changeable, evolving and acquiring new content and meaning as they are told and retold by successive generations (Vansina 1985; Cruikshank 2005).

TABLE 1. Yakutat archaeological sites and sealing camps (identified by Alaska Heritage Resource Survey number [AHRS]).

AHRS #	Site name	Location	Site type	Approximate occupation dates	Founding period	Oral and archaeological data
			YAKUTAT FORELAND			
YAK-015	Ák Ká	Aka Lake	Village	?–1840	Eyak	De Laguna et al. 1964; De Laguna 1972; Sealaska Corp. 1975
YAK-016	Nets'eł hwuw.aan	Aka Lake	Village	?–1840	Eyak	De Laguna et al. 1964; De Laguna 1972
YAK-017	Gooch Shakee Aan	Summit Lake	Village	?–1840	Eyak	De Laguna et al. 1964; De Laguna 1972
YAK-018	Naasoodat	Tawah Creek	Village	?–1840	Eyak	De Laguna et al. 1964; De Laguna 1972; Sealaska Corp. 1975; this volume
YAK-019	Diyaaguna.éit	Tawah Creek	Village	900–1840	Eyak	De Laguna et al. 1964; De Laguna 1972; Sealaska Corp. 1975; Davis 1996
YAK-020	Wulilaayi Aan (Shallow Water Town)	Lost River	Village	1400–1840	Eyak	De Laguna et al. 1964; Davis 1996
YAK-021	Bear Paw House	Lost River	Fishing camp	Early 20th century	Tlingit	De Laguna et al. 1964
YAK-022	Situk River Village	Situk River	Village, graves	1875–1920	Tlingit	De Laguna et al. 1964; De Laguna 1972; Sealaska Corp. 1975
YAK-023	Eagle Fort	Situk River	Fort	1805–?	Tlingit	De Laguna et al. 1964
YAK-025	Ahrnklin River	Ahrnklin River	Village	post-1700–1840	Tlingit	De Laguna et al. 1964
YAK-029	Nova Rossiysk	Kardy Lake	Russian fort	1796–1805	Tlingit	De Laguna et al. 1964; De Laguna 1972; Sealaska Corp. 1975
			YAKUTAT BAY			
YAK-002	Khantaak Island Village	Khantaak Island, Monti Bay	Village, cemetery	Late 18th century to 1890	Tlingit	De Laguna et al. 1964; De Laguna 1972; Sealaska Corp. 1975
YAK-003	Old Yakutat	Monti Bay	Town	1889–present	Tlingit	De Laguna et al. 1964; De Laguna 1972; Sealaska Corp. 1975
YAK-004	Canoe Pass	Canoe Pass	Midden	Not dated	Eyak?	De Laguna et al. 1964
YAK-005	Dolgoi Island	Dolgoi Island	Midden	Not dated	Eyak?	De Laguna et al. 1964
YAK-007	Tlákw.aan (Old Town)	Knight Island	Village	1500–1750	Ahtna	De Laguna et al. 1964; De Laguna 1972; Crowell 2022; this volume

TABLE 1. (*Continued*)

AHRS #	Site name	Location	Site type	Approximate occupation dates	Founding period	Oral and archaeological data
YAK-009	Nookwk'	Knight Island Passage	Fort	Not dated	Ahtna?	De Laguna et al. 1964; Sealaska Corp. 1975
YAK-010	Néix Hit Tá	Knight Island Passage	Camp	Late 17th–19th century	Tlingit	De Laguna et al. 1964; De Laguna 1972; this volume
YAK-011	Laaxaa Tá	Tl'·tsh·ú·t stream	Sealing camp	1750–1800	Tlingit	Harrington 1940; De Laguna et al. 1964; De Laguna 1972; Olson 2002; this volume
YAK-074	Spoon Lake 1	Spoon River	Culturally modified trees	1890s–1920s	Tlingit	Crowell 2011a
YAK-075	Spoon Lake 2	Spoon River	House	1300–1500	Eyak	Crowell 2011a; this volume
YAK-076	Spoon Lake 3	Spoon Lake	Village	1200–1500	Eyak	Crowell 2011a; this volume
YAK-077	Spoon Lake 4	Spoon River	Cache pits	19th–20th century	Tlingit	Crowell 2011a
YAK-078	Spoon Lake 5	Spoon River	Camp	19th–20th century	Tlingit	Crowell 2011a
YAK-205	North Knight Island Village	Knight Island	Sealing camp	1500–19th century	Ahtna	This volume
			DISENCHANTMENT BAY			
YAK-012	Keik'uliyáa	Indian Camp Creek	Sealing camp	1840–1915	Tlingit	Burroughs et al. 1901; Laguna et al. 1964; De Laguna 1972; Sealaska Corp. 1975; Goldschmidt and Haas 1998; Crowell 2016; this volume
YAK-013	Gil' Shakee.aan	Bancas Point	Sealing camp	post-1800	Tlingit	De Laguna et al. 1964
YAK-202	Woogaani Yé	North of Aquadulce Creek	Sealing camp; reported fort	1805–1960s	Tlingit	Laguna et al. 1964; De Laguna 1972; this volume
	Daak Léin	Haenke Island	Sealing camp	20th century	Tlingit	This volume
	Harvey Milton camp	Near Haenke Island	Sealing camp	20th century	Tlingit	This volume
	X'aa Tlein Jiseiyi	Near Haenke Island	Sealing camp	20th century	Tlingit	This volume

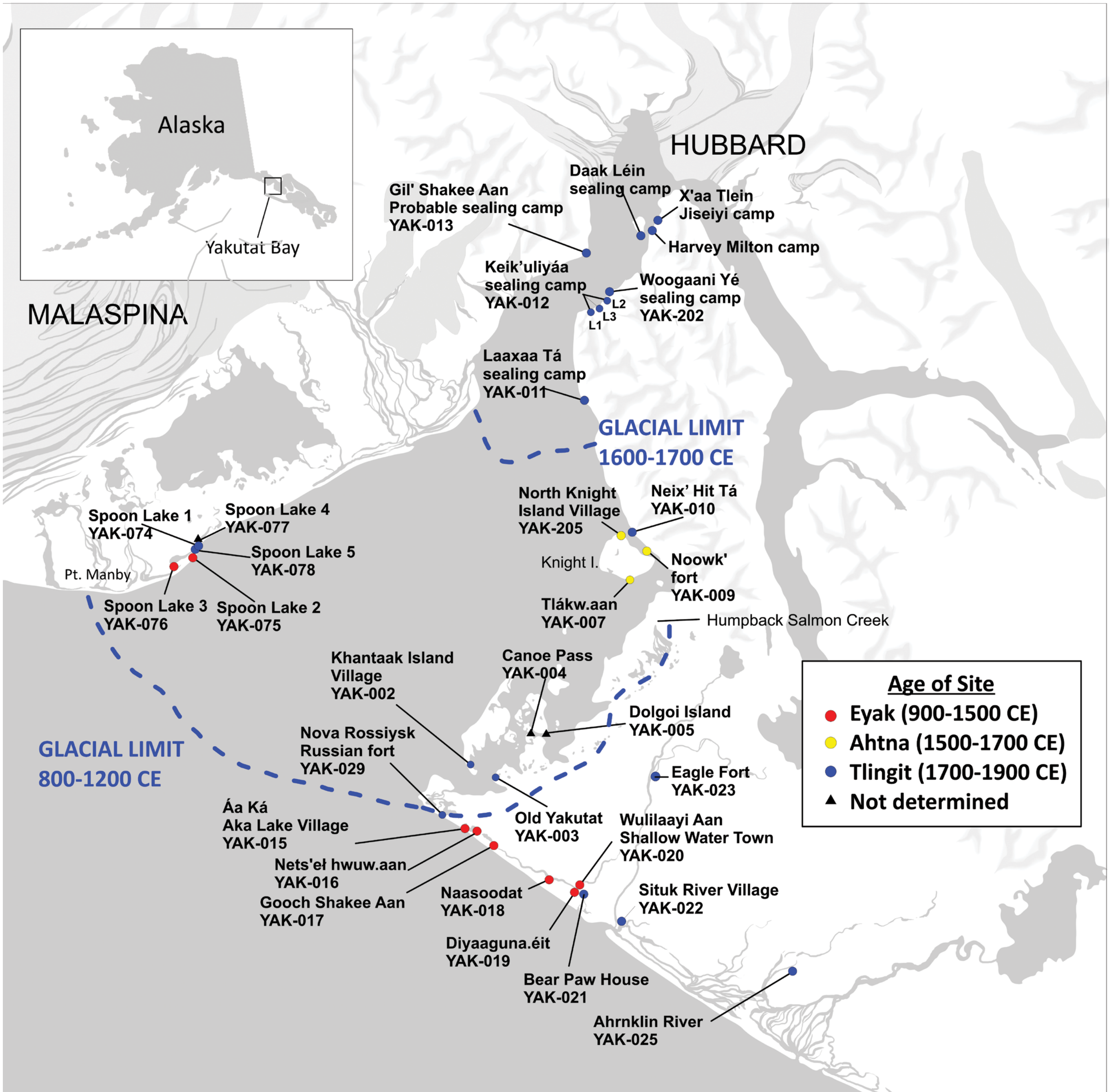

FIGURE 7. Yakutat archaeological sites (see Table 1 for site information) and periods of settlement. Sites founded during the Eyak Period are located in the outer fiord; Ahtna Period sites were established around Knight Island; and sites dating to the Tlingit Period were founded from the mouth of the fiord to Disenchantment Bay. Glacial limits at 800–1200 CE (Neoglacial) and 1600–1700 CE (Little Ice Age) are shown, each marked by a cross-bay moraine. There are no known sites in Russell Fiord. © Smithsonian Institution.

In addition, oral traditions have an undefined relationship to time, rarely including calendrical dates or other clear indications of when historical events took place (Henige 1974).

Archaeological, geological, and paleoenvironmental evidence has quite different qualities; such records are generally stable, durable, stratigraphically ordered, and datable by radiocarbon analysis or other techniques. Yet these material scientific data are mute, lacking the direct, culturally authentic voice of oral tradition. Archaeological deposits are anonymous, cumulative byproducts of group behavior in which particular individuals or moments in history are difficult or impossible to discern; furthermore, the limitations of archaeological preservation, discovery, and sampling mean that only a limited view of the past is accessible by this means alone (Crowell and Howell 2013).

Reflecting on these two ways of knowing the past, Judith Ramos said, "When they [elders] talk about the stories of their ancestors, the migration stories or the Raven-creation stories, there's no linear point of view so there's always the question, 'Well, when did that happen?' Western science . . . gives you a date" (J. Ramos, 29 July 2014, IN-48). Another benefit of archaeological dating, she added, is proof that "we've been here longer than the Western legal system, and we have a right to say what happens on our land. We've been the caretakers of the land for the last thousands of years, so we have that right" (J. Ramos, 29 July 2014, IN-48).

PROTOCOLS FOR COMMUNITY-BASED RESEARCH

Reflecting on stories passed on by his maternal uncle, L'uknax̱.ádi clan elder George Ramos Sr. proposed that archaeologists could trace Yakutat's history by studying glacial retreat and the sequence of ancestral villages and sealing camps, from the oldest near the mouth of the fiord to the most recent at its head. The study he envisioned would include a special focus on the human relationship to harbor seals as a key to understanding Yakutat's culture and way of life (George Ramos Sr., personal communication to Steve Langdon, 2010).

This concept inspired the codesigned, collaborative research program described here, carried out in 2011–2014 by the Smithsonian Institution's Arctic Studies Center in partnership with the Yakutat Tlingit Tribe. For Mr. Ramos' wife, Kwáashk'i K̲wáan clan leader Elaine Abraham, and their daughter, Judith Ramos, the work represented an opportunity to record and preserve traditional knowledge and the Tlingit language. It would develop scientific understanding of Yakutat's natural and cultural worlds, establish the time depth of ancestral occupancy on the land, and provide information relevant to heritage education and resource management (Figure 8).

The National Science Foundation (NSF) through its Arctic Social Sciences program was the leading sponsor of the project, entitled *Glacial Retreat and the Cultural Landscape of Ice Floe Sealing at Yakutat Bay, Alaska* and known informally as the Yakutat Seal Camps Project (Crowell 2011c, 2012, 2015; Oh 2014). The Sealaska Heritage Institute, the Smithsonian Institution, and the National Park Foundation provided additional funding. Partners and stakeholders included the U.S. National Park Service (Wrangell–St. Elias National Park), U.S. National Forest Service (Tongass National Forest), Sealaska Corporation, and Sealaska Heritage Institute. The study was led by Principal Investigator Aron Crowell (Arctic Studies Center, National Museum of Natural History, Smithsonian Institution) and Co-Principal Investigators Elaine Abraham (Alaska Native Science Commission) and Judith Ramos (University of Alaska Southeast). Archaeologist Mark Luttrell co-led field investigations and excavations at ancestral villages and camp sites. This collaborative work owes an incalculable intellectual debt to anthropologist Frederica de Laguna (1906–2004), whose extensive research on Yakutat culture, history, and archaeology is highly regarded both within her profession and by the people of the community (De Laguna et al. 1964; De Laguna 1972; Abraham and Ramos 2006).

Documenting Oral Knowledge

Elaine Abraham and Judith Ramos joined Steve Langdon (University of Alaska Anchorage), Gary Holton (then at the Alaska Native Language Center, University of Alaska Fairbanks), and Aron Crowell to interview Yakutat community members about oral traditions, ancestral settlements, place names, and ecological knowledge (Figure 9). In total, 57 research interviews were conducted in English and Lingit (the Tlingit language) during the four years of the project and have been sequentially numbered (IN-1, IN-2, etc.) for reference in this volume (Table 2). Community knowledge shared during interviews enriched all aspects of the study and is interwoven throughout these pages.

Interviews with Yakutat community members were authorized by the Yakutat Tlingit Tribe through a National Historic Preservation Act (NHPA) memorandum of agreement (National Science Foundation et al. 2014). Research protocols codified in the memorandum were developed in accordance with the *Principles for Conducting Research in the Arctic* (Interagency Arctic Research Policy Committee, revised in 2018), including community codesign, effective communication, full collaboration, return and access to data, and respect for Indigenous knowledge and cultures. The Smithsonian Institution's Institutional Review Board reviewed the initial NSF proposal in 2011 and determined that interviews with tradition bearers do not constitute "research involving human subjects" (Smithsonian Institution 2009; Smithsonian Institution Human Subjects Institutional Review Board 2011). Nonetheless, the Yakutat interviews were conducted in compliance with the ethical standards of such research, including informed consent, right of review, and fair compensation. Discussants gave written permission for their sessions to be videotaped, transcribed, and used for purposes of research, print publication, and digital media. With permission from contributors, interview statements are

FIGURE 8. Ramos–Abraham family members at Disenchantment Bay, July 2013. Left to right: Kai Monture, Elaine Abraham, Judith Ramos, Nirvana Ramos, and George Ramos Sr. The occasion was a community visit to archaeological excavations at Keik'uliyáa sealing camp. Photo © Smithsonian Institution.

attributed by name throughout this volume and other project publications. Interview passages spoken in Lingit were transcribed and translated by linguist Jeff Leer (Alaska Native Language Center, University of Alaska Fairbanks).

Archaeological Investigations

Archaeological fieldwork was coordinated with the Yakutat Tlingit Tribe, U.S. National Forest Service, U.S. National Park Service, Sealaska Corporation, and the State of Alaska's Office of History and Archaeology. These agencies and organizations issued permits allowing excavations and artifact collection on their lands, which include parts of Tongass National Forest, Wrangell–St. Elias National Park, and Sealaska Corporation's Alaska Native Claims Settlement Act allotment on Knight Island. Community protocols for archaeological research, collections, data archiving, and publication were agreed in the NHPA memorandum.

The Smithsonian research effort included University of Alaska Anchorage graduate and undergraduate field school students, high school and university students from Yakutat, private and agency volunteers, and community members who visited the archaeological sites and attended public presentations and discussions (Figure 10).

FIGURE 9. Lena Farkas (left) and Elaine Abraham (right) recording oral traditions, place names, and knowledge of traditional sealing in the Tlingit language (Lingit), June 2011. Photo © Smithsonian Institution.

TABLE 2. Interviews conducted at Yakutat, 2011–2014.

Name	Clan	Life dates	Interviews[a]
Elaine Abraham	Kwáashk'i Kwáan	1929–2016	10 Jun 2011 Orientation [IN-1] 11 Jun 2011 Life history, sealing [IN-2] 15 Jun 2012 Repatriation [IN-11] 16 Jun 2012 Place names [IN-13A] 17 Jun 2012 Clan history, oral traditions [IN-13B] 19 Jun 2012 Egg Island seal camp [IN-17] 27 Jun 2013 Sealing in Disenchantment Bay [IN-28] 27 Jul 2013 Elders' visit to Keik'uliyáa camp [IN-34] 4 Aug 2013 Discuss elders' visit to Keik'uliyáa [IN-29]
Bertrand J. Adams Sr.	L'uknax.ádi	1937	16 Jun 2012 Life history, sealing, Dry Bay [IN-12]
Devlin Anderstrom	Kwáashk'i Kwáan	1997	27 May 2014 Cultural heritage, sealing [IN-39] 17 Jun 2014 Cultural heritage, sealing [IN-40]
Ronnie G. Converse Sr.	Galyáx Kaagwaantaan	1952	21 Jun 2012 Preparation of seal meat, oil [IN-27] 28 May 2014 Preparation of seal meat, oil [IN-54]
Victoria L. Demmert	Kwáashk'i Kwáan	1946	16 Jul 2014 Visit to Tlákw.aan [IN-56]
Lena Farkas	Kwáashk'i Kwáan	1933–2017	11 Jun 2011 Life history, sealing [IN-4] 16 Jun 2012 Place names [IN-13A] 17 Jun 2012 Clan history, oral traditions [IN-13B]
Eli Hanlon	Teikweidí	1980	17 Jun 2012 Seal hunting [IN-14]
Jeremiah James	Galyáx Kaagwaantaan	1981	20 Jun 2012 Seal hunting, tanning skins [IN-24] 22 May 2014 Seal hunting, sewing sealskins [IN-44, IN-45] 25 May 2014 Seal hunting trip with Gary Johnson 26 May 2014 Demonstration of cutting up seals [IN-46] 29 May 2014 Discussion of learning to hunt, sharing [IN-47]
Gary S. Johnson	Kwáashk'i Kwáan	1944–2019	27 May 2014 Sealing, future of the community [IN-41]
Kai Monture	Kwáashk'i Kwáan	1990	21 Jun 2013 Keik'uliyáa seal camp YAK-012 [IN-31] 29 Jul 2013 Egg Island and Disenchantment Bay [IN-32] 29 Jul 2013 Cultural heritage and change [IN-33]
Sheri A. Nelson	Kiks'sadi	1956	21 Jun 2012 Life history, subsistence, sealing [IN-25]
Elizabeth "Janice" Piccard	Kwáashk'i Kwáan	1945–2015	28 May 2014 Preparation of seal meat, oil [IN-54]
George Ramos Sr.	L'uknax.ádi	1930–2019	11 Jun 2011 Traditional sealing methods [IN-3] 12 Jun 2011 Glacier prayer [IN-10] 13 Jun 2011 Calling seals [IN-5] 13 Jun 2011 Disenchantment Bay place names and history [IN-8] 13 Jun 2011 Seal hunt with David Ramos [IN-9] 18 Jun 2012 Yakutat place names and sealing camps [IN-15] 19 Jun 2012 Daak Léin men's camp on Egg Island [IN-18] 19 Jun 2012 Woogaani Yé battle [IN-19, IN-22]

TABLE 2. (*Continued*)

Name	Clan	Life dates	Interviews[a]
George Ramos Sr. (*Continued*)			19 Jun 2012 Glacier prayer [IN-20] 19 Jun 2012 Place names [IN-21] 20 Jun 2012 Yakutat canoe [IN-23] 23 May 2014 Seal hunting with Kai Monture 24 May 2014 Discussion of sealing trip, picking wild celery [IN-42]
David Ramos	Kwáashk'i Kwáan	1960	10 Jun 2011 Orientation with Elaine Abraham [IN-1] 13 Jun 2011 Seal hunt with George Ramos Sr. [IN-9]
Judith Ramos	Kwáashk'i Kwáan	1959	27 Jun 2013 Sealing at Disenchantment Bay, w/ Elaine Abraham [IN-28] 4 Aug 2013 Discussion of elders' visit to Keik'uliyáa site [IN-29] 16 Jul 2014 Visit to Tlákw.aan site [IN-57] 29 Jul 2014 Personal history, Yakutat language and culture [IN-48]
Ray Sensmeier	Kwáashk'i Kwáan	1944	12 Jun 2011 Sealing at Disenchantment Bay [IN-6] 18 Jun 2012 Seal conservation, disturbance by cruise ships [IN-16] 27 Jul 2013 Visit to Keik'uliyáa [IN-37] 26 May 2014 Yakutat subsistence [IN-53]
Ingrid L. Shodda	Wooshkeetaan	1946	21 Jun 2012 Seal hunting and subsistence [IN-26]
Ted Valle Sr.	Galyáx Kaagwaantaan	1938	12 Jun 2011 Sealing and subsistence [IN-7]
Jennie Wheeler	Teikweidí	1954	27 Jun 2013 Sewing and beadwork on sealskin [IN-30]

[a] IN-# = interview reference number.

FIGURE 10. Yakutat Tlingit resident Fred Beemis examining a halibut hook barb found at the Tlákw.aan archaeological excavation, July 2014. Photo © Smithsonian Institution.

Teams conducted site investigations and searched by boat and on foot for ancestral settlements along the east side of Yakutat fiord from Knight Island to the head of Disenchantment Bay and on the west side from Point Manby to Bancas Point (Figure 11). Reconnaissance was guided by earlier archaeological discoveries (De Laguna et al. 1964; Crowell 2011a) and knowledge of historical places that has been preserved in oral tradition (Harrington 1940; De Laguna 1972; Goldschmidt and Haas 1998). Oral information about the locations of former camps and villages was sometimes inexact, and field challenges to their rediscovery included brush and trees that have grown up on formerly inhabited areas. The displacement of former shorelines due to tectonism (crustal movements during earthquakes) and isostatic uplift (rebound of land when the weight of glacial ice is removed) was also an important consideration in the search for sites.

Mapping and excavations were conducted at seven sites ranging in age from 1250 CE to the mid-twentieth century: Spoon Lake 3 (Alaska Heritage Resource Survey number YAK-076), Tlákw.aan (YAK-007), North Knight Island Village (YAK-205), Néix̲ Hit Tá (YAK-010), Laax̲aa Tá (YAK-011), K̲eik'uliyáa (YAK-012), and Woogaani Yé (YAK-202; Table 1; Figure 7). Artifacts, architectural features, and faunal remains uncovered at these locations yielded information about the cultural identities, technologies, social organization, and subsistence practices of the residents (Figure 12).

Global positioning system coordinates were recorded and site locations were plotted on U.S. Geological Survey 1:63,000 topographic sheets. Low-altitude aerial photography of Yakutat fiord coastlines available through National Oceanic and Atmospheric Administration's Alaska ShoreZone program (https://www.fisheries.noaa.gov/alaska/habitat-conservation/alaska-shorezone, accessed 17 April 2023) was

FIGURE 11. Archaeologists walking through glacial boulders in the intertidal zone at Logan Beach north of Knight Island, July 2013. Creek drainages in this area were searched for traces of Laax̲aa Tá and other ancestral sealing camps. Photo © Smithsonian Institution.

FIGURE 12. Excavating a tent ring at the nineteenth century Keik'uliyáa sealing camp site (YAK-012), June 2013. Left to right: Emily Rose Bryson, Mark Luttrell, and Tim Johnson. Artifacts found inside and around the tents included glass trade beads, rifle cartridges, metal utensils, ceramics, and toys. Photo © Smithsonian Institution.

used as an aid to archaeological reconnaissance. Site boundaries, cultural features, topography, excavations, and elevation above tidal mean lower low water were recorded on individual site maps.

Calibrated radiocarbon dating of wood charcoal samples allowed synchronization of occupation periods at these sites with the history of glacial retreat and provided a chronological framework for related oral historical traditions. Accelerated mass spectroscopy (AMS) and standard radiocarbon dates are reported with calibrated age ranges at two standard deviations (95.4% confidence interval) with the computed median date in parentheses. All dates were calibrated using the University of Oxford's online program OxCal 4.4.4 (https://c14.arch.ox.ac.uk/, accessed 17 April 2023). Dates reported from earlier archaeological work (De Laguna et al. 1964; Davis 1996) have been recalibrated using the online OxCal 4.4.4 program.

Test squares and block excavations were aligned with metric survey grids, and the locations of artifacts, features, faunal remains, and other finds were precisely recorded in three dimensions relative to a site datum by means of a laser survey station (Figure 13). Cultural strata were distinguished by soil character and subdivided into 10 cm levels for elevation control. Soil was screened through 1/8 in screen mesh to ensure recovery of small artifacts and animal bones.

No human remains were anticipated or encountered, but as mandated by the Native American Graves Protection and Repatriation Act, if human remains had been found they would have been immediately reported to the landowner and to the Yakutat Tlingit Tribe and all research at the location halted pending tribal consultation to determine proper action.

Returning Research

A guiding principle of the Yakutat project was the return of research results to the community. Judith Ramos emphasized that researchers are obligated to "report back to the community [about] what they're doing, so that the community has control" (J. Ramos, 29 July 2014, IN-48). In accordance with this understanding, this book has been authorized, reviewed, and approved by the Yakutat Tlingit Tribe. It has already proven to be of value to the tribe in managing the natural and cultural resources of Yaakwdáat Kwáan (Andrew Guildersleeve, Yakutat Tlingit Tribe president, personal communication to Aron Crowell, 2 December 2022). Supplemental National Science Foundation funding allowed for no-cost distribution of the book to the

FIGURE 13. The excavation of House 1 at the Spoon Lake 3 site (YAK-076), showing use of the laser total station to record artifact locations, August 2014. Left to right: Kaitlyn McGlamery, Ken Jessen, Emalie Thern, and Penelope Baggs (holding target rod). Photo © Smithsonian Institution.

Yakutat Tlingit Tribe, state and regional libraries, Sealaska Heritage Institute, research contributors, and members of the Yakutat community; in addition, an open access digital version will be available from Smithsonian Institution Scholarly Press. Judith Ramos's doctoral dissertation on Yakutat traditional sealing, based on the project interviews, is in preparation for the Indigenous Studies Program at the University of Alaska Fairbanks. Other project publications (e.g., Crowell 2016, 2020, 2022; Ramos 2020) have been provided to the residents of Yakutat, with deep appreciation for their contributions. A complete set of project interviews with transcriptions has been compiled as a digital video archive for provision to the Yakutat Tlingit Tribe, Sealaska Heritage Institute, and the National Anthropological Archives (Smithsonian Institution, Washington, D.C).

1

Ecology and Environmental History

During the Little Ice Age (1100–1900 CE) Yakutat fiord offered an exceptional opportunity for territorial expansion by Indigenous peoples of the eastern Gulf of Alaska (Cruikshank 2001). While habitable areas were being reduced in other coastal fiords due to ice advances under the cooler conditions of the Little Ice Age (Wiles et al. 2008), glaciers at Yakutat fiord were following a contrary path of retreat, exposing new water and land for biotic colonization and human occupation. An overview of the glacial history and ecology of the fiord provides a foundation for understanding Laax̲aayík as an Indigenous homeland where a unique way of life was forged over the centuries.

GEOGRAPHY AND GLACIERS

Situated between Prince William Sound to the north and the Alexander Archipelago to the south, Yakutat fiord (Figure 14) offers one of the few refuges for canoe or ship-borne seafarers along more than 1,100 km of exposed North Pacific coastline. The fiord opens on the Gulf of Alaska and extends about 60 km inland, linking at its head to Russell Fiord, which bends back toward the coast and terminates on the Yakutat foreland. Surrounding local peaks rise to 1,500 m and reach over 4,500 m in the mountainous hinterlands. The inner fiord falls within the Chugach–St. Elias Mountains ecoregion, while the shores and forelands of Yakutat Bay are part of the Gulf of Alaska Coast ecoregion (Noacki et al. 2001).

The climate is temperate maritime, with average temperatures of –2.2°C in January and 12.4°C in July and annual precipitation (rain and snow) of over 3,900 mm (Alaska Climate Research Center 2020). The heaviest rains, accompanied by high river flows, are during the months of September through November. Owing to the relatively mild winters, the ocean waters of the fiord do not freeze except in a few protected nearshore areas. Evergreen forests of western hemlock and Sitka spruce (Figure 15) occupy the coastal lowlands and mountain slopes up to about 700 m elevation in Yakutat Bay, with the tree line descending toward the head of the fiord and dropping to sea level around Disenchantment Bay. Alder-dominated brush extends to higher altitudes in many areas and is widespread on recently deglaciated lowland areas and alluvial fans, along with grasses, willows, and other shrubs (Figure 16).

Glacially sculpted Yakutat fiord is up to 300 m deep in Disenchantment Bay and up to 180 m deep in Yakutat Bay, with shallower bathymetry toward the eastern and western shores and at cross-fiord moraines (Figure 17). The outer fiord is exposed to Pacific Ocean swells and heavy surf, especially along the western shore. The largest of the

FIGURE 14. Aerial view to the north toward the head of Yakutat fiord and surrounding mountains of the St. Elias Range, July 2013. Hubbard and Valerie glaciers are seen in the far distance; Blizhni and Bancas points project from the fiord's western shore at left and Point Latouche enters from the right, marking the entrance to Disenchantment Bay. Photo © Smithsonian Institution.

FIGURE 15. Spruce and hemlock forest covering the shores and mountain slopes of eastern Yakutat Bay, viewed from the north shore of Knight Island, July 2014. Alders fringe the shoreline and cover the peaks to about 900 m. Photo © Smithsonian Institution.

FIGURE 16. Grasses, willows, alders, and young spruce trees on the Malaspina foreland, viewed to the northeast from near Spoon Lake, July 2014. Photo © Smithsonian Institution.

glaciers that discharge directly into the fiord is the Hubbard—the most extensive tidewater glacier in North America—which descends to the head of Disenchantment Bay, and is flanked by Turner, Haenke, and Valerie Glaciers. Hubbard Glacier surges and retreats periodically and advanced temporarily to block the channel between Yakutat and Russell fiords in 1986 and 2002. The water level in Russell Fiord rose on both occasions due to freshwater inflows, followed by outburst floods into Disenchantment Bay when the ice dams ruptured (Trabant et al. 2003a, 2003b; Stearns et al. 2015).

Malaspina Glacier is a stagnant ice mass of enormous extent—the world's largest piedmont glacier—that occupies the coastal lowlands between Icy Bay and Yakutat fiord. Malaspina Lake formed after 1914 due to early twentieth century glacial retreat (Winkler 2000). The Malaspina foreland on the west side of Yakutat Bay has a linear shoreline that is building outward due to isostatic uplift combined with the deposition of sediments by rivers flowing from Malaspina Lake and from Lucia and Atrevida Glaciers.

The islands and indented eastern shore of Yakutat Bay are layered with moraine deposits dating from the first-millennium Neoglacial advance of Malaspina and Hubbard Glaciers, while the Yakutat foreland to the east consists of glacial debris deposited as early as 15,000 years ago during the Late Glacial Maximum, although not isostatically elevated above sea level until 3,000–1,500 years ago (Blackwelder 1909; Tarr 1909; Plafker and Miller 1958; Molnia 1986). The Yakutat glacial foreland is drained by the Situk, Ahrnklin, Lost, and Italio Rivers and

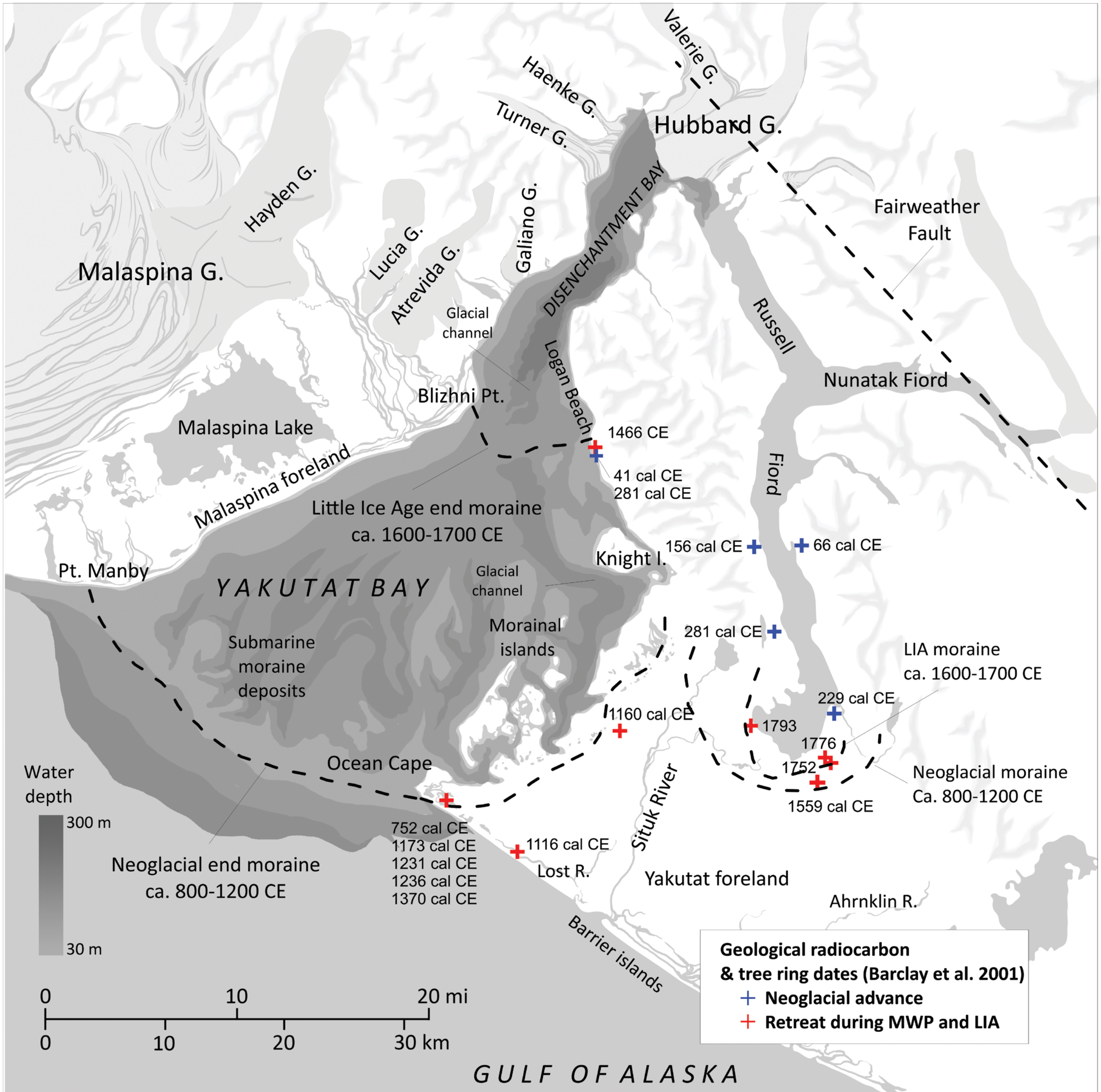

FIGURE 17. Yakutat fiord showing topography, bathymetry, glaciers, end moraines, tree ring dates, and geological radiocarbon dates pertaining to glacial advances and retreats since 200 CE, including Medieval Warm Period (MWP) and Little Ice Age (LIA). Glacial data from Barclay et al. 2001. © Smithsonian Institution.

dozens of smaller streams. Isostatic rebound following glacial retreat, combined with heavy sediment discharges from the rivers and redeposition by coastal currents, has generated an outward-building coastal terrain of beach ridges, barrier islands, spits, and lagoons (Figure 18).

The Yakutat area is tectonically active due to the Fairweather Fault, which crosses the head of Disenchantment Bay beneath Hubbard Glacier and has generated eight earthquakes greater than magnitude 7.5 since the late nineteenth century (Yehle 1979). The largest occurred in September 1899, producing tsunami waves in Yakutat fiord and lifting parts of the shoreline as much as 14 m while other areas subsided 2 m or more (Tarr and Martin 1912:30–32). Tectonic uplift and isostatic rebound have the effect of shifting former shorelines and coastal archaeological sites to higher, more inland positions, while subsidence can lead to site erosion or immersion below sea level.

FIGURE 18. Beach ridges, sloughs, streams, and old growth forest on the coastal plain of the Yakutat foreland, with the Brabazon Range in the background. These waterways traditionally provided passage for canoes between Yakutat Bay and Dry Bay. Photo courtesy of John Jansen, Alaska Fisheries Science Center, National Oceanic and Atmospheric Administration, Seattle.

CLIMATE AND GLACIAL HISTORY

Glacial history may be reconstructed from the combined evidence of climate data, glacial geology, historical observations, and oral traditions. North American and Alaskan temperature curves for the last 2,000 years derived from multiproxy data (Barclay et al. 1999; Hu et al. 2001; Mann and Jones 2003; Moberg et al. 2005; Wiles et al. 2008) show a Neoglacial cold period during the first millennium CE, warming after 900 CE (Medieval Warm Period), and a return to colder conditions during 1100–1900 CE (Little Ice Age).

Temperature estimates based on growth rings of mountain hemlock trees indicate that the Medieval Warm Period was characterized by an average air temperature (February to August) of 7.7°C, followed by Little Ice Age cooling periods from the 1180s through the 1320s when the average air temperature averaged 7°C; from 1400 to 1530 when it averaged 6.7°C; from the 1540s to 1710s when it averaged 6.8°C; and from the 1810s to 1880s when it averaged 6.9°C (Wiles et al. 2014; Figure 19). These periods correlate with the advance and retreat of land-terminating glaciers in southern Alaska and to a lesser degree with the growth and recession of tidewater glaciers (Figure 20; Wiles et al. 1996, 2008; Mann et al. 1998).

At Yakutat, geological studies indicate that the Hubbard and Malaspina Glaciers underwent multiple Holocene expansions, but the two most recent, during approximately 200–800 CE (Neoglacial) and 1600–1700 CE (late Little Ice Age), are of present interest (Carlson 1989; Barclay et al. 2001; Elmore et al. 2015). Tarr (1909), followed by Plafker and Miller (1958), proposed that the Hubbard and its glacial tributaries pushed past the Malaspina during the Neoglacial advance and deposited the terminal moraine that extends across the mouth of Yakutat Bay from Point Manby to Ocean Cape. However, as originally proposed by Gilbert (1910) and confirmed by recent submarine seismic studies (Elmore et al. 2015; Zurbechen et al. 2015), an expanded Malaspina Glacier was responsible for depositing this moraine as well as submarine banks and islands in eastern Yakutat Bay (Figure 21). The Malaspina blocked Hubbard Glacier during the advance, confining it to the upper bay. The oldest calibrated radiocarbon date from the terminal moraine complex at Ocean Cape is 663 (752) 881 cal. CE (Beta 122439), indicating arrival of the glacier by about 800 CE (Barclay et al. 2001: table A1).

As the Malaspina and Hubbard Glaciers were expanding in Yakutat fiord, an eastern lobe of the Hubbard, combined with Nunatak, Fourth, and Hidden Glaciers, pushed to the southern end of Russell Fiord, where it deposited the outermost of two end moraines (Figure 21; Plafker and Miller 1958;

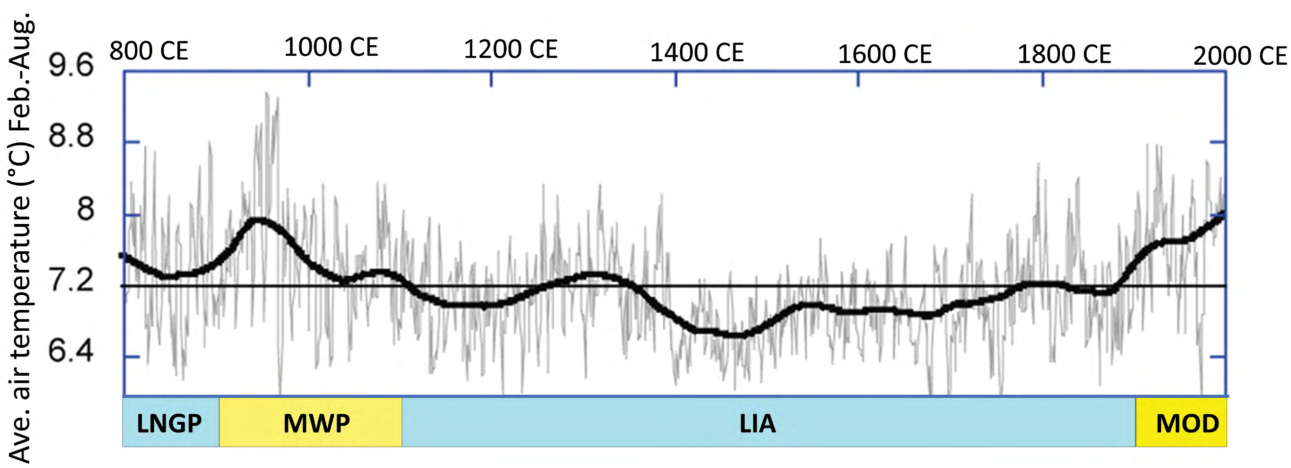

FIGURE 19. Major climatic periods including the Late Neoglacial Period (LNGP), Medieval Warm Period (MWP), Little Ice Age (LIA), and Modern Warm Period (MOD) with estimated Gulf of Alaska air temperatures (°C) since 800 CE derived from tree ring widths (Wiles et al. 2014). Climate curve courtesy of Greg Wiles.

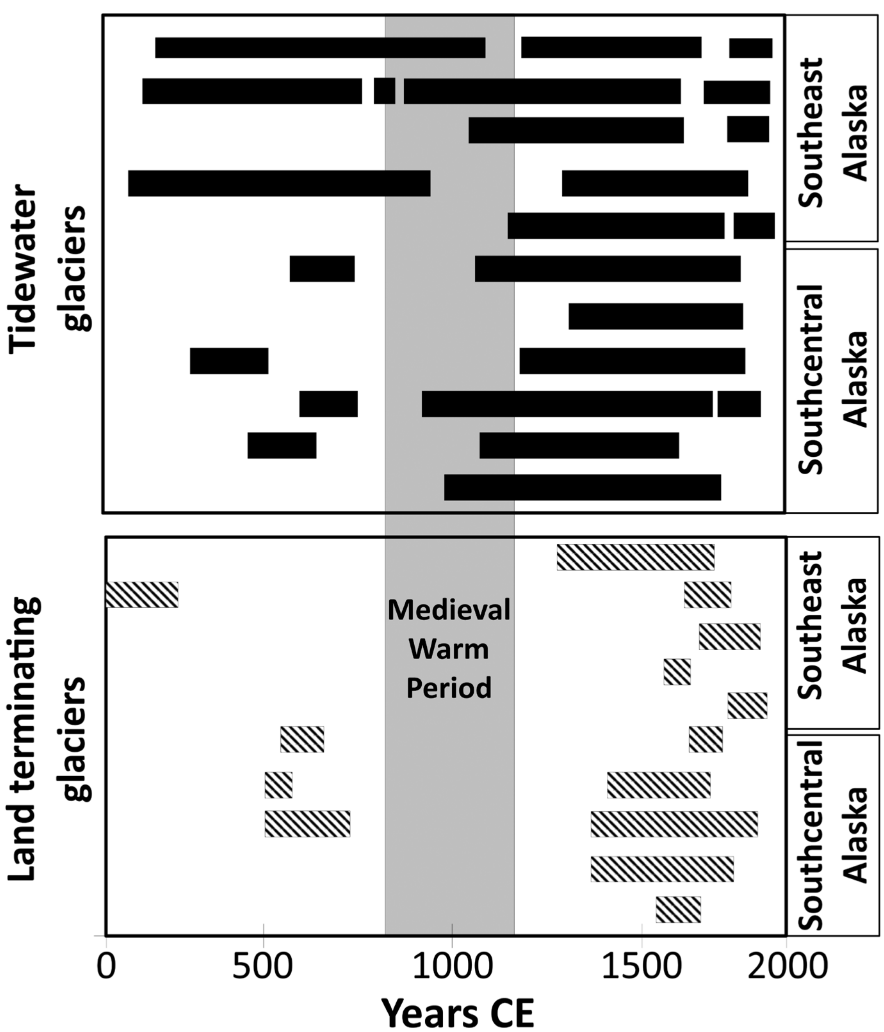

FIGURE 20. Glacial advances (bars) of tidewater and land-terminating glaciers in southcentral and southeastern Alaska during the Neoglacial, Medieval Warm Period, and Little Ice Age (redrawn from Mann et al. 1998).

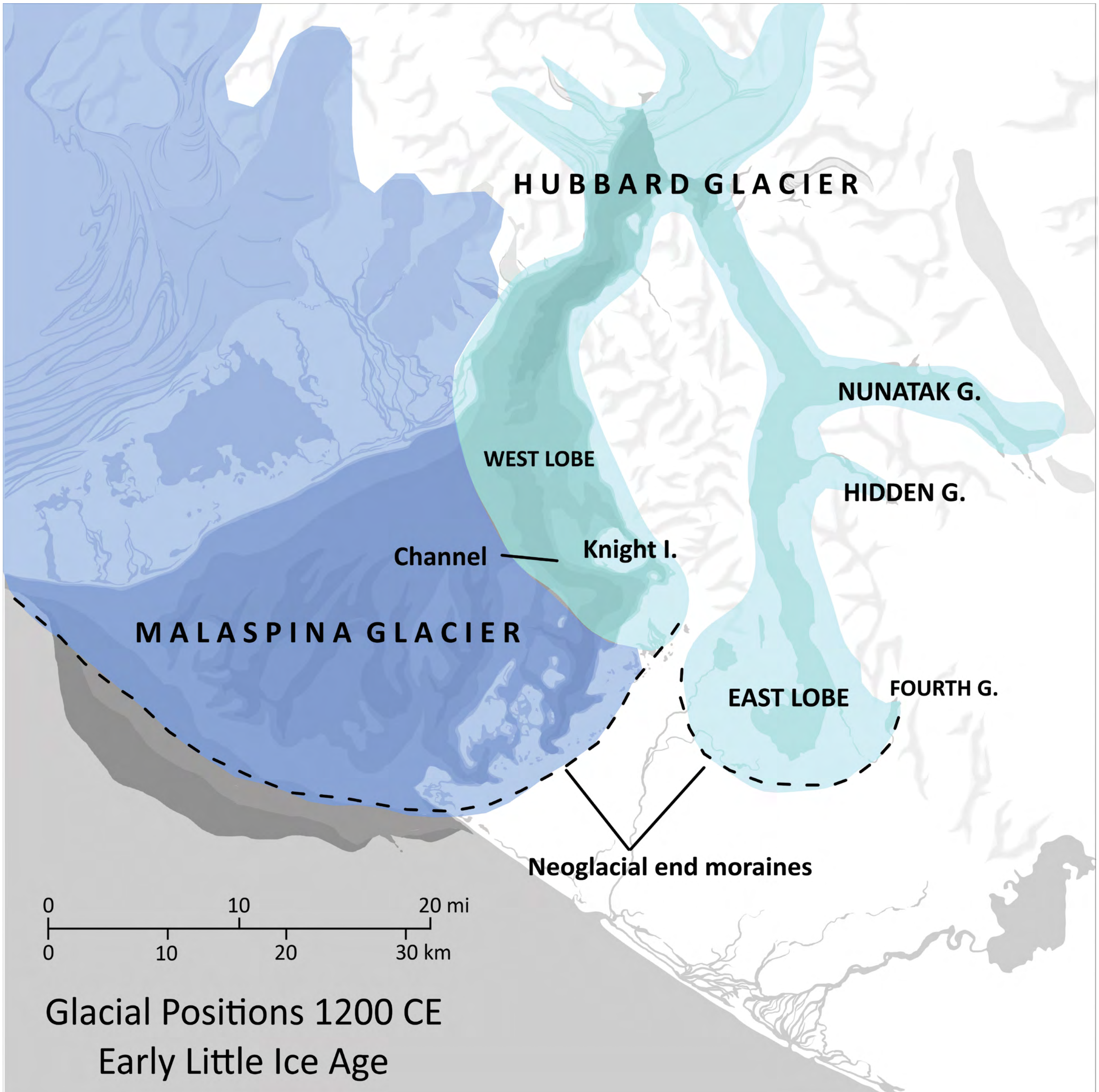

FIGURE 21. Reconstructed positions of Malaspina (dark blue) and Hubbard (light blue) glacial complexes in Yakutat and Russell fiords circa 1200 CE. The enlarged Malaspina deposited a moraine across the mouth of Yakutat Bay during the Neoglacial period, while the west Hubbard lobe extended to just south of Knight Island. © Smithsonian Institution.

Molnia 1986:228; Barclay et al. 2001; Daniel Mann, University of Alaska Fairbanks, personal communication, 2018). This period, when glacial ice filled Yakutat Bay, Russell Fiord, and Icy Bay is noted in early Yakutat oral traditions (De Laguna 1958).

Glacial abandonment of the moraine that extends across the mouth of Yakutat Bay is indicated by the four most recent radiocarbon dates from Ocean Cape (Figure 17), which were 883 (1173) 1425 cal. CE (U.S. Geological Survey W-559); 1053 (1231) 1285 cal. CE (Beta 98984); 1054 (1236) 1294 cal. CE (Beta 122438); and 1282 (1370) 1456 cal. CE (Teledyne Isotopes I-439; Barclay et al. 2001: table A1; recalibrated using the online program OxCal 4.4.4, https://c14.arch.ox.ac.uk/, accessed 17 April 2023). The medians of these dates cluster around 1250 CE, suggesting the approximate date when the Malaspina–Hubbard ice mass began to retreat. The earliest archaeological date on newly deglaciated land is 1045 (1257) 1406 cal. CE (Beta 96769) from Spoon Lake 3 at Point Manby (chapter 4, this volume).

After abandoning its terminal moraine, the Malaspina–Hubbard glacial complex began to diminish rapidly despite the onset of cooler temperatures during the Little Ice Age. Stability of the Yakutat glaciers during the Medieval Warm Period followed by recession during the Little Ice Age exemplifies the complex dynamics of tidewater glaciers in southern Alaskan fiords, where heavy snowfall and large accumulation areas in the coastal mountains sustain long advances alternating with rapid retreat when glacial tongues become unmoored from protective end moraines (Post 1975; Molnia 1986; Mayo 1988, 1989; Barclay et al. 2001; Calkin et al. 2001). The expansion of most other southern Alaskan fiord glaciers during the Little Ice Age (Barclay et al. 2001; Wiles et al. 2008) coincided with glacial retreat at Yakutat fiord (Barclay et al. 2009), underlining Yakutat's importance as a refuge for coastal peoples who lost habitable territories elsewhere, including Glacier Bay (Crowell et al. 2013a).

By the mid-fifteenth century Hubbard Glacier had retreated past Logan Beach north of Knight Island, where the oldest living tree was dated by ring count to 1466 CE (Barclay et al. 2001:396; Figure 17). The withdrawal of Malaspina Glacier from the Point Manby area (Plafker and Miller 1958; Sharp 1958) occurred before 1045 (1257) 1406 cal. CE, which is when the Spoon Lake 3 archaeological site was established. An oral tradition recounted to Frederica de Laguna (De Laguna 1972:241) indicates that when Tlákw.aan village was founded on Knight Island in 1454 (1509) 1631 cal. CE (chapter 5, this volume), Malaspina and Hubbard Glaciers were still joined and extended from the Point Manby area to near Point Latouche (Figure 22). Glacial retreat in Russell Fiord by 1500 CE is assumed but not well defined; however, oral tradition suggests that there was open water at the southern end of Russell Fiord during this period (De Laguna 1972:231). Eyak place names are attached to several locations around this ancient "lake" (Thornton 2012:23), consistent with Eyak use in the fifteenth or sixteenth century.

A Hubbard Glacier readvance in approximately 1600–1700 CE (Figure 23) is marked by a cross-fiord moraine at Blizhni Point (Carlson 1989; Zurbechen et al. 2015). Tenure at this location ended before the late eighteenth century based on the observations of Malaspina in 1791 and Vancouver in 1794, who charted Hubbard Glacier as having completely withdrawn from Disenchantment Bay to several kilometers north of its modern position (Tarr 1909; Barclay et al. 2001; Daniel Lawson, Dartmouth College, personal communication, 2022). This implies retreat of about 25 km in less than a century. The Laax̲aa Tá sealing camp, located 4 km north of the Blizhni Point moraine, was established at an unknown date prior to 1791 when Malaspina reported it, in an area that was probably deglaciated before 1750 (chapter 6, this volume).

North of Yakutat fiord, Yahtse Glacier expanded into Icy Bay prior to 1794 (Plafker and Miller 1958), when it is said to have overrun an Eyak village (Topham 1889; De Laguna 1958, 1972:286). Malaspina Glacier underwent a minor readvance at about the same time (Sharp 1958) but did not cover the Spoon Lake archaeological sites near Point Manby. An apparently simultaneous readvance of the eastern lobe of Hubbard Glacier, joined by Nunatak, Hidden, and Fourth Glaciers, reached the end of Russell Fiord before 1700 CE and deposited the inner and more recent of the two end moraines located there (Figure 23; Tarr 1909). Retreat from this position began by the 1780s–1790s CE based on ring counts of tree stumps rooted on the inner moraine (Barclay et al. 2001).

By the early nineteenth century Malaspina Glacier had withdrawn onshore, Hubbard Glacier was in approximately its modern position at the head of Yakutat and Russell fiords, and Russell Fiord was segmented by lateral tributary glaciers into three bodies of open water (Figure 24). Referring to the northernmost segment, an early twentieth century Yakutat resident said that Nunatak Glacier extended northward up Russell Fiord as far as Marble Point, with open water separating it from Hubbard Glacier (Tarr 1909:128; Tarr and Martin 1914:119). This expanse of seawater, which curved around into Disenchantment Bay, is likely the "copious river" that one of Malaspina's sailors observed in 1791 from atop Gilbert Point (Wagner 1936:251).

A Yakutat resident told De Laguna in the 1950s that Nunatak Glacier (augmented by Hidden Glacier) advanced south to Tsaa Eejí ("seal reef") on the west side of Russell Fiord (De Laguna 1952, 1972:70; Thornton 2012:23; Figure 24). The eastern end of this terminus was at Shelter Cove, where the glacier overran living forests (Tarr 1909:134–135). The Nunatak–Hidden Glacier ice dam breached at an unknown date in the middle to late nineteenth century, and water that had backed up behind it to the south—that is, the middle Russell Fiord segment—was released (De Laguna 1958, 1972:70).

At the southern end of Russell Fiord, Fourth Glacier extended to Cape Stoss, and the cape is known accordingly as Laagak̲aal (Eyak, "it is holding the glacier in its mouth"; Thornton 2012:23; Figure 24). This ice dam caused a lake to build up behind it to the south due to freshwater inflows, which is shown in an 1852 Russian chart as the source of the Situk River (Davidson 1904:49–53; Teben'kov 1981: map 7). The Fourth

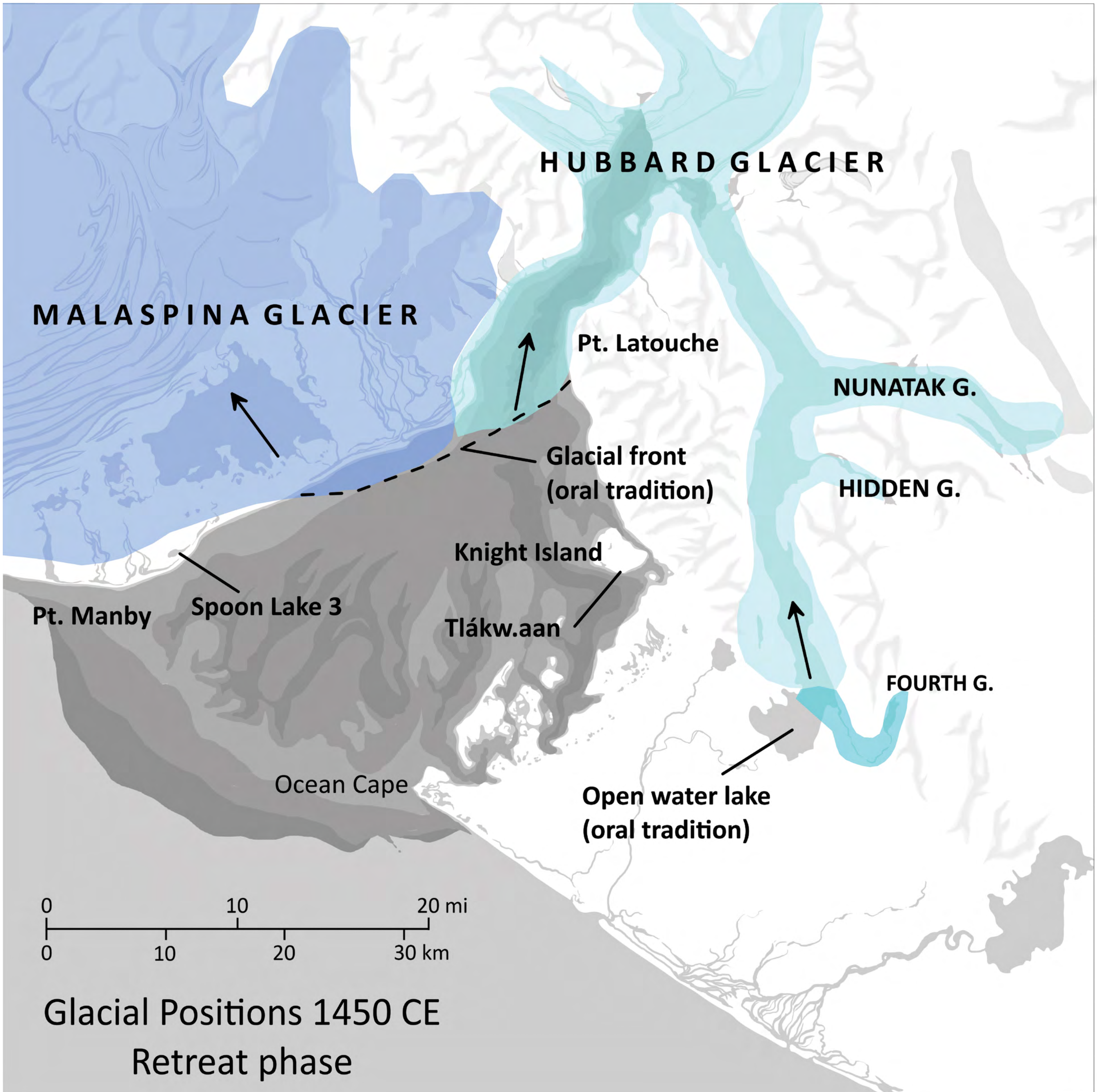

FIGURE 22. Reconstructed glacial positions during the retreat period of the early Little Ice Age, circa 1450 CE, when the combined front of the Malaspina and Hubbard extended across Yakutat fiord near Point Latouche. The Spoon Lake 3 and Tlákw.aan settlements were established in recently deglaciated areas. © Smithsonian Institution.

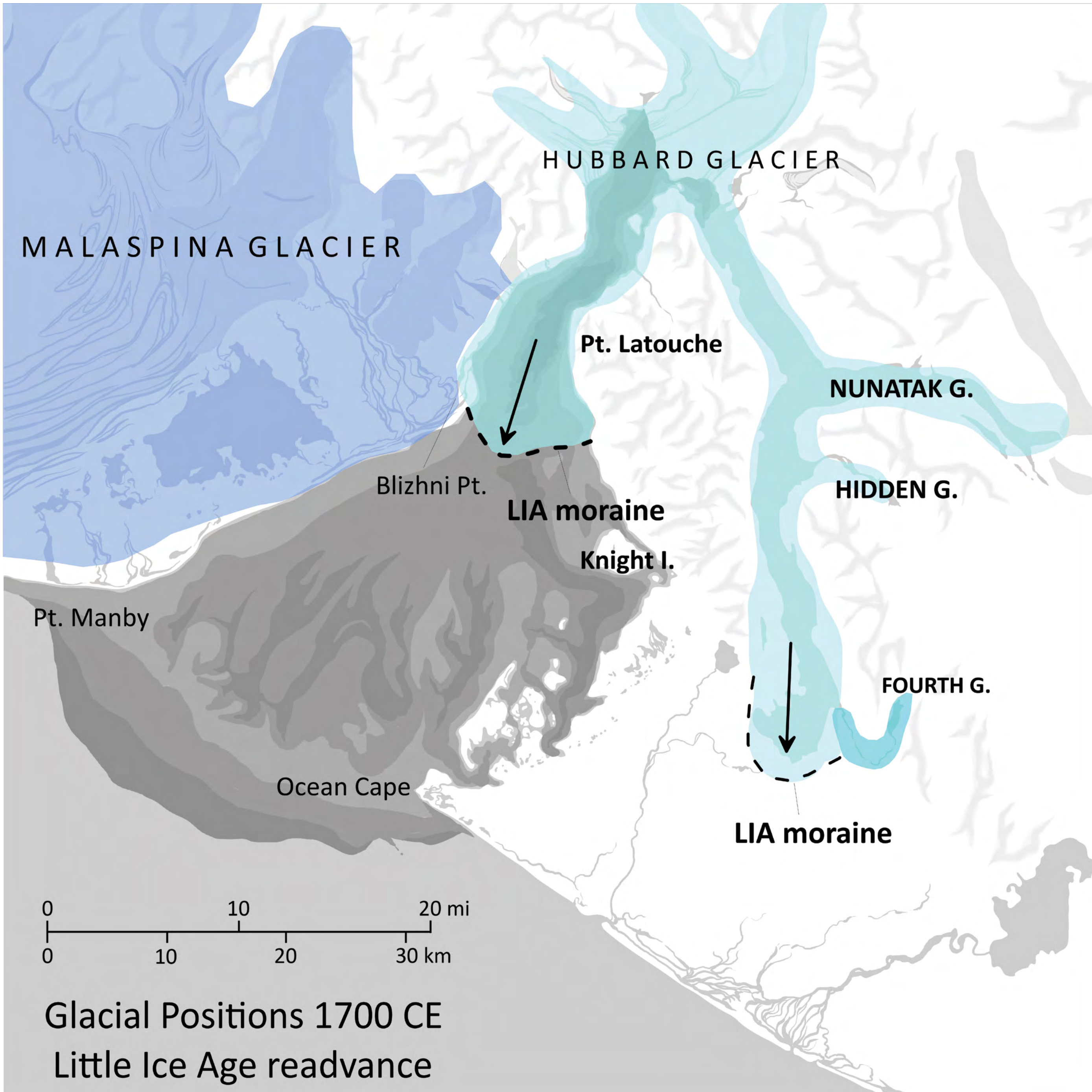

FIGURE 23. Reconstructed glacial positions during the middle Little Ice Age (LIA) readvance circa 1600–1700 CE. The west lobe of Hubbard Glacier, which had retreated to the head of Disenchantment Bay by about 1600 CE, readvanced and deposited a cross-bay moraine at Blizhni Point. The eastern lobe of the Hubbard, joined by Nunatak, Hidden, and Fourth Glaciers, once again expanded to the end of Russell Fiord. © Smithsonian Institution.

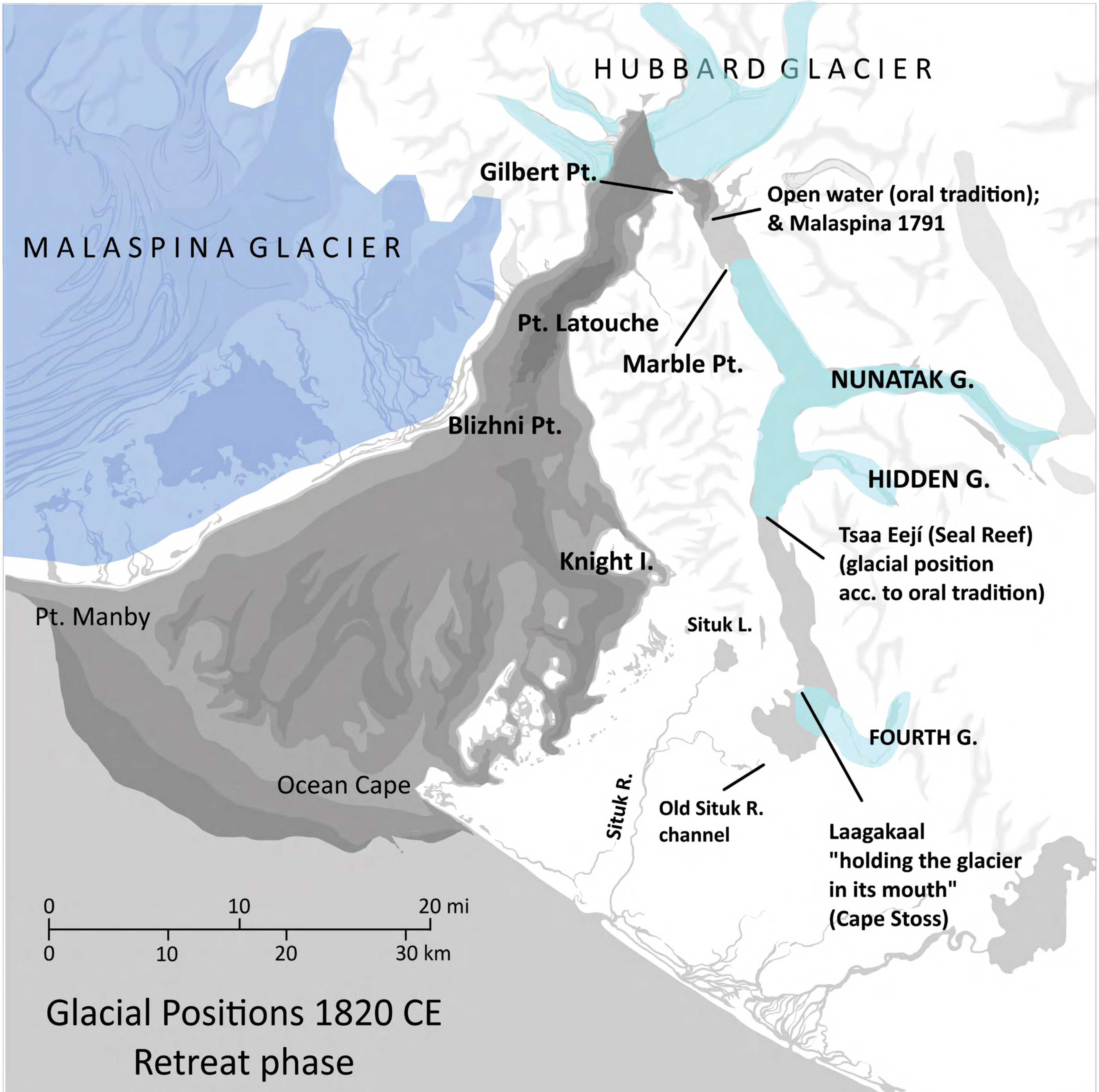

FIGURE 24. Reconstructed glacial positions during the late Little Ice Age retreat circa 1820 CE. Glaciological data and oral tradition indicate that Hubbard Glacier had retreated to approximately its modern position, while Russell Fiord was segmented into three bodies of open water. Malaspina Glacier was grounded but did not retreat significantly until the early twentieth century. © Smithsonian Institution.

Glacier dam breached sometime after 1850, draining the elevated waters of the lake into Russell Fiord and causing the old upper main channel of the Situk River to dry up (De Laguna et al. 1964:17; De Laguna 1972:287; Mayo 1988:6). The Situk River today is fed by freshwater Situk Lake, located west of Russell Fiord. Tarr and Martin (1914:230) estimated that trees growing on the elevated beach around the old lake at the end of Russell Fiord (known locally as Mud Bay) were no more than half a century old in 1909–1913, supporting an estimate that it drained in about 1860.

Yakutat Tlingit resident Harry Bremner reported oral knowledge of this event to De Laguna, recounting that people who were picking strawberries at the end of Russell Fiord first saw the lake level drop rapidly (presumably as it drained north past the breached ice dam), followed by a rush of salt water (possibly backflow from the upper fiord) that swept down the old channel of the Situk River as they escaped in canoes (De Laguna 1972:287). Afterward, drainage down the old Situk River channel was much reduced, and the water was salty rather than fresh (G. Ramos, 11 June 2011, IN-3).

MARINE ECOSYSTEM

Glacial discharges have important effects on the marine ecology of fiords, increasing phytoplankton (primary) productivity and supporting organisms at higher trophic levels, from zooplankton and invertebrates to fish, seabirds, and marine mammals (Arimitsu et al. 2012, 2016; Renner et al. 2012; Lydersen et al. 2014; O'Neel et al. 2015; Arimitsu 2016; Urbanski et al. 2017). Ecological effects vary seasonally and with distance from glacial runoff sources, fiord geography, and bathymetry.

Estimates of annual primary productivity in Gulf of Alaska glacial fiords and estuaries range from 300 g C m^{-2} (mass of phytoplankton carbon per square meter of ocean surface) in lower Cook Inlet to 185 g C m^{-2} in Prince William Sound and 145 g C m^{-2} in Boca de Quadra in Southeast Alaska, similar to values for fiords in Norway, Sweden, Greenland, and Canada (Burrell 1986; Eslinger et al. 2001; Cooney 2007). Continental shelf waters offshore from glacial fiords, such as the Kenai Shelf along the Kenai Peninsula, may have similar levels (Larrance et al. 1977), but production in the open subarctic Gulf of Alaska is only about 100 g C m^{-2} per year due to nutrient limitations (Welschmeyer et al. 1993). A study of the annual phytoplankton flux in Prince William Sound showed a peak bloom in May–June, correlating with the longest daylight hours, highest glacial discharges, and maximum availability of dissolved nutrients (Eslinger et al. 2001).

At Yakutat fiord, cold, sediment-laden freshwater runoff enters Disenchantment Bay as calved ice and meltwater from Hubbard and adjacent glaciers, and along the west shore of Yakutat Bay it enters as stream flows from the inland Malaspina, Atrevida, Lucia, and Black Glaciers (Figure 25). These discharges are greatest in summer when glacial melting increases (Hood et al. 2006).

Plumes of glacial discharge are characterized by high turbidity, cool temperatures, low salinity, and stratification of fresh water over salt water; these plumes extend down Yakutat fiord from their sources for up to 20 km before dissipating in surrounding ocean waters (Figure 26; Arimitsu 2016; Arimitsu et al. 2016).

The plumes are cloudy with silt produced by abrasion of mountain bedrock and carry dissolved or suspended ammonium, nitrogen, phosphates, silicates, and iron into the fiord (Figure 27; Arimitsu et al. 2016). Nutrient concentrations and turbidity are highest in Disenchantment Bay and along the west shore of Yakutat Bay near Grand Wash River and Sudden Stream.

Midsummer phytoplankton is relatively low in Disenchantment Bay despite high nutrient levels because turbidity from suspended glacial sediments reduces light penetration of the water column. Phytoplankton (sampled in early July and measured by chlorophyll-a fluorescence) increases tenfold or more in the mixed waters of Yakutat Bay below Blizhni Point, where glacially contributed mineral nutrients are present but the water is relatively clear (Figure 28A; Arimitsu et al. 2016). Phytoplankton are most abundant in the relatively warm, shallow waters around morainal banks and islands in eastern Yakutat Bay, and copepods and other zooplankton that consume phytoplankton are also elevated in this area (Figure 28B). Euphausiids (krill) feed on phytoplankton but prefer cool, moderately silty water and are most abundant in upper Yakutat Bay between Blizhni Point and Knight Island (Figure 28C).

Distributions of animals at higher trophic levels are influenced to varying degrees by both prey distributions and environmental gradients (Renner et al. 2012). At Glacier Bay in Southeast Alaska, intertidal communities near tidewater glaciers never develop beyond barnacles and filamentous algae because of heavy silt deposition and scouring by icebergs (Milner et al. 2007:242). These inhibiting conditions also prevail in Disenchantment Bay, but in Yakutat Bay clams, cockles, chitons, mussels, urchins, kelp, and edible seaweeds are abundant in the eastern archipelago of shoals and islands, an area known as the "ice box" for its abundance of marine and intertidal subsistence foods (Mills and Firman 1986:62; Figure 25).

Capelin (*Mallotus villosus*), longfin smelt (*Spirinchus thaleichthys*), daubed shanny (*Leptoclinus maculatus*), Pacific herring (*Clupea pallasii*), walleye pollock (*Gadus chalcogrammus*), and other small forage fishes are found throughout Yakutat Bay during summer, with highest numbers at Blizhni Point shoal where euphausiids are available as feed; some fishes also consume zooplankton in the upper light-scattering layer of the turbid waters of Disenchantment Bay (Figure 28D; Arimitsu et al. 2008, 2016). Based on harvest reporting by Yakutat residents (Sealaska Corporation 1982; Mills and Firman 1984; Alaska Department of Fish and Game 1986a, 1986b; Sill et al. 2017), the most important subsistence fish species congregate in the eastern islands "ice box" area of Yakutat Bay, where they feed on zooplankton, crustaceans, and smaller fish. Species that are abundant in this area include Pacific herring (feeding and spawning

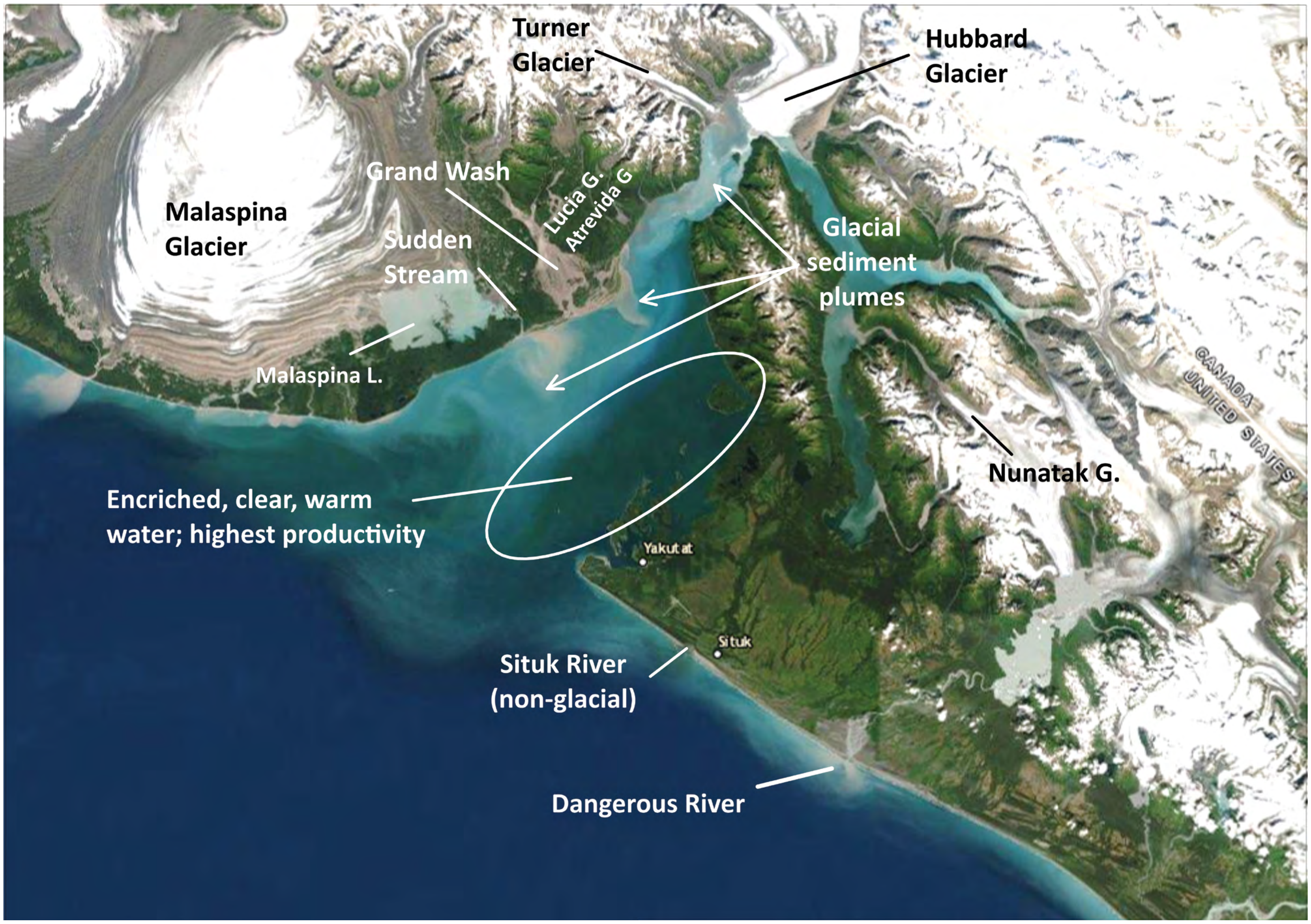

FIGURE 25. Yakutat fiord showing glacial sediment plumes and the high productivity mixing zone on the east side of Yakutat Bay. Glacial discharges into Disenchantment Bay are primarily from Hubbard and Turner glaciers; meltwater from Malaspina, Lucia, and Atrevida Glaciers enters the west side of Yakutat Bay via Grand Wash and Sudden Stream. Sentinel 2 satellite photo, July 2017, open access from the European Space Agency (https://scihub.copernicus.eu).

areas), halibut (*Hippoglossus stenolepis*, also taken in deep waters of the open bay), sablefish (*Anoplopoma fimbria*), rockfishes (*Sebastes* spp.), and lingcod (*Ophiodon elongatus*).

Coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*O. tshawytscha*), pink salmon (*O. gorbuscha*), sockeye salmon (*O. nerka*), chum salmon (*O. keta*), and other anadromous fish, including cutthroat trout (*O. clarkii*), steelhead (*O. mykiss*), and Dolly Varden (*Salvelinus malma*), spawn in rivers around Yakutat Bay (Alaska Department of Fish and Game 2005) but are fished most intensively in the eastern islands. These species also spawn in Situk River and Situk Lake and in other drainages on the Yakutat foreland. Eulachon (*Thaleichthys pacificus*) feed in Yakutat fiord and use estuaries on the Yakutat foreland for spawning.

The abundance of ocean-feeding birds, dominated by black-legged kittiwake (*Rissa tridactyla*), marbled murrelet (*Brachyramphus marmoratus*), Kittlitz's murrelet (*B. brevirostris*), Arctic tern (*Sterna paradisaea*), and glaucous-winged gull (*Larus glaucescens*), is strongly correlated with the distribution of fish biomass (Figure 28E; Arimitsu et al. 2016), and there are populations in both Yakutat and Disenchantment Bays (Stephensen and Andres 2001; Schoen et al. 2013). Seabird nesting colonies (Figure 29), where eggs are harvested for subsistence (Figure 30), are located along the east side of the fiord from Ocean Cape to Disenchantment Bay as well as in Russell Fiord and on Malaspina Lake (Alaska Department of Fish and Game 1986a).

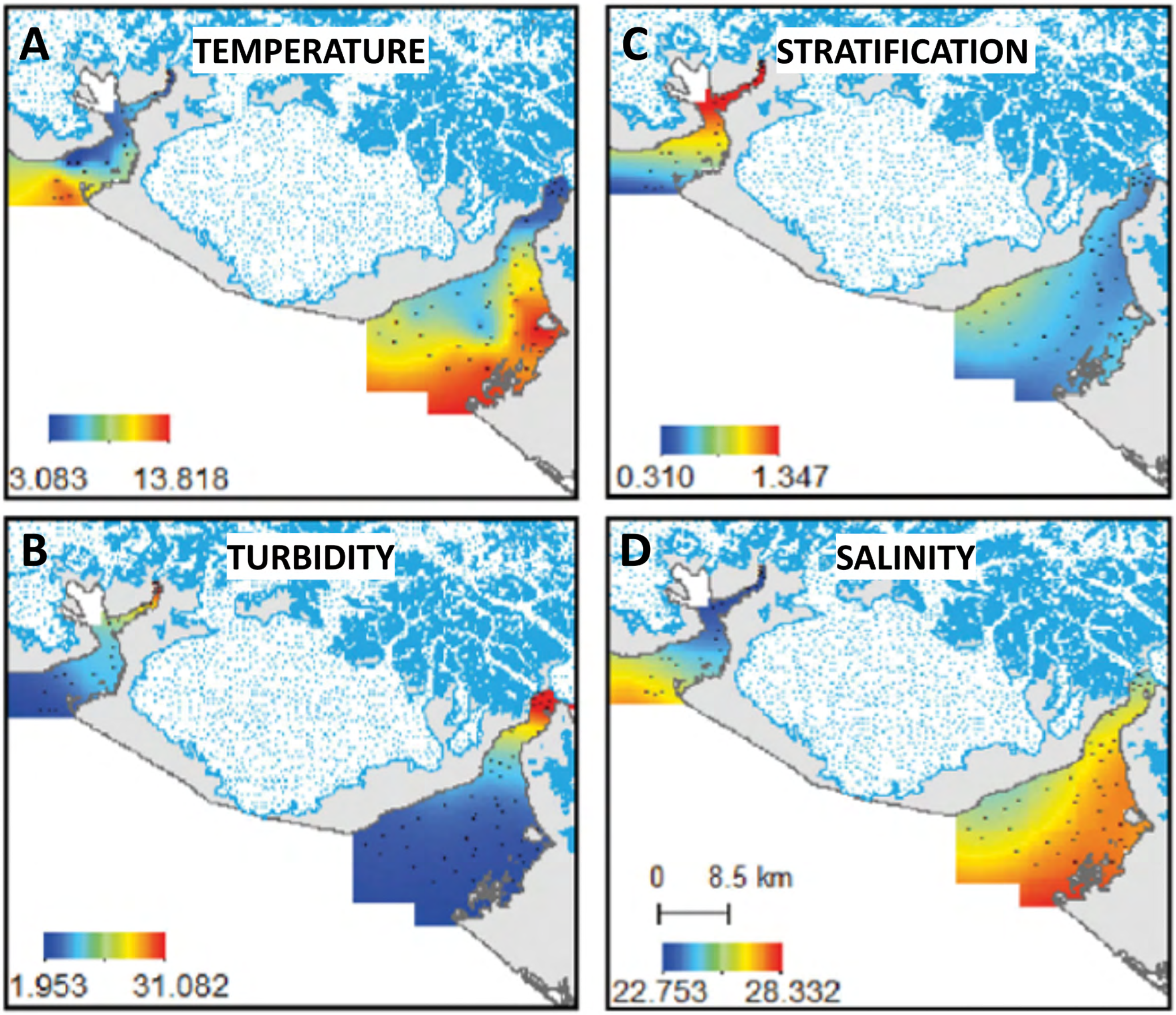

FIGURE 26. Ocean conditions: (A) summer temperature (°C), (B) turbidity (percent beam attenuation in upper 5m), (C) stratification (average change in density per m of depth, kg/m^3), and (D) salinity (g/kg) gradients n Yakutat fiord (lower right) and Icy Bay (upper left). Inflows of cold, turbid, fresh meltwater from glaciers are evident at the head of Yakutat fiord and along its western shore. Fresh water from glaciers is lighter than salt water and forms an upper layer until mixed by currents (stratification). Figures from Arimitsu et al. 2016, reproduced by permission of the author.

Harbor seals (*Phoca vitulina*) are widely distributed around Yakutat fiord in all seasons, with a large concentration in spring—up to 2,100 animals—in Disenchantment Bay at the ice floe rookery near Hubbard and Turner Glaciers (Figure 31; Jansen et al. 2006, 2014). Seal populations at this location were higher prior to the Gulf of Alaska harbor seal crash of the late 1960s–1970s (Kruse and Springer 2007; Springer et al. 2007; Crowell 2020). The floes provide safe haulouts for the seals, protecting them from predation by sharks and killer whales and serving as floating platforms where the pups are born and nursed during late May through June (Pitcher and Calkins 1979; Hoover-Miller 1994; Iverson et al. 2007). Adult seals forage on fish and crabs in this periglacial habitat, although female seals do not feed while nursing, relying on accumulated blubber (R. Sensmeier, 26 May 2014, IN-53). The islands and shoals of eastern Yakutat Bay are an important feeding ground for harbor seals

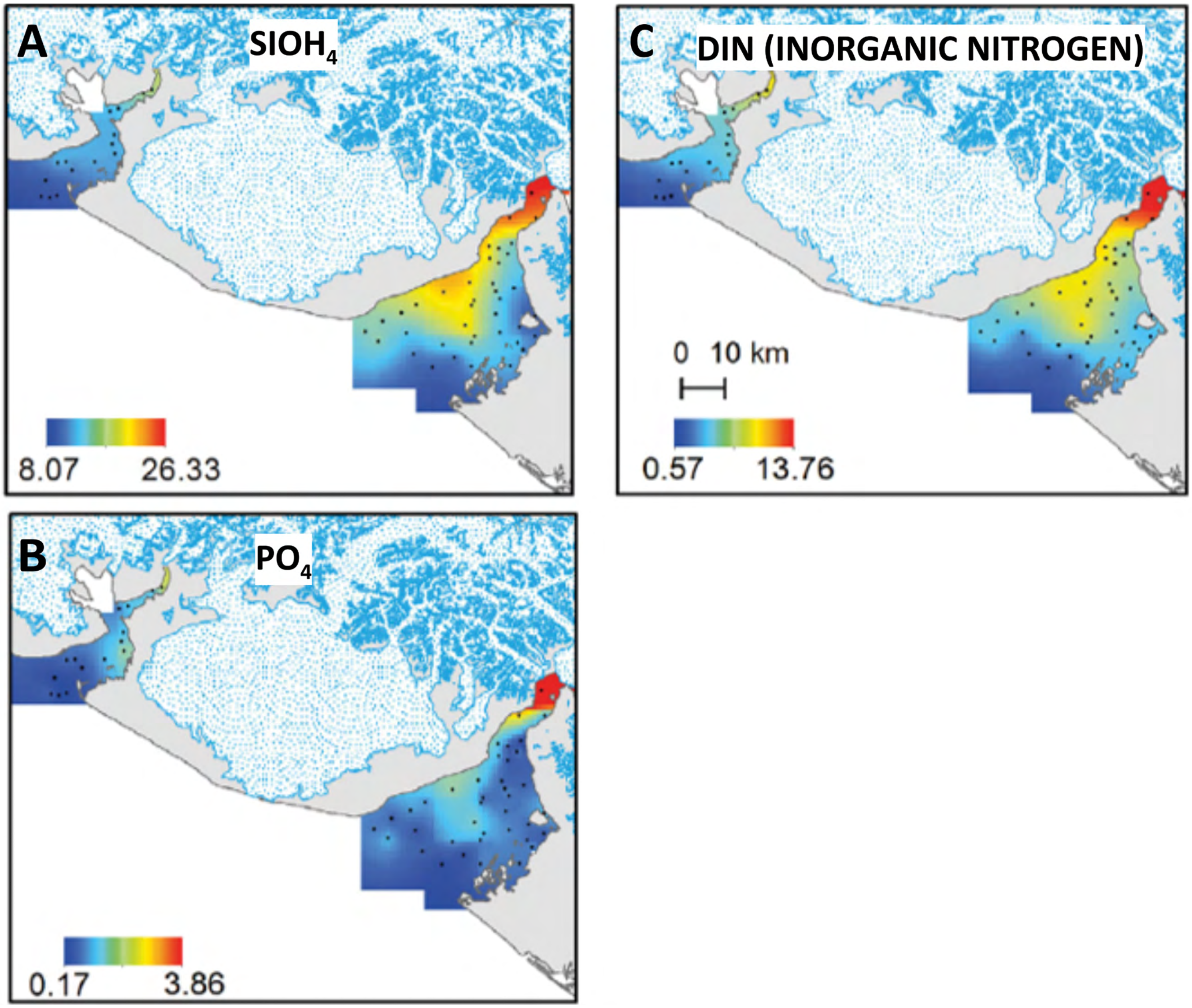

FIGURE 27. Summer concentrations (parts per million) of (A) silicate, (B) potassium, and (C) dissolved inorganic nitrogen in Yakutat fiord (lower right) and Icy Bay (upper left). Figures from Arimitsu et al. 2016, reproduced by permission of the author.

during all seasons, where they eat herring, capelin, salmon, and other fish and where they are taken by subsistence hunters (G. Ramos Sr., 18 June 2012, IN-15; see chapter 3, this volume). Harbor seals feed on salmon and haul out on sand bars at Osar Stream, Kame Stream, Sudden Stream, and Grand Wash River on the west side of Yakutat Bay, where they were formerly taken by hunters armed with clubs who rushed the seals from the water (G. Ramos, 11 June 2011, IN-3; 18 June 2012, IN-15).

Sea otters (*Enhydra lutris*) concentrate in kelp beds around the eastern islands of Yakutat Bay, where they consume shellfish and sea urchins. A small population of beluga whales (*Delphinapterus leucas*) lives in Disenchantment Bay and feeds on salmon at Esker Stream (Castellote et al. 2015). The distribution of harbor porpoises (*Phocoena phocoena*), year-round residents of Yakutat fiord that were formerly important as a subsistence species, is not well documented, although they are known to prey on salmon at Esker Stream and Grand Wash (Castellote et al. 2015) and are commonly seen in eastern Yakutat Bay. Northern fur seals (*Callorhinus ursinus*) formerly visited Yakutat fiord during their annual migration to the Pribilof Islands (G. Ramos Sr., 18 June 2012, IN-15), and bones of young-of-the-year fur seals from the return migration are present in the archaeological

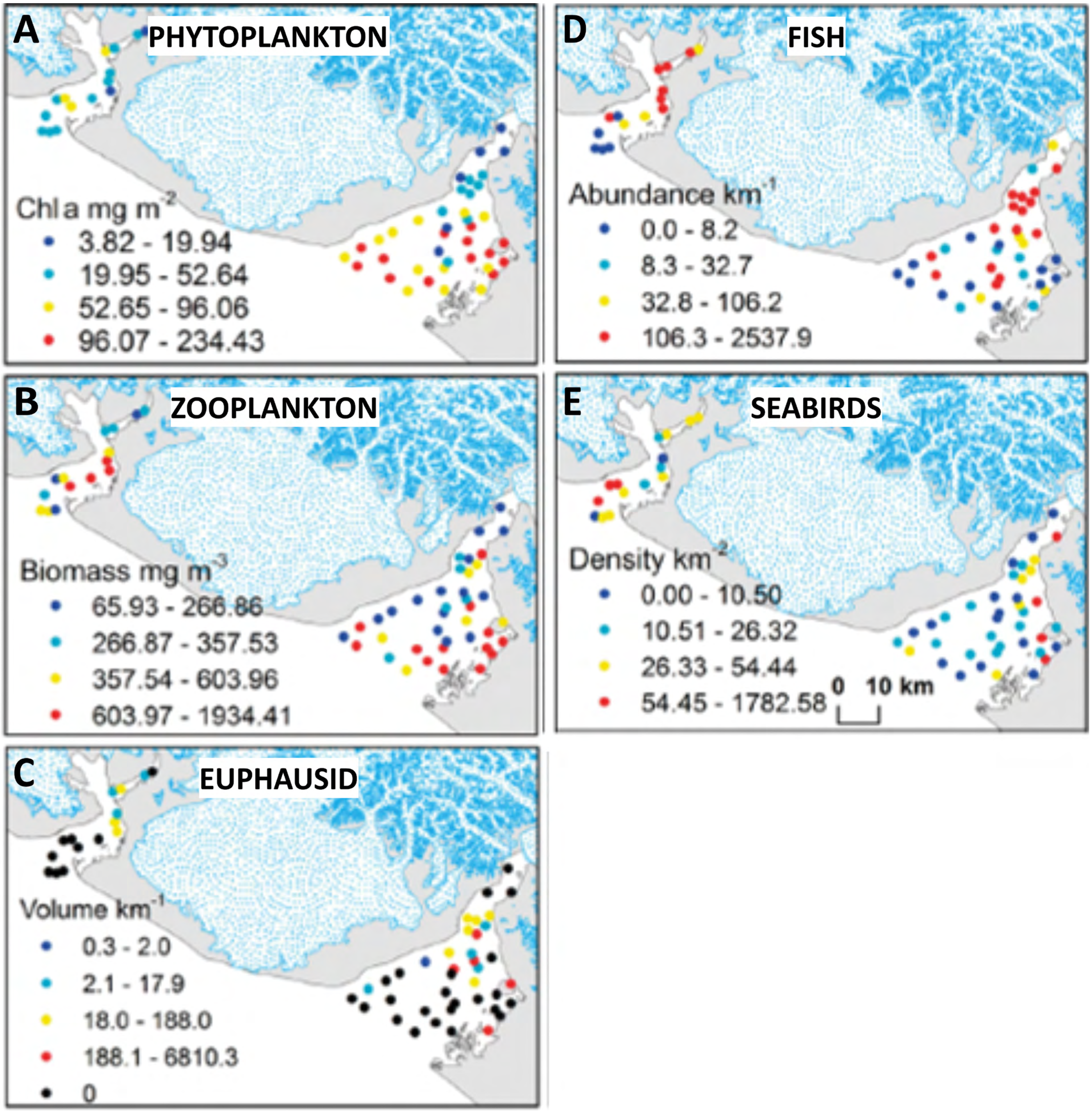

FIGURE 28. Summer measurements of (A) estimated phytoplankton chlorophyll-a at 0–15 m (mg/m^2); (B) zooplankton biomass (mg/m^3); (C) volume of euphausiids in net samples (ml/km towed); (D) abundance of capelin, longfin smelt, daubed shanny, Pacific herring, walleye pollock, and other fish in net samples (number/ km towed); and (E) density per km^2 of black-legged kittiwake, marbled murrelet, Kittlitz's murrelet, Arctic tern, glaucous-winged gull, and other seabirds in Yakutat fiord (lower right) and Icy Bay (upper left). Figures from Arimitsu et al. (2016), reproduced by permission of the author.

FIGURE 29. Nesting kittiwakes, west side of Haenke Island, June 2011. Photo © Smithsonian Institution.

FIGURE 30. Judith Ramos with kittiwake egg harvested from a nesting colony on Haenke (Egg) Island in Disenchantment Bay, June 2011. Her brother David Ramos is at the stern of the boat. Photo © Smithsonian Institution.

FIGURE 31. Harbor seal on an ice floe in Disenchantment Bay. Photo by Jamie Womble, 2016. Courtesy of National Oceanic and Atmospheric Administration, Alaska Fisheries Science Center, Seattle.

midden at Tlákw.aan on Knight Island (chapter 5, this volume), but these animals are rarely seen today. Steller sea lions (*Eumetopias jubatus*) occasionally haul out on rocks in Monti Bay but are uncommon and seldom taken for food (De Laguna 1972:40; Sill et al. 2015). Humpback whales (*Megaptera novaeangliae*), killer whales (*Orcinus orca*), and minke whales (*Balaenoptera acutorostrata*) visit the fiord, but there is no evidence that these species were ever hunted by Yakutat residents.

Overall, nutrient-rich glacial meltwater discharges from the Hubbard, Malaspina, and other glaciers appear to produce the greatest biological enhancements in the outer part of the fiord where the plumes are diluted and turbidity reduced, promoting summer phytoplankton growth and supporting large populations of invertebrates, fish, seabirds, and sea mammals. Euphausiids, some species of forage fish, plunge-feeding seabirds, harbor seals, and beluga whales have specialized seasonal adaptations to turbid waters near the glaciers, but the greatest diversity and abundance of food resources occur farther down the fiord in Yakutat Bay, especially among the islands and shoals along its eastern shore.

Around the Gulf of Alaska, the concentration of marine subsistence resources in the outer portions of fiords is a consistent pattern; moreover, the number of resource harvesting locales in this zone is correlated with higher numbers of archaeological sites, reflecting intensive human use and occupation (Erlandson et al. 1992; Crowell et al. 2003, 2013b). Structuring of biotic communities by glacial discharge plumes almost certainly contributes to this phenomenon in addition to upwelling and mixing generated by shallow bay mouth sills (Burrell 1986; Arimitsu et al. 2016) and protection from high-energy ocean waves afforded by outer bay islands, which allows for the growth of diverse intertidal communities.

The effects of glacial effluents on the Yakutat fiord ecosystem and human settlement patterns likely changed over time during glacial retreat. In the early stages, when there was a limited mixing zone for glacial and ocean waters, turbidity would have been high and phytoplankton productivity low; however, as a greater length of the fiord was exposed downstream, productivity would have increased. The ice floe harbor seal rookery may have come into existence very early, possibly as soon as retreat had progressed far enough for floes to be retained within Yakutat Bay rather than escaping into the Gulf of Alaska and being carried north by the coastal current.

Climate effects during early states of the system may also be considered. Cooler sea surface temperatures occur during weaker periods of the Pacific Decadal Oscillation and also prevailed during the Little Ice Age; cooler sea surface temperatures are associated with high productivity regimes for forage fishes, sea mammals, and sea birds (Hirons et al. 2001; Benson and Trites 2002; Finney et al. 2002; Maschner et al. 2008; Misarti et al. 2009). Late eighteenth century sea surface temperatures were 2°–3°C colder in the central Gulf of Alaska than at present (Helser et al. 2018), and faunal remains from the Early Contact Village, a Sugpiat site on the Kenai Peninsula that was occupied in about 1800 CE, were dominated by harbor seal, harbor porpoise, sea lion, murre, puffin, Pacific cod, rockfish, and other species that thrive in colder water (Crowell et al. 2008; Crowell and Arimitsu 2023). A similar suite of species, although lacking seabirds, is present at the late Little Ice Age archaeological site of Tlákw.aan in Yakutat Bay (chapter 5, this volume).

TERRESTRIAL ECOSYSTEM

Time since deglaciation and distance from the glacial front are principal determinants of biodiversity on subarctic fiord landscapes (Mathews 1992). In Southeast Alaska, newly deglaciated terrestrial, stream, and lake habitats are controlled initially by physical factors such as the character of the inorganic substrate, drainage, erosion, and air and water temperatures but increasingly by biotic processes including plant colonization, competition and succession, the accumulation of organic soils, and the organic enrichment of lakes and streams (Milner et al. 2007).

These processes lead to the emergence of diverse plant and animal communities over periods of decades to centuries. Bryophytes, *Equisetum*, and other genera that colonize barren periglacial surfaces give way to a variety of vascular ground plants followed by *Dryas* spp., willow, and other shrubs and eventually by balsam poplar (*Populus balsamifera*), Sitka spruce (*Picea sitchensis*), and hemlock (*Tsuga heterophylla*) trees (Chapin et al. 1994; Fastie 1995). Mature forests develop in 150–200 years, rooted in carbon- and nitrogen-enriched soils built up during earlier successional periods. Streams mature as their banks and courses are stabilized by vegetation and woody debris, populations of freshwater invertebrates increase, and productive habitats for juvenile and spawning fishes develop (Milner and Petts 1994; Milner et al. 2000). Anadromous fish runs may begin within a few decades of deglaciation and increase over time, feeding birds, bears, and other terrestrial mammals and transferring marine-derived nutrients to the terrestrial ecosystem (Naiman et al. 2002; Helfield and Naiman 2006). Lakes, required by sockeye salmon for spawning and growth of juvenile fish, are enriched with dissolved organic carbon, become less alkaline, and host diverse zooplankton (Milner et al. 2007).

Progressive deglaciation dates for Yakutat fiord correlate with terrestrial ecosystem development and species availability to human subsistence harvesters. The Yakutat foreland east of the late Neoglacial terminal moraine has been ice-free for at least 1,500 years (Blackwelder 1909; Davis 1996), allowing development of highly diverse plant and animal communities. Foreland forests follow the drainages of meandering streams surrounded by extensive bogs and extend along the tops of uplifted coastal beach ridges (Figure 18; National Oceanographic and Atmospheric Administration 1997; Albert and Schoen 2007).

On the western foreland, Seal Creek and other freshwater streams descend from outwash slopes near the end of Russell Fiord, while from Ahrnklin River to the east most watercourses are turbid meltwater streams that drain glaciers in the Brabazon Range or originate at Harlequin Lake and other proglacial lakes (Figure 32).The mosaic of habitats on the foreland supports at least 380 species of vascular plants including trees (Sitka spruce, western hemlock, balsam poplar, lodgepole pine [*Pinus contorta*], and others), alders, willows, berry bushes and other shrubs, graminoids, forbs, and ferns (Shephard 1995).

Stream drainages on the foreland support substantial spawning runs of sockeye salmon, Chinook salmon, and steelhead, which are harvested by the Yakutat community (Alaska Department of Fish and Game 2005). Terrestrial species that are hunted and trapped for food and fur in this area include moose (*Alces alces*, not present in the area until the 1930s), Sitka deer (*Odocoileus hemionus*), brown bear (*Ursus arctos*), black bear (*Ursus americanus*), wolf (*Canis lupus*), snowshoe hare (*Lepus americanus*), beaver (*Castor canadensis*), ermine (*Mustela erminea*), mink (*Neovison vison*), marten (*Martes caurina*), hoary marmot (*Marmota caligata*), river otter (*Lutra canadensis*), and red squirrel (*Tamiasciurus hudsonicus*; Mills and Firman 1986; Goldschmidt and Haas 1998; National Oceanographic and Atmospheric Administration 2006; Sill et al. 2017). Geese and ducks abound at foreland lakes and estuaries during the spring and fall migrations, and harbor seals inhabit the coastal lagoons and lower river courses, where they feed during summer on salmon and eulachon. The area is traditionally known as a land of plenty, reflected in the Tlingit name Aan Tlein (Ahrnklin River) which means "big country (of the animals)" (Thornton 2012:23).

Nearly continuous old-growth spruce and hemlock forests (except for recently logged tracts) cover the islands, mainland, and stream valleys of eastern Yakutat Bay as far north as Point Latouche, including the lake- and pond-dotted moraine at the west end of the foreland between Ocean Cape and the base of Mount Tebenkof (Figure 15). Areas south of Logan Bluffs were deglaciated between 1200 CE and 1500 CE, with forest ages of up to 800 years, while areas north of Logan Bluffs were overrun by the 1600–1700 CE readvance of Hubbard Glacier and are covered with trees no older than about 300 years. Forest habitats along the eastern shore of the fiord appear to be less biodiverse than on the Yakutat foreland and are used by Yakutat residents primarily for hunting brown bear, black bear, moose, and deer (Sill et al. 2017). There is only one productive salmon stream in this area, "Humpy Creek" (named for pink or "humpback" salmon), which enters Humpback Cove (Alaska Department of Fish and Game 2005).

In Disenchantment Bay, time since deglaciation is as much as 300 years, but the shores are covered by alder thickets and scattered spruce and balsam poplar trees less than 100 years old, suggesting

FIGURE 32. Seal Creek on the Yakutat foreland, aerial view to the northwest. The foreland is a mosaic of old growth spruce–hemlock forest, lakes, rivers, and muskeg. Image © Patrick Endres, Alaska Photographics.

that ecological succession has been suppressed by low temperatures that prevail year-round in the vicinity of the glaciers. George Ramos said that when his uncle first brought him to Disenchantment Bay for seal hunting in the 1930s it was a “land without trees” (G. Ramos Sr., 11 June 2011, IN-3), and few have grown since then. Other than harbor seals, Disenchantment Bay offers a narrow range of subsistence options including seabird eggs at Haenke (Egg) Island, black bears, and mountain goats (*Oreamnos americanus*).

On the west side of Yakutat Bay, the withdrawal of Malaspina Glacier has been comparatively recent, not occurring until the early twentieth century in most areas. The Malaspina’s broad outwash plain is traversed by numerous shifting, braided watercourses, including Black Glacier stream, Esker Stream, Grand Wash River, and Sudden Stream, where vegetation consists of alders, willows, and other early successional and flood-tolerant species (Figure 33). Stands of mature spruce and hemlock forest are present at Point Manby and around Spoon Lake, where deglaciation took place 700–800 years ago (Figure 34), as well as in the upper Esker Stream drainage and on lower mountain flanks. Old-growth stands are also rooted in organic deposits that have accumulated on stagnant ice along the margins of Malaspina and Atrevida Glaciers.

The Malaspina foreland was traditionally used for berry picking, waterfowl hunting, and trapping of marten, mink, fox (*Alopex lagopus*), and river otter (De Laguna 1972:59–60). Brown bears are abundant, and coho salmon can be netted at the mouths of rivers; however, modern subsistence use of the area is limited. In general, the terrestrial margins on both sides of Yakutat fiord are less productive of subsistence fauna than is the more anciently deglaciated Yakutat foreland east of Lost River, and a primary emphasis on marine food resources characterized ancestral settlements along its shores.

Terrestrial areas in Russell Fiord north of Cape Stoss were not completely free of ice until the late nineteenth century and are covered with vegetation in early successional periods, while the southern end, which was deglaciated in the late eighteenth century, supports stands of old-growth forest (Barclay et al. 2001). Russell Fiord is relatively difficult to access for local residents and sees minimal subsistence use at the present time, limited to occasional trips by boat for harbor seal, black bear, and mountain goat. Because of comparatively recent deglaciation, Russell Fiord was never included within any traditional clan territories, unlike Yakutat fiord and the Yakutat foreland, and has no known archaeological sites.

FIGURE 33. Rock-covered Black Glacier (in the background valley) and its outlet stream on the west side of Yakutat Bay. Rocks and sediment melting out of the glacier have produced a braided, flood-prone delta. Alders and young spruce trees border the stream and more mature trees grow on the lower mountain slopes. Photo © Smithsonian Institution.

FIGURE 34. Spoon Lake on the Malaspina foreland near Point Manby with old-growth spruce and hemlock forest. Deglaciation of this area occurred about 800 years ago. Photo © Smithsonian Institution.

2

People on the Land: History, Culture, And Ecological Knowledge

Indigenous knowledge—historical, cultural, social, technical, ecological, and artistic—connects the past and present of the Yakutat community. Matrilineal clans, allied with each other through intermarriage, mutual support, and ceremonial exchange in the potlatch (*ku.éex*), remain a vital part of social life. Clan histories, symbols, and traditions are learned by rising generations, and a heritage of elegant, functional design is celebrated in the work of contemporary artists. Ecological knowledge of Yakutat fiord and time-honored practices for harvesting, preparing, and sharing wild foods sustain an Indigenous way of life. Each generation applies this endowment of traditional knowledge to the changing circumstances of society, economy, and environment.

YAKUTAT HISTORY

Eyak clans migrated to the Yakutat foreland at the end of the first millennium of the common era and gradually expanded into the fiord as the glaciers withdrew. The original Eyak homeland was Galyáx Kwáan, extending between Icy Bay and the Copper River (Figure 35). *Kwáan* are tribal regions often encompassing the territories of multiple clans (Thornton 2012:3–9). The oldest known Eyak settlement is Diyaaguna.éit, founded at Tawah Creek on the Yakutat foreland in about 900 CE (De Laguna et al. 1964; Davis 1996). Two Eyak settlements were later established at Spoon Lake at the western entrance to the fiord after the area was deglaciated (Crowell 2011a; chapter 4, this volume).

In about 1450–1500 CE, members of a Copper River Ahtna Raven clan called the Gineix Kwáan migrated south across montane glaciers and descended to the coast at Icy Bay, where they were joined members of an Eyak Eagle clan, the Galyáx Kaagwaantaan (Swanton 1909:347–368; De Laguna 1972). The combined Ahtna–Eyak group then moved to Yakutat fiord, arriving at a time when the glacial front had retreated to upper Yakutat Bay. The Gineix Kwáan (later known as the Kwáashk'i Kwáan) traded copper ceremonial items to resident Eyak groups in exchange for land and subsistence rights to all of Yakutat fiord, Icy Bay, and the Yakutat foreland as far east as Lost River, and then built the village of Tlákw.aan on Knight Island in the heart of this territory.

In about 1700 CE, Tlingit clans from the Alexander Archipelago expanded north along the Gulf of Alaska coast toward Yakutat, partly in response to encroachment on their southern territory by the Haida (De Laguna 1990b). A Little Ice Age glacial advance in Glacier Bay during 1700–1770 CE overran Tlingit villages and depressed habitable shorelines along Icy Strait, likely also spurring northward migration (Mann et al. 1998; Connor

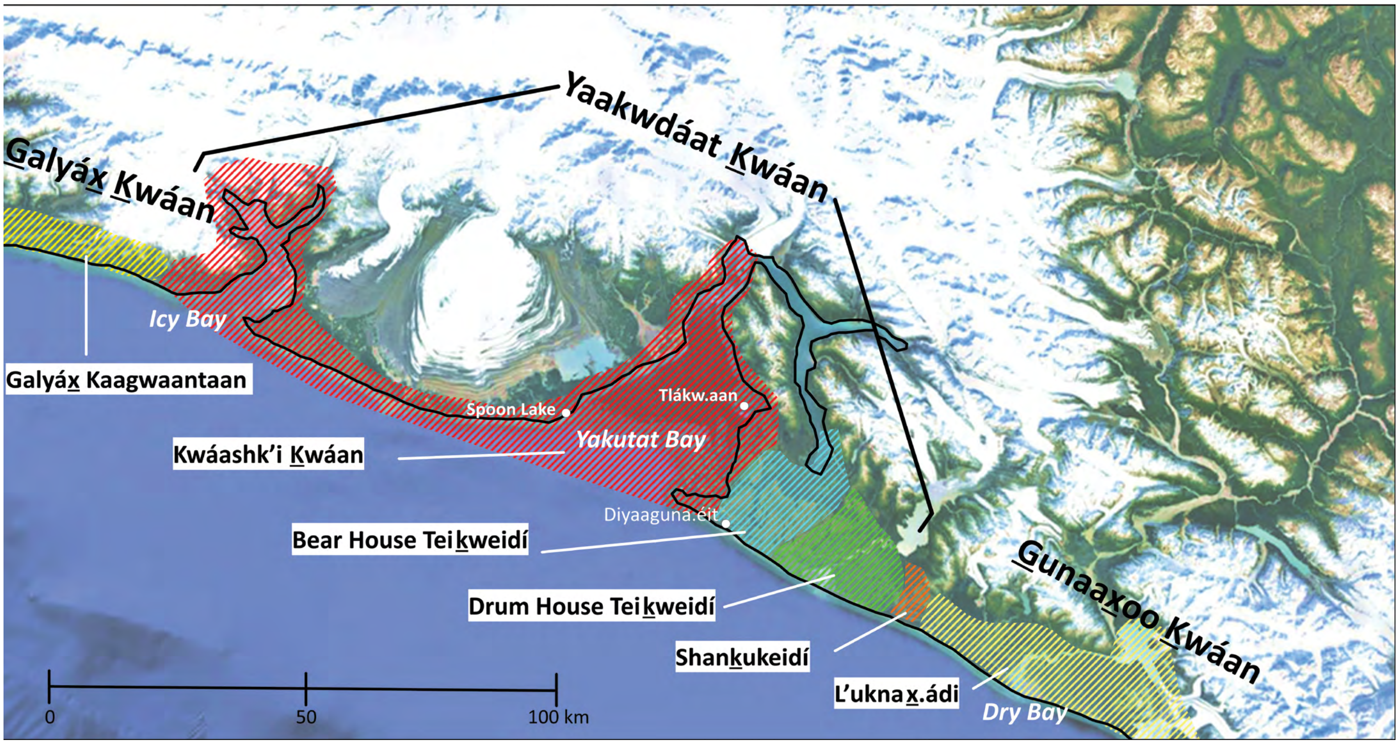

FIGURE 35. Clan territories and *kwáan* regions from west of Icy Bay to Dry Bay. Locations of important early settlements—Diyaaguna.éit, the Spoon Lake sites, and Tlákw.aan—are indicated. © Smithsonian Institution.

et al. 2009; Crowell et al. 2013a). The Tlingit merged socially with their long-established trading partners, the Tutchone Athabascans of Alsek River and Dry Bay, to form the territory of Gunaaxoo Kwáan (Figure 35). Tlingit and Tlingit–Tutchone clans—the L'uknax.ádi, Teikweidí, and Shankukeidí—then moved farther north, seizing Eyak villages and territory on the Yakutat foreland, intermarrying with Eyak and Ahtna residents, and exerting strong cultural and linguistic influence over Yaakwdáat Kwáan, which includes all of the Kwáashk'i Kwáan lands as well as the Yakutat foreland as far east as Italio River (De Laguna 1972).

Russian, European, and American colonialism brought significant changes to Yakutat's Indigenous culture and population, linking the residents to external economies and the market dynamics of the capitalist world system (Crowell 1997). Russian, Spanish, British, and American exploring and fur trading expeditions came to Yakutat during the last decades of the eighteenth century, including the British sea otter trader Dixon in 1787, Russian navigators Izmailov and Bocharof in 1788, and Italian explorer Malaspina for Spain in 1791 (Wagner 1936; Dixon 1968; De Laguna 1972:107–176; Ismailov 1981; Olson 2002; Figure 36). Russian trading vessels were accompanied by kayak fleets of Sugpiat sea otter hunters, and Yakutat oral tradition includes accounts of conflict with these intruders. A Russian fort, part of a network of Alaskan trading outposts established during the Russian colonial period between 1741 and 1867, was constructed near Ankau Lagoon on Ocean Cape in 1795 but destroyed by Yakutat Native residents in 1805 (De Laguna 1972:166–176).

A period of reduced contact with the outside world followed, punctuated by the Alaska smallpox epidemic of 1837–1840, which killed more than 400 Yakutat residents and led to the abandonment of many settlements on the foreland (De Laguna 1972:177). Following the purchase of Alaska from Russia by the United States in 1867, the Alaska Commercial Company began trading for furs from its outposts across southern Alaska (Lee 1996). Sea otters had been overhunted and depleted during the Russian period, but by the 1870s Yakutat residents were market hunting for harbor seals at Disenchantment Bay and trading the skins and oil to the Alaska Commercial Company store at Nuchek in Prince William Sound for guns and factory-made goods (De Laguna et al. 1964:22–23; De Laguna 1972:67–69, 373–377; Crowell 2016; chapter 6, this volume; Figure 37).

The Swedish Free Mission Church and a mission school were established at Yakutat in 1889 (Johnson 2014), and commercial activities including salmon packing, gold mining, and timber cutting were initiated by outside interests, providing employment for some Yakutat residents but also negatively affecting the environment and disrupting the traditional seasonal cycle (De Laguna 1972:180–207). The town of Yakutat

FIGURE 36. Alejandro Malaspina's ships at Port Mulgrave, Yakutat Bay, 1791, are depicted in this engraving entitled "Puerto de Mulgrave y alojamiento de los indios" (Port Mulgrave and accommodation [trade] with the Indians) by José Cardero. Tlingit residents in dugout canoes are shown in the foreground. Open access courtesy of Europeana Digital Archive at https://www.europeana.eu/item/499/https___hispana_mcu_es_lod_oai_larramendi_es_15311_ent0

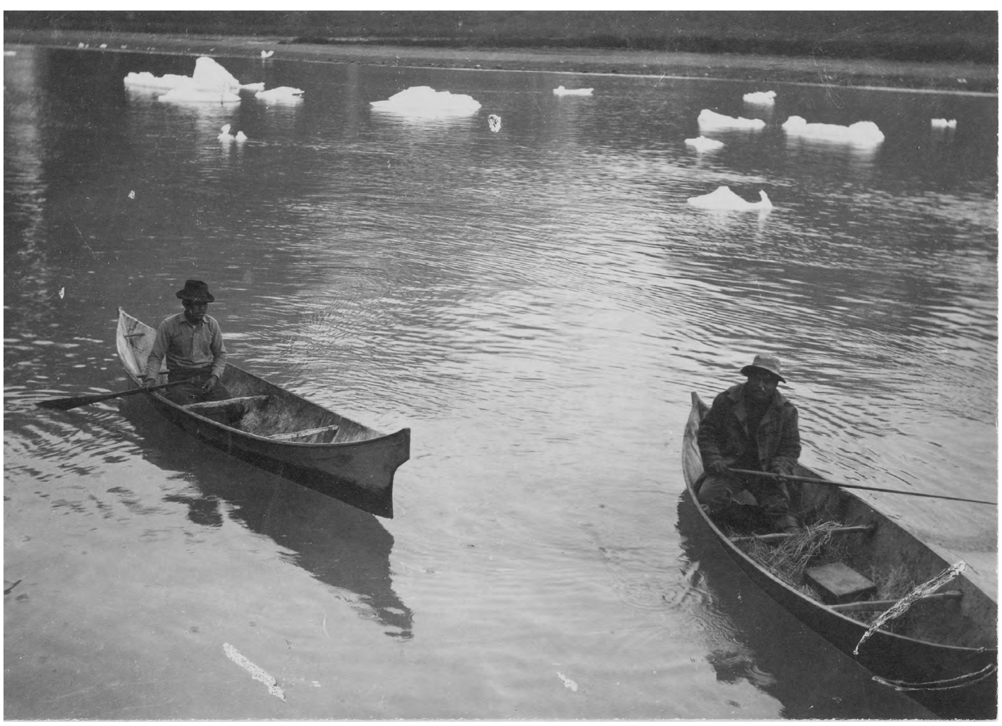

FIGURE 37. Yakutat men in spruce dugout canoes used for hunting harbor seals at Disenchantment Bay, June 1899. Photograph by Edward S. Curtis, Harriman Alaska Expedition. National Museum of the American Indian, Smithsonian Institution P10966.

(Figure 38), located at the head of Monti Bay near the southeastern entrance of the fiord, was founded in 1889 following relocation from the former main village on Khantaak Island. A salmon cannery opened in 1903 and was a key part of the local economy until it closed in 1970. Yakutat was garrisoned and fortified during World War II when a large Air Force landing strip was constructed, still used as the runway of Yakutat airport.

Major transfers of Yakutat traditional lands to the U.S. government occurred with establishment of the Tongass National Forest in 1907 and Wrangell–St. Elias National Park in 1980, which together encompass most of the land around Yakutat and Russell fiords. Under the Alaska National Interest Lands Conservation Act of 1980, these lands are accessible for subsistence activities (Sill et al. 2017). The Alaska Native Claims Settlement Act of 1971 established Sealaska Corporation and Yak-Tat Kwaan as the regional and village-level Alaska Native corporations, respectively. Other important community institutions in Yakutat today include the federally recognized Yakutat Tlingit Tribe and the Alaska Native Brotherhood/Alaska Native Sisterhood. Yakutat's modern economic base includes commercial fishing, tourism, sport fishing and hunting, logging, and retail businesses, combined with the residents' reliance on wild foods.

FIGURE 38. Houses and canoes at Yakutat village, 1899. The town was built in 1889 after residents moved from their former winter village on Khantaak Island. Photograph by Edward S. Curtis, Harriman Alaska Expedition. National Museum of the American Indian, Smithsonian Institution P10947.

HISTORICAL DEMOGRAPHY

The demographic effects of Western contact were devastating. Historical census data indicate that the Yakutat Tlingit population in 1840 was only 150 persons (Veniaminov 1984:182), a very low count taken in the immediate aftermath of the smallpox epidemic. De Laguna estimated that 400 people died in the epidemic, suggesting a precontact population in the mid-500s, a range that is supported by archaeological data (chapter 6, this volume). Estimates—which varied in quality and coverage— of the subsequent Yakutat Tlingit population were 380 in 1861 (Petroff 1884:38); 250 in 1874 (Dall 1877:37); 300 in 1880 (Petroff 1884:32); 345 in 1890 (U.S. Bureau of the Census 1893:158); 247 in 1900 (U.S. Bureau of the Census 1901:426); 271 in 1910 (U.S. Bureau of the Census 1913:573); and 165 in 1920 (U.S. Bureau of the Census 1921:681). The apparent low point of the twentieth century was 1920, in part because of tuberculosis that raged through Southeast Alaska in the late nineteenth and early twentieth centuries (Fortuine 1989:260–261). Numbers recovered gradually, and by 2010 the population of Yakutat City and Borough was 662, about half of whom were Alaska Native. These data indicate that by the early twenty-first century the Indigenous population had regained about 60% of its estimated size before Western contact.

YAKUTAT CLANS AND TERRITORIES

Yakutat's Indigenous residents identify primarily as Tlingit while honoring Eyak and Ahtna strands of their heritage and ancestry. Cultural identity is shaped by membership in matrilineal clans (sibs) belonging to two exogamous moieties, Raven and Eagle/Wolf, which are equivalent to the Raven (or Crow)–Eagle division among the Eyak and Raven–Seagull division among the Ahtna (De Laguna 1990a). Clans belonging to opposite moieties are bound to each other by intermarriage and by reciprocal social and ceremonial obligations (Olson 1967; De Laguna 1972, 1990b; Emmons 1991; Deur et al. 2015). Possession by the Eyak, Ahtna, and Tlingit of parallel systems of kinship and marriage enabled the three groups to amalgamate into a unified Yakutat society despite initial conflicts. Cultural dominance exerted by the Tlingit over other groups led De Laguna to characterize the historic Eyak population from Yakutat to Controller Bay as having been "Tlingitized," and language capture by Lingit (the Tlingit language) led to the eventual extinction of the Eyak and Ahtna languages at Yakutat (De Laguna 1972, 1990a; Deur et al. 2015:25–26).

The principal clans of contemporary Yakutat are the Kwáashk'i K̲wáan (Ahtna, Raven moiety), L'uknax̲.ádi (Tlingit–Tutchone, Raven moiety), G̲alyáx̲ Kaagwaantaan (Eyak, Eagle moiety), Teik̲weidí (Tlingit, Eagle moiety), and Shank̲ukeidí (Tlingit, Eagle moiety; Table 3). Yakutat matrilineal clans (*naa*) are divided into houses (*hít*) whose members traditionally occupied one or several large winter dwellings together with affinal relatives from clans of the opposite moiety and who cooperated in all aspects of food production, household economy,

TABLE 3. Principal clans and houses of Yakutat (adapted from Deur et al. 2015: table 2).

Clan	House	House Translation
	RAVEN MOIETY	
L'uknax̲.ádi (Children of L'ukanax̲)	Shaa Hít	Mountain House (for Mount Fairweather)
	Daginaa Hít	Far Out in the Sea House
	Eech Hít 1	Reef House 1
	Eech Hít 2	Reef House 2 (at Situk River)
Kwáashk'i K̲wáan (Gineix̲ K̲wáan) (People of Kwáashk', Humpback Creek [from Eyak], or People of Ginéix̲)	Aanyuwaa Hít	In Front of Town House
	Tsisk'w Hít	Owl House
	Dís Hít	Moon House
	Yéil S'aagi Hít	Raven's Bones House
	Noow Hít	Fort House
	Shaa Hít	Mountain House (for Mount St. Elias)
	EAGLE/WOLF MOIETY	
G̲alyáx̲ Kaagwaantaan (Charred House People)	Gooch Xaay Hít	Wolf Steam Bath House
Teik̲weidí (People of Teik̲ [a bay])	Xeitl Hít	Thunderbird House 2
	Gijook Hít	Golden Eagle House
	Gaaw Hít	Drum House
	K'atxaan Hít	Man Who Acted Like a Woman House
	Tóos' Hít	Shark House
	Xóots Hít	Brown Bear House
Shank̲ukeidí or Dagisdinaa ("People of Dagis" or Dageis [a river or channel])	Xeitl Hít	Thunderbird House 2

and ceremonial life. The five clans, which originated from several ethnolinguistic groups (Eyak, Ahtna, Tlingit, and Tutchone) together constitute the people of Yaakwdáat K̲wáan (Figure 35), a consolidated unit of social geography that reflects the historical process of lineage-based articulation between these Na-Dene peoples. Ancestral ties to adjacent G̲unaax̲oo K̲wáan (Dry Bay and Alsek River) and G̲alyáx̲ K̲wáan (the coast from Icy Bay to Controller Bay) are culturally recognized and preserved in oral tradition (Thornton 2012:3–9).

Traditional society was further structured by rank, with a privileged and wealthy elite including clan leaders ("chiefs") and their close relatives; commoners, who were more distant relatives within the lineage; and enslaved people, who were acquired as war captives or in trade. Some individuals were socially esteemed for their accomplishments as healers, master carvers, weavers, and canoe builders (De Laguna 1972, 1990b; Emmons 1991; Deur et al. 2015). Enslaved people, who performed much of the manual labor in Tlingit society, made up a substantial proportion of the population, possibly as high as one-third in some areas, with wealthy chiefs owning as many as 30 individuals (Niblack 1890; Krause 1956; De Laguna 1972, 1990b; Emmons 1991). At Yakutat, a census taken late in the Russian period (1861) enumerated 25 men and 24 women held in slavery out of a total population of 380, or about 13% (Petroff 1884:38).

Prior to modern state and federal land acquisitions, the five Yakutat clans held customary title to local territories claimed through settlement, purchase, or conquest, with rights to take fish, game, plants, timber, water, and other resources from these lands. Leaders of clans and major sublineages (e.g., the Bear and Drum houses of the Teik̲weidí) managed land and resources by allocating labor for harvesting and processing, setting catch limits, declaring the openings and closings of fishing and hunting seasons, assigning hunting grounds to non-clan relatives (e.g., sons, brothers-in-law, grandsons), and maintaining cooperative relationships with other clans as well as external Tlingit, Eyak, Tsimshian, and Tutchone trading partners. Prominent Yakutat chiefs such as Yaa X̲ooda Keit (Kwáashk'i K̲wáan, nineteenth century) and Xatgawet (Teik̲weidí, eighteenth century) were "big men" who played significant roles in the social economy and in orchestrating human interaction with the ecosystem (De Laguna 1972).

Clans hold exclusive rights to *at.óow*—images (crests or totems) of animals, glaciers, mountains, and other spirit beings that symbolize their origin, history, and territories. Clans have proprietary rights to ceremonial regalia and objects that depict *at.óow* (Figures 39–41) and to intangible properties including ancestral songs, dances, and oral traditions. Memorial ceremonies (Tlingit *ku.éex*, potlatch), which are held a year or more after a death in the community, are complex ritual feasts hosted by the clan of the deceased to honor lineage ancestors, celebrate the departed person, and repay clans of the opposite moiety with food and gifts for their help with the funeral and for assistance to grieving relatives. Additional ceremonial purposes were traditionally served by the *ku.éex*, including the bestowal of names and noble titles and the dedication of new clan houses (De Laguna 1972:610–651).

The host clan of a *ku.éex* displays its treasured crest objects and regalia, performs sacred songs and dances, and retells its history, publicly validating ancestral heritage and land ownership with members of the opposite moiety as witnesses (Figure 42). *Ku.éex* are still regularly given at Yakutat, including a ceremony hosted by the Kwáashk'i K̲wáan Owl House in 2014, although the era of lavish, multiday potlatches hosted by wealthy chiefs ended in the early twentieth century. In its traditional form the memorial potlatch could require many months or years of preparation, and the largess of host leaders enhanced their social prestige through redistribution of resources to the community. To this day the Tlingit *ku.éex* is a means of maintaining balanced social and economic relations between clans (Worl 2010).

Judith Ramos commented on the enduring social importance of clans and the belief that ancestors are reborn in each generation:

> Living in Yakutat, you are related to everyone in the community, either through marriage or blood. Everyone's related through the clan system. Growing up, people would recognize me as someone who was born long ago and reincarnated, and when my children were born, they would recognize them based on the names that they were given through the clan system. When we relate to someone, it's not only contemporary but also based on clan history—who they're reincarnated from, and who they're related to. So, it's a very different world; it's kind of a world that is traditional, yet modern. (J. Ramos, 29 July 2014, IN-48)

FIGURE 39. This nineteenth century spruce root hat of the Yakutat Bear House Teik̲weidí is painted with a Killer Whale design and crowned with six potlatch cylinders, three of wood and three of copper over wood. Courtesy of the Portland Art Museum, Portland, Oregon (PAM 48.3.597, height 43 cm). Unknown Tlingit artist. Rasmussen Collection of Northwest Coast Indian Art.

FIGURE 40. Chilkat style coat, circa 1885, woven from dyed mountain goat wool with Teik̲weidí crest designs representing the Brown Bear. The neck and sides are edged with river otter fur. Courtesy of the Portland Art Museum, Portland, Oregon (PAM 48.3.548, height 86 cm). Mrs. Benson, Tlingit artist, active late nineteenth century. Rasmussen Collection of Northwest Coast Indian Art.

FIGURE 41. Wooden box drum painted with a design representing an Owl, a crest of the Kwáashk'i Kwáan Owl House. The eyes are inlaid with abalone shell. Purchased for George Heye at Yakutat in 1938. National Museum of the American Indian (NMAI), Smithsonian Institution 19/9099. Photo by NMAI Photo Services.

FIGURE 42. Yakutat and Sitka Tlingit in ceremonial regalia, photographed at a regional potlatch in Sitka, 9 December 1904. The majority are L'uknax̲.ádi and display clan emblems depicting Raven, Killer Whale, and Frog; others are Kwáashk'i K̲wáan and Teik̲weidí. The attire includes fur hats trimmed with beads and feathers, nose rings, nose pins, an ermine jacket, jackets and shirts beaded with clan crests, button blankets, a Chilkat blanket, and dance bags. Two men at the back of the group hold song leaders' poles, and Qex̲ix̲, the L'uknax̲.ádi chief of Sitka Whale House, crouches in front wearing a wooden Raven crest hat with two potlatch rings. For full details and identifications of individuals, see De Laguna 1972: pl. 210. Alaska State Library, Case and Draper Photograph Collection (1898–1920), P39-0786.

BUILT ENVIRONMENT

Houses, storage facilities, smokehouses, fish weirs, and other structures constituted the traditional built environment of the Yakutat people and were critical components of environmental adaptation. Winter clan houses of the Eyak (Birket-Smith and De Laguna 1938:32–3; De Laguna 1990b:181; Davis 1996:210–309) and Ahtna (Allen 1887:130; Shinkwin 1979:40–50; De Laguna and McClellan 1981:645; Ketz 1983:145–149) were 5–10 m long with a subterranean floor, a central hearth, a smoke vent in the roof overhead, packed earth or wooden sleeping platforms, and a bark-covered roof supported by beams and a single (Eyak) or double (Ahtna) ridge pole.

Traditional Tlingit lineage houses were 6–18 m long, accommodating 50 people or more (Seton Karr 1887:156–157; Russell 1891:79–80; De Laguna 1972:294–299, 1990b:207–208; Emmons 1991:59–68). The house had vertical or horizontally planked walls, a gabled roof covered with spruce planks, and stout house posts—often carved with lineage crests—that supported the heavy roof beams. The fronts of many houses were painted with crest designs, and crest poles with carved figures representing lineage history were erected outside (Figure 43).

FIGURE 43. Tlingit Bear House at Gaash (Cape Fox) village near Ketchikan, Alaska, with memorial poles. Photograph by Edward S. Curtis, Harriman Alaska Expedition, July 1899. Bancroft Library, University of California Berkeley, C. Hart Merriam Collection Misc-P10 Vol. 44 No. 10. Courtesy of the Bancroft Library.

The interior was excavated up to 4 m below ground level, and the central floor with its hearth, overhead smoke vent, and work areas was surrounded by stepped seating and sleeping platforms that were partitioned into family apartments (Figure 44). Positioning on the platforms was allocated by rank, with the house leader and immediate family occupying the far end of the house, commoners along the walls, and enslaved people near the entrance. In some of the most artistically elaborate southern Tlingit houses a carved screen displaying crest emblems separated the house leader's apartment from the rest of the interior space (Figure 45).

Other village constructions included rectangular shed caches with sunken floors and plank walls, used for storing preserved food and supplies; wood-planked smoke houses; small sheds for steam bathing; and isolation huts for menstruating women. At ancestral village sites clusters of house pits are typically surrounded by the imprints of these smaller structures, reflecting the settled way of life during winter when the entire community was in residence and living on the preserved harvests of warmer months.

Temporary structures were built at hunting and fishing camps, including bark-covered huts (Figure 46) used as smokehouses at the Disenchantment Bay sealing camps (De Laguna 1972:294–315).

Some Tlingit villages were built on high defensible rocks or islands and enclosed by log palisades or stone walls for protection against raids by other tribal groups (De Laguna 1972:580–592; Emmons 1991:324–358; Moss and Erlandson 1992; Crowell and Howell 2013). One such location in Yakutat Bay is Noowk' ("little fort"), a fortified settlement on an islet adjacent to Knight Island that according to oral tradition was used as a wartime refuge by the residents of Tlákw.aan (De Laguna et al. 1964:22). Another is Diyaaguna.éit on the Yakutat foreland, which was surrounded by a palisade during its Tlingit period of occupation (De Laguna 1972:76–77).

INDIGENOUS TECHNOLOGY

Yakutat was home to an unusual variety of traditional watercraft due to its situation at a crossroads between Inuit and Na-Dene cultures (De Laguna 1972:330–346; Emmons 1991:84–98). These craft included large, sealskin-covered *umiaks* and one- and two-person *kayaks* brought to Yakutat by the Eyak but originally of Sugpiat (Inuit) design. There were wooden dugout canoes of several types, including the fork-prow canoe used for sea mammal hunting in open water (Figure 37); an older style (*goodi.yee*) with a projecting ice bumper, used for hunting seals near the glaciers; and the general-purpose Tlingit "spruce canoe" (or round-bottom canoe) used for fishing. A twentieth century style was the flat-bottomed "plank canoe" used for sealing at Disenchantment Bay, which had a squared-off stern for mounting a small outboard motor but was paddled when hunting in the ice (T. Valle, 12 June 2011, IN-7; G. Ramos, 19 June 2012, IN-18; S. Nelson, 21 June 2012, IN-25). The use of canoes in seal hunting is discussed in chapter 3.

Larger dugout canoes (Figures 36, 38) were used for ocean travel and transport, including Haida "war canoes" that could carry up to 30 passengers and considerable quantities of freight (Crowell et al. 2010:204). Such boats were capable of long sea voyages to and from Prince William Sound, the Copper River, the Alexander Archipelago, and the Queen Charlotte Islands, enabling trade and interaction between the Yakutat community and other Indigenous peoples and Western traders. Tlingit hunters from Southeast Alaska and Tsimshian from British Columbia traveled in Haida-style canoes to Yakutat fiord for harbor seal and sea otter hunting during the eighteenth to nineteenth century commercial fur trade era.

FIGURE 44. Interior of Tlingit house at Sitka, Alaska, circa 1885. Family living areas are on the raised platforms surrounding the central hearth. Anchorage Museum B97.12.33.

The principal traditional weapon for hunting seals and other sea mammals was a handheld harpoon with a long wooden shaft and a detachable barbed bone head, connected by a leather line to a float made from an inflated sealskin or stomach (Harrington 1940; De Laguna 1972:376–77; Emmons 1991:121–123; Figure 47). Heavy wood or bone clubs were used to kill seals once they had been retrieved to the canoe (Figure 48). Even after muskets and rifles became available, seal hunters used harpoons to strike and secure animals to prevent them from sinking once they had been shot.

Sea otters were taken by surrounding the animal in a circle of canoes and hitting it with barbed harpoon-arrows (Figure 49) shot from bows and carried in wooden quivers (Figure 50; De Laguna 1972:378–381; Emmons 1991:122–127). Spears were employed for hunting bears in their dens; arrows tipped with slate blades, bone slivers, or barbed bone heads were used against land animals and birds; traps and deadfalls were used to capture weasels, foxes, lynx, wolverines, and bears; and snares were made for foxes, wolves, and ptarmigan (De Laguna 1972:367–373; Emmons 1991:127–139).

Fishing utilized diverse equipment, techniques, and facilities (Harrington 1940; De Laguna 1972:381–391; Emmons 1991:102–121). Salmon were one of the most important food sources and were caught and dried in mass quantities for winter consumption. Spawning Chinook, sockeye, pink, and coho salmon enter the rivers in sequence from April through October and were taken with fish harpoons and gaff hooks as the fish schooled below barricades built across the watercourses. Cylindrical basket traps made of spruce rods were set in smaller streams for salmon and eulachon, and large box traps made of wooden stakes were constructed in rivers, their mouths flanked by bank-to-bank weirs. An example of the latter type was found in 1997 at the Lost River, consisting of a box frame about 2 m wide and wooden stakes that extend across the river (heritage site YAK-079, Alaska Heritage Resources Survey; Alaska Department of Natural Resources 2023).

Stone tidal weirs placed across the mouths of streams were another type of trap, designed so that salmon passed over the top of the rock wall when the tide was high but were blocked behind it as the water receded. Gear used for other types of fish included rakes with pointed teeth used to scoop up herring; dip nets for eulachon; bone hooks for cod; and V-shaped wooden halibut hooks rigged with stone sinkers, kelp lines, and seal stomach floats (Figure 51). Cut spruce boughs were placed in

FIGURE 45. Interior of the Whale House at Klukwan in 1894, showing the house screen, carved posts, and clan regalia. University of Washington Libraries, Special Collections, UWA-NA 3073.

FIGURE 46. Bark-covered smokehouse at K̲eik'uliyáa sealing camp in Disenchantment Bay. The pole-framed structure is roofed with spruce bark; harbor seal skins stretched on frames have been placed on the roof and against the front. Photograph by Edward S. Curtis, Harriman Alaska Expedition, June 1899. National Museum of the American Indian, Smithsonian Institution P10972.

FIGURE 47. Yakutat Tlingit seal hunters in dugout canoe, 1896. The standing man holds a harpoon about 3.5 m long, tipped with a barbed bone point. Photographer N. B. Miller. University of Washington Libraries, Special Collections, PH Coll 595.14; negative NA3061.

FIGURE 48. A club used for killing seals on land or after they were harpooned from a canoe. The carved designs depict a sharp-toothed animal with a long tongue (possibly a sea lion) and a killer whale. From Sitka, 1905. National Museum of the American Indian, Smithsonian Institution 004601.000. Photo by NMAI Photo Services.

herring spawning areas so the fish would deposit eggs on them, an important subsistence food.

Containers for storing, serving, and cooking foods included water-tight baskets woven of split spruce roots (Figure 52) and bentwood bowls and storage boxes made by shaving and scarfing a plank of cedar wood, softening it by boiling, bending it into a rectangle to form the sides of the box, and adding a separately carved bottom (Figure 53). Foods were boiled in baskets or boxes by adding hot stones handled with wooden tongs, and serving spoons were carved from wood and mountain goat horn. Large, decorated bentwood boxes and chests were made for storing clothing and ceremonial regalia. Everyday tools included adzes and crooked knives for carving wood; knives with iron or copper blades; and scrapers made of stone, copper, or shell. The semilunar knife with a stone or copper blade was the favored tool for flensing blubber from seal hides, with the hide placed on a wooden cutting board (Figure 54).

Women scraped and tanned harbor seal and other animal hides and tailored clothing including shirts, pants, hoodless parkas, boots, moccasins, socks, hats, and mittens. They also made feathered parkas of eagle and swan skins, fur capes and jackets of sea otter, wolf, beaver, bear, and marten pelts, and waterproof jackets of bear intestine. Conical hats for everyday use were twined from split spruce roots. Ceremonial clothing and dance regalia (Figures 39, 40, 42) were finely sewn and ornamented with clan symbols, including painted spruce root hats topped with woven cylinders; beaded shirts, moccasins, vests, and bags; beaded and button blankets made of trade cloth; and Chilkat-style blankets woven from mountain goat hair (De Laguna 1972:432–439; Emmons 1992:224–233).

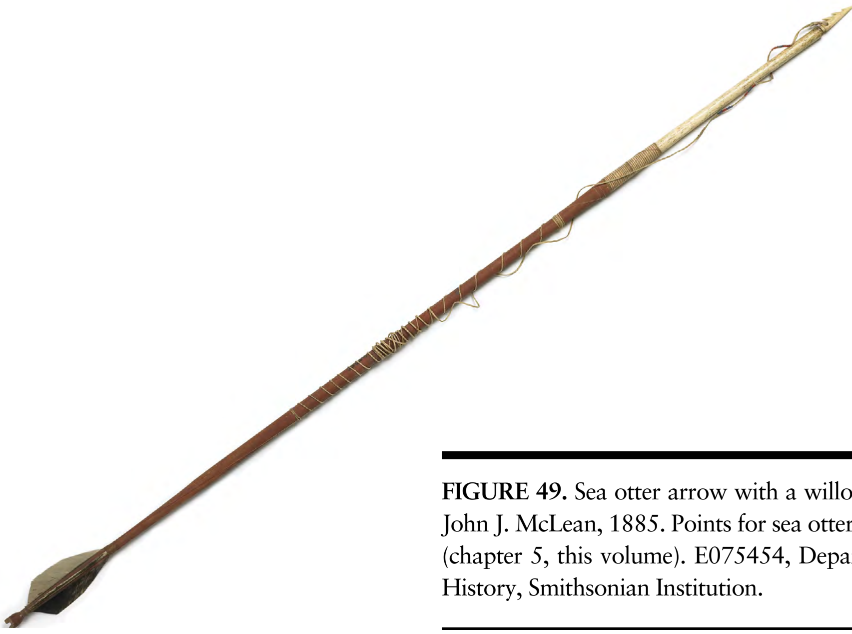

FIGURE 49. Sea otter arrow with a willow shaft and barbed bone point, collected at Yakutat by John J. McLean, 1885. Points for sea otter arrows were found at the Tlákw.aan archaeological site (chapter 5, this volume). E075454, Department of Anthropology, National Museum of Natural History, Smithsonian Institution.

FIGURE 50. Quiver carved from red cedar to hold sea otter arrows, Southeast Alaska (probably Yakutat), accessioned 1917, D. F. Tozier Collection. National Museum of the American Indian, Smithsonian Institution 069007.000. Photo by NMAI Photo Services.

TRADITIONAL SUBSISTENCE AND SEASONAL ROUND

The Yakutat seasonal round of hunting, fishing, intertidal collecting, and forest gathering in the late nineteenth to early twentieth century, by then already modified through accommodation to the commercial fur, salmon, and seal industries and the availability of firearms, may be summarized from oral historical testimony (Harrington 1940; De Laguna 1972:360–391; Goldschmidt and Haas 1998) and interviews conducted for this study. George Ramos Sr. said, "All of our life is based on a time schedule of animals and plants that provide food" (G. Ramos Sr., 11 June 2011, IN-3). The traditional subsistence schedule followed the availability of animal and plant resources at different times and places within the greater fiord environment, paired with a settlement pattern composed of villages occupied during the winter months by most members of the *hít* (lineage houses) and seasonal hunting and fishing camps within the clan's surrounding territory. The production cycle was divided into the spring–summer–fall period of intensive resource harvesting and the winter period when relatively little hunting or fishing took place and stocks of preserved foods were consumed.

During the months of heavy snow (November through January) most people lived at villages on the Yakutat foreland and at Khantaak Island and, after 1889, at the town of Yakutat in Monti Bay. They worked at indoor tasks including the manufacture of clothing, tools, hunting equipment, boxes, spruce-root baskets, beadwork, and other domestic and trade items and subsisted on dried fish, smoked meat, seal oil, berries, roots, and other preserved foods. Some of the men went hunting for seals at the mouth of the Situk River or in Yakutat Bay, killed hibernating bears in their dens with spears, or wintered in camps on the foreland to trap minks, river otters, weasels, and wolves by use of snares and deadfalls or imported steel traps (De Laguna

FIGURE 51. Two-piece wooden halibut hooks baited with octopus were rigged between a stone sinker and a wooden buoy or inflated seal stomach so they would float just above the ocean floor where halibut feed. A human or animal image faced downward to entice the fish to slip its mouth into the V-shaped opening. This hook has an iron barb; examples of bone barbs were found at the Tlákw.aan archaeological site (chapter 5, this volume). Hook collected at Angoon, Alaska, by George T. Emmons in the late nineteenth century. National Museum of the American Indian, Smithsonian Institution 149612.000. Photo by NMAI Photo Services.

1972:360–391; E. Abraham, 11 June 2011, IN-2 and16 June 2012, IN-13A; L. Farkas, 11 June 2011, IN-4; R. Sensmeier, 18 June 2012, IN-16). Winter was also the primary season for potlatches and feasts, and for steam bathing.

Subsistence activities increased in late winter and early spring (February–March), when men paddled to Icy Bay for sea otters and women dug the edible roots of Kamchatka lilies, lupine, and other plants, scraped the edible inner bark (cambium) of spruce trees, and gathered clams and cockles (L. Farkas, 11 June 2011, IN-4). Families netted spawning eulachon at Dry Bay and the Situk River (L. Farkas 11 June 2011, IN-4), gutting and stringing them on alder branches to cure in a smokehouse or extracting their oil by fermenting them in a canoe (E. Abraham, 17 June 2012, IN-13B).

In late spring (April–May) many families moved up the fiord to camps at Knight Island, Eleanor Cove, and Chicago Harbor, where they fished for halibut, harvested herring eggs on spruce boughs placed in the water, caught spring-run Chinook salmon in the bay, hunted black and brown bears as they emerged from their dens, and gathered hemlock bark, roots, seaweed, sea urchins, shellfish, and wild celery (De Laguna 1972:360–391; E. Abraham, 11 June 2011, IN-2 and16 June 2012, IN-13A; L. Farkas, 11 June 2011, IN-4; R. Sensmeier, 18 June 2012, IN-16). Yakutat elders said that the area around Knight Island, Chicago Harbor, and Humpback Creek was where "every resource that you needed" was available in spring (the "ice-box" area discussed above in Marine Ecosystem), and that stores of foods were cached at the camps for later transport back to town after the sealing season (E. Abraham, 17 June 2012, IN-13B). By early May harbor seals were moving into Yakutat fiord from their main wintering grounds along the foreland coast and could be shot at Ocean Cape, and by late May they were at the ice floe rookery in Disenchantment Bay.

At the end of May or in early June nearly the entire Yakutat population went by canoe to the Kwáashk'i K̲wáan sealing camps in Disenchantment Bay where they hunted through July, a pattern that prevailed from the mid-nineteenth century until the early 1900s (chapter 3, this volume). Many families then moved in August to Teik̲weidí salmon fishing camps on the Lost, Situk, Ahrnklin, and other foreland rivers where they caught and put up fish until the last coho salmon runs were finished in October (L. Farkas, 11 June 2011, IN-4; E. Abraham, 27 June 2013, IN-28). After the Yakutat salmon cannery opened in 1904 much of the population engaged in commercial fishing using gill nets and beach seines, starting at Dry Bay in mid-May and on the Situk, Ankau, and Lost rivers in June, lasting until September or October. Although the full range of traditional subsistence activities was curtailed by participation in commercial fishing, many families still went to Disenchantment Bay in May or June for a few weeks of seal hunting, halibut fishing, collecting bird eggs, and bear hunting before moving to the Situk River camps.

FIGURE 52. A Tlingit storage basket twined from split spruce roots with a "blanket border" pattern of light-colored grass and dark maidenhair fern (Crowell et al. 2010:207). Northern Tlingit communities were renowned for tightly woven, watertight baskets that could be used for boiling liquids by adding hot stones. Southeast Alaska (possibly Yakutat), 1927. National Museum of the American Indian, Smithsonian Institution 156615.000. Photo by NMAI Photo Services.

CONTEMPORARY SUBSISTENCE AND ECOLOGICAL KNOWLEDGE

As in the past, seasonal and spatial patterns of the contemporary wild food harvest correlate closely with the biogeography of the fiord, manifesting extensive ecological knowledge that is of immense practical value. There is widespread sharing of the subsistence effort and exchange of foods between families, continuing ancestral patterns of inter- and intra-clan cooperation.

A comprehensive household survey of Yakutat subsistence was conducted in 2015 by the Alaska Department of Fish and Game (ADFG), Division of Subsistence (Sill et al. 2017), building on similar studies in 1984 (Mills and Firman 1986), 1987 (Alaska Department of Fish and Game 1987), and 2001 (Alaska Department of Fish and Game 2001). These efforts were coordinated through the Yakutat Tlingit Tribe and employed local researchers and interviewers. In 2015, the Yakutat population was 592 (a decline from 662 in 2010), of which 59% (349) were Alaska Native. No distinction was made in the ADFG surveys between Alaska Native and non-Native households because all Yakutat residents are eligible for State of Alaska subsistence fishing and hunting permits and have equal priority for harvesting activities on federal lands, including Wrangell–St. Elias National Park and Tongass National Forest. However, under the federal Marine Mammal Protection Act only Alaska Natives can hunt sea mammals, including harbor seals (Sill et al. 2017).

Species and Quantities Harvested

In 2015, Yakutat residents harvested an estimated 293 kg (646 lb) of wild foods per household and 118 kg (262 lb) per person (Sill et al. 2017: table 1.7), a large amount although

FIGURE 53. A bentwood bowl used for storing and serving berries, fish, seal grease, and other foods (Crowell et al. 2010:206). Hot stones could be added to cook the contents. The ends of the bowl are sculpted with bird faces resembling a raven and owl, with wing designs extending along both sides. Southeast Alaska, 1920. National Museum of the American Indian, Smithsonian Institution 099857.000. Photo by NMAI Photo Services.

FIGURE 54. Jennie Abraham (identified by her granddaughter Elaine Abraham) using a *wéiksh* (semilunar knife) to flense blubber from a seal hide at K̲eik'uliyáa sealing camp in Disenchantment Bay. Photograph Edward S. Curtis, Harriman Alaska Expedition, June 1899. National Museum of the American Indian, Smithsonian Institution P10975.

substantially lower than in 1984–1985, when totals were 502 kg (1,107 lb) per household and 167 kg (369 lb) per person (Mills and Firman 1986: appendix D). Sharing of subsistence foods between households was extensive in 2015, with nearly every household (99%) using at least one wild resource, 87% giving away one or more resources, and 97% receiving resources from another family (Sill et al. 2017:52).

The community harvest total in 2015 was 70,296 kg (154,977 lb) of edible weight from over 100 animal and plant species (Table 4). The dominant categories were salmon, including sockeye, coho, Chinook, and pink (35% of the total harvest by weight); other fish including halibut, eulachon, herring, herring roe on branches, black rockfish, yelloweye rockfish, and sablefish (black cod) (18%); large land mammals including moose, Sitka deer, and black bear (18%); and harbor seal, the only marine mammal harvested for food (12%). Other resource categories contributed lesser amounts, including 9% from berries, seaweed, and other plants; 5% from shellfish, octopus, crabs, and other marine invertebrates; 2% from birds and eggs; and 1% from small land mammals.

These proportions reflect a greater emphasis on large land mammals than in the past, particularly moose, which was the most important single species by weight in 2015. Moose extended their range to Yakutat in the 1920s and 1930s, reportedly arriving via the Alsek River valley, and have greatly increased in number since then (R. Sensmeier 18 June 2012, IN-16 and 26 May 2014, IN-53). Sitka deer, apparently endemic at Yakutat based on archaeofaunal data, also increased during the twentieth century and became a leading food source. On the other hand, mountain goats and brown bears, which formerly were important food species, now receive little hunting effort.

Marine mammal use has also declined in recent decades. The harbor seal population dropped sharply during the 1960s–1970s, leading to a Gulf of Alaska-wide reduction in seal consumption (Crowell 2020). Seal usage continues to go down at Yakutat, from 640 seals taken in 1996 to 115 in 2008, an 82% reduction (Wolfe et al. 2009). Other sea mammals that contributed to the ancestral diet, including fur seals and harbor porpoises, are no longer hunted, and sea otters, which are currently undergoing rapid population growth, are harvested only for their furs (J. James, 22 May 2014, IN-45). The contemporary seasonal round was described by community members in 2015:

> Eulachon (locally called "hooligan") is one of the first fish species to arrive in the spring, usually sometime between February and May, and usually heading to either the Situk or Alsek rivers. Eulachon are an important fish to area residents. Pacific herring return a little after the eulachon and residents can set out hemlock branches around the islands to harvest the Pacific herring spawn (eggs). By May and June, salmonberries are starting to ripen as fiddlehead ferns and spruce tips become prime for picking throughout the area. Berries and plants continue blooming and ripening and residents engage in picking throughout the summer and into the fall for foods like mushrooms or highbush cranberries. Seaweeds are harvested toward the end of spring or beginning of summer. Harbor seals and sea otters are harvested throughout the year, but springtime and fall are popular hunting seasons. Chinook salmon fishing begins in earnest in the spring and will last through the summer. Chinook salmon are caught in nets in Yakutat Bay during the summer, but

TABLE 4. Subsistence species harvested by Yakutat households in 2015 (from Sill et al. 2017: table 1.1).

Resource	Scientific Name[a]
FISH	
Chum salmon	*Oncorhynchus keta*
Coho salmon	*Oncorhynchus kisutch*
Chinook salmon	*Oncorhynchus tshawytscha*
Pink salmon	*Oncorhynchus gorbuscha*
Sockeye salmon	*Oncorhynchus nerka*
Pacific herring	*Clupea pallasii*
Pacific herring roe	*Clupea pallasii*
Pacific herring spawn on kelp	*Clupea pallasii*
Pacific herring spawn on hair seaweed	*Clupea pallasii*
Pacific herring roe on hemlock branches	*Clupea pallasii*
Eulachon (hooligan, candlefish)	*Thaleichthys pacificus*
Pacific (gray) cod	*Gadus macrocephalus*
Lingcod	*Ophiodon elongatus*
Rock greenling	*Hexagrammos lagocephalus*
Pacific halibut	*Hippoglossus stenolepis*
Black rockfish	*Sebastes melanops*
Yelloweye rockfish	*Sebastes ruberrimus*
Dusky rockfish	*Sebastes ciliates*
Copper rockfish	*Sebastes caurinus*
China rockfish	*Sebastes nebulosus*
Sablefish (black cod)	*Anoplopoma fimbri*
Unknown sculpin	Not determined
Dolly Varden	*Salvelinus malma*
Cutthroat trout	*Oncorhynchus clarkii*
Rainbow trout	*Oncorhynchus mykiss*
Steelhead	*Oncorhynchus mykiss*
SEA MAMMALS	
Harbor seal	*Phoca vitulina*
Harbor seal oil	*Phoca vitulina*
Fur seal	*Callorhinus ursinus*
Sea otter	*Enhydra lutris*
LAND MAMMALS	
Black bear	*Ursus americanus*
Brown bear	*Ursus arctos*
Sitka deer	*Odocoileus hemionus*
Mountain goat	*Oreamnos americanus*
Moose	*Alces alces*
Beaver	*Castor canadensis*
Coyote	*Canis latrans*
Snowshoe hare	*Lepus americanus*
Land (river) otter	*Lontra canadensis*
Lynx	*Lynx canadensis*
Marten	*Martes* spp.
Mink	*Neovison vison*
Red (tree) squirrel	*Tamiasciurus hudsonicus*
Weasel	*Mustela*
Gray wolf	*Canis lupus*
Wolverine	Gulo gulo
BIRDS	
Canvasback	*Aythya valisineria*
Goldeneye	*Bucephala* spp.
Mallard	*Anas platyrhynchos*
Northern pintail	*Anas acuta*
Scaup	*Aythya* spp.
Teal	*Anas* spp.
Wigeon	*Anas* spp.
Dusky Canada goose	*Branta canadensis occidentalis*
Canada/cackling geese	*Branta* spp.
Snow goose	*Chen caerulescens*
White-fronted goose	*Anser albifrons*
Sandhill crane	*Grus canadensis*
Common snipe	*Gallinago gallinago*
Ptarmigan	*Lagopus* spp.
Glaucous-winged gull eggs	*Larus glaucescens*
Arctic tern eggs	*Sterna paradisaea*
INVERTEBRATES	
Black chiton	*Katharina tunicate*
Butter clam	*Saxidomus gigantea*
Horse clam	*Simomactra planulata*
Pacific littleneck clam	*Protothaca staminea*
Razor clam	*Siliqua* spp.
Unknown cockles	Not determined
Dungeness crab	*Cancer magister*
Tanner crab	*Chionoecetes* spp.
Mussel	*Mytilus* spp.
Octopus	*Octopus vulgaris*
Sea cucumber	*Apostichopus californicus*
Green sea urchin	*Parastichopus californicus*
Unknown shrimp	Not determined

TABLE 4. (*Continued*)

Resource	Scientific Name[a]
LAND PLANTS	
Blueberry	*Vaccinium uliginosum alpinum*
Lowbush cranberry	*Vaccinium vitis-idaea minus*
Highbush cranberry	*Viburnum edule*
Elderberry	*Sambucus racemose*
Currant	*Ribes* spp.
Huckleberry	*Vaccinium parvifolium*
Nagoonberry	*Rubus arcticus*
Raspberry	*Rubus idaeus*
Salmonberry	*Rubus spectabilis*
Soapberry	*Shepherdia canadensis*
Strawberry	*Fragaria virginiana*
Twisted stalk berry (watermelon berry)	*Streptopus amplexifolius*
Beach asparagus	*Salicornia virginica*
Goose tongue	*Plantago maritima*
Wild rhubarb	*Polygonum alaskanum*
Devil's club	*Echinopanax horridum*
Fiddlehead ferns	Not determined
Hudson's Bay (Labrador) tea	*Ledum palustre*
Kamchatka lily (Indian rice)	*Fritillaria camschatcensis*
Salmonberry shoots	*Rubus spectabilis*
Skunk cabbage	*Lysichiton americanus*
Spruce tips	*Picea* spp.
Wild celery	*Angelica lucida*
Yarrow	*Achillea* spp.
Unknown mushrooms	Not determined
Fireweed	*Epilobium angustifolium*
Chaga	*Inonotus I. obliquus*
Wild chive	*Allium schoenoprasum*
Cottonwood	*Populus* spp.
SEAWEED	
Black seaweed	*Porphyra abbottae*
Bull kelp	*Nereocystis luetkeana*
Red seaweed	*Palmaria hecatensis*
Sea ribbon	*Palmaria hecatensis*
Giant kelp	*Macrocystis pyrifera*
Alaria	*Alaria marginata*
Bladder wrack	*Fucus vesiculosus*

[a] Taxa are ordered by family.

also on rod and reel throughout the year. Coho salmon are one of the latest salmon runs available for harvest and residents will fish for them through October and November. Nets are put out in the Situk River area to harvest sockeye salmon in June and July. With the better summer weather, people head out in boats to harvest Dungeness crab, shrimp, and halibut. Snowshoe hares are taken during summertime as well as fall. As fishing and berry picking begin to slow down with the transition to fall, residents turn their attention to hunting. Deer season opens for the month of November, while moose hunting occurs from September through December. The areas close to Yakutat where a lot of people hunt moose are open in October and the beginning of November. Ducks and geese migrate through the Yakutat area in the fall and hunters search out many different types of waterfowl. Ptarmigan hunting increases through the fall into the winter months when most of the harvest takes place. Fall and winter months are popular times to dig clams on the beaches. Winter is also the time when furbearers are at their peak quality and most trapping occurs during these months. (Sill et al. 2017:46–52).

Harvest Areas and Ecologically Productive Zones

Correspondences between modern harvest areas and zones of high ecosystem productivity demonstrate the continuity of traditional ecological knowledge. For example, subsistence fishing by net and line for sockeye, coho, Chinook, and pink salmon is undertaken almost entirely within two areas (Figures 55, 56; Sill et al. 2017: figs. 2-18, 2-19). The first is among the islands on the east side of Yakutat Bay, extending from Knight Island to Ocean Cape, where phytoplankton, copepods and other zooplankton, and small forage fish are abundant due to mineral enrichment by glacial plumes, providing prey for all four salmon species (chapter 1, this volume).

The second important salmon area is along the Yakutat foreland at the Situk River, Lost River, and Ahrnklin River and in the adjacent saltwater lagoon system, which provide critical feeding and spawning habitats. Rivers and lakes of the Yakutat foreland host the largest salmon runs in the Yakutat region, exemplifying interconnections between the marine and terrestrial ecosystems. Sockeye salmon ascend the Situk River to Situk Lake for spawning and are caught in the lower river as well as upstream at the Harlequin Lake Road crossing. Other species are taken along the foreland at the river mouths and ocean lagoons, including eulachon, trout, steelhead, and Dolly Varden (Figures 57, 58; Sill et al. 2017: figs. 2-24, 2-25).

Zooplankton abundance accounts for the spring concentration of herring around the Yakutat islands, where both the fish and the roe they deposit on seaweed are harvested (Figure 57; Sill et al. 2017: fig. 2-22). However, the once-thriving herring

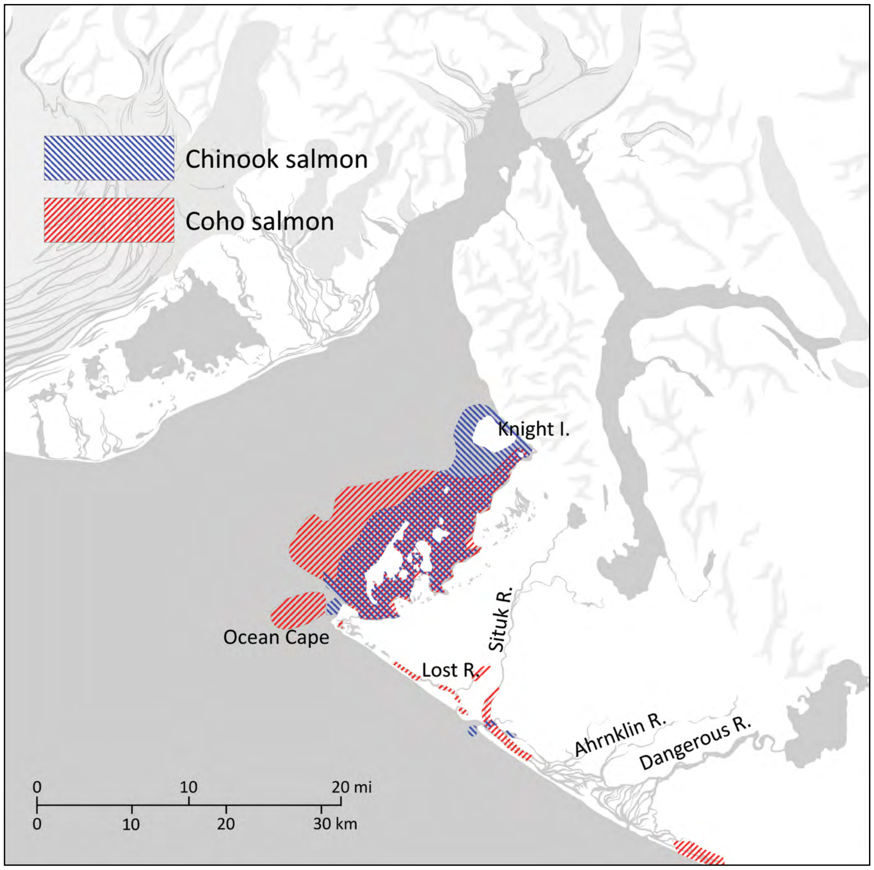

FIGURE 55. Areas used by Yakutat residents to fish for Chinook salmon and coho salmon as reported in 2015 (redrawn from Sill et al. 2017).

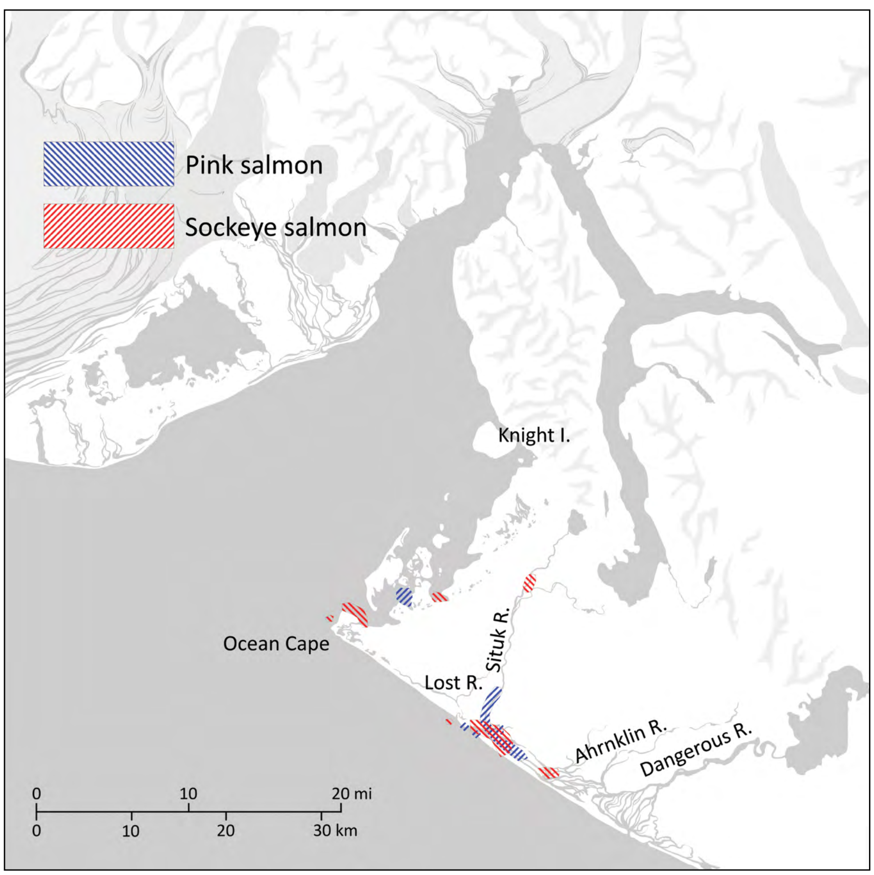

FIGURE 56. Areas used by Yakutat residents to fish for pink salmon and sockeye salmon as reported in 2015 (redrawn from Sill et al. 2017).

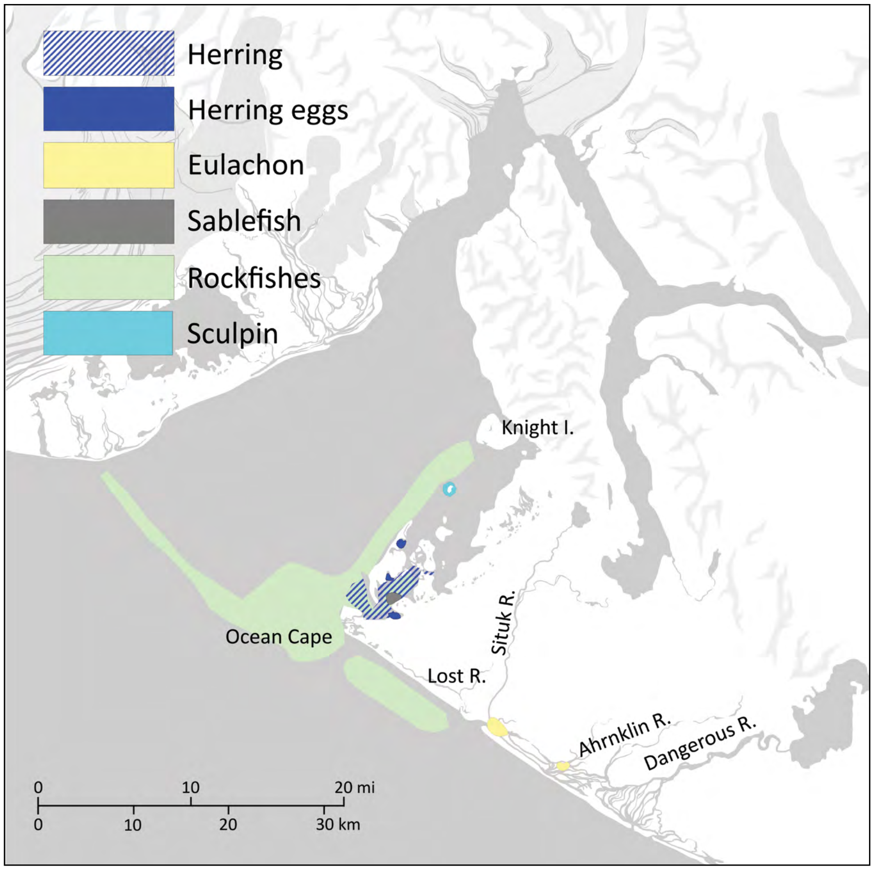

FIGURE 57. Areas used by Yakutat residents to fish for herring, herring eggs, eulachon, sablefish, rockfishes, and sculpin as reported in 2015 (redrawn from Sill et al. 2017).

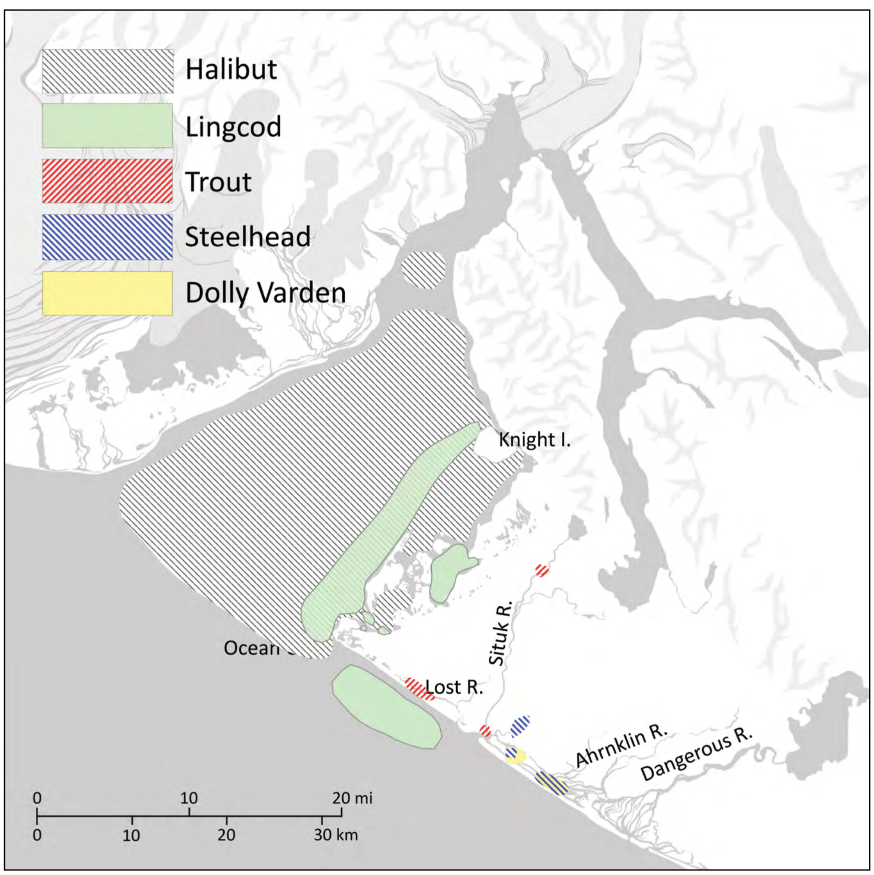

FIGURE 58. Catch areas for halibut, lingcod, trout, steelhead, and Dolly Varden as reported in 2015 (redrawn from Sill et al. 2017).

fishery at Eleanor Cove east of Knight Island was depleted by commercial seiners in the mid-1960s and is no longer significant (T. Valle, 12 June 2011, IN-7; R. Sensmeier, 26 May 2014, IN-53). Other species fished in the islands area include sablefish and sculpin (Figure 57; Sill et al. 2017: fig. 2-23). Lingcod prefer submarine slopes both within the island group and along its western edge, as well as offshore from the Yakutat foreland (Figure 58; Sill et al. 2017: fig. 2-24). Rockfish concentrate in channels west of the island group, along the submarine moraine that crosses the mouth of the fiord, and by the Yakutat foreland (Figure 57; Sill et al. 2017: fig. 2-23).

Halibut are taken in the islands as well as in deeper waters from the mouth of the fiord to Point Latouche (Figure 58; Sill et al. 2017: fig. 2-22). Each of the more than 20 species of harvested fish (Table 4) has a distinct distributional pattern determined by season, prey availability, water depth, and water temperature, and understanding of the shifting mosaic of marine habitats is a critical dimension of ecological knowledge.

Marine invertebrates, including shrimp, Dungeness crab, and octopus are harvested throughout Yakutat Bay but seldom in Disenchantment Bay, where the water is heavily clouded with glacial silt and primary productivity is low (Sill et al. 2017: fig. 2-27). Intertidal invertebrates including butter clams, cockles, Pacific littleneck clams, black chitons, urchins, and razor clams are collected in the islands near Yakutat village, where plankton counts are high and protected reefs and sandy shores offer ideal substrates.

Harbor seals are hunted at different seasonal locations as they "follow their food" (J. James, 22 May 2014, IN-45), which includes a wide variety of fish and invertebrates. As discussed in chapter 3, harbor seals are hunted at the Situk River, along the Yakutat foreland, at many locations in eastern Yakutat Bay, and at Disenchantment Bay (Figure 59; Sill et al. 2017: fig. 2-33). Sea otters, which consume bivalves, sea urchins, and crustaceans, are closely associated with the Yakutat Bay islands area as well as Logan Beach north of Knight Island, where rocky reefs support a wide variety of invertebrates and kelp forests provide shelter for the animals (Figure 59; Sill et al. 2017: fig. 2-33).

The most important terrestrial game animals—moose, Sitka deer, and black bear—have contrasting distributions. Moose thrive and are primarily harvested in the old-growth forests and riparian wetlands of the Yakutat foreland between the Situk and Italio Rivers (Figure 60; Sill et al. 2017: fig. 2-29). Sitka deer, which are especially vulnerable to predation by bears, seek protection on the Yakutat Bay islands and at the west end of the foreland (Figure 60; Sill et al. 2017: fig. 2-29). Hunters take moose and occasionally deer along the road that runs from Yakutat to Harlequin Lake, taking advantage of this access corridor across the foreland.

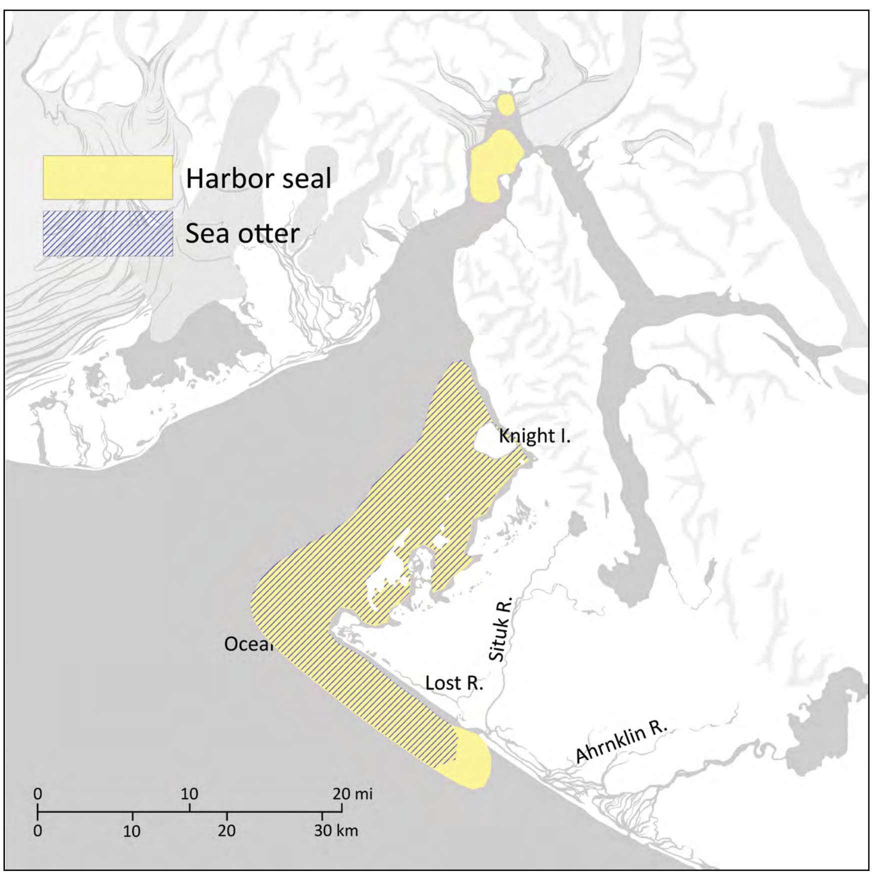

FIGURE 59. Areas used by Yakutat residents to hunt for harbor seals in 2015 included Yakutat Bay, Disenchantment Bay, and along the coast of the Yakutat foreland. Sea otters were taken in similar locations but not at Disenchantment Bay (redrawn from Sill et al. 2017).

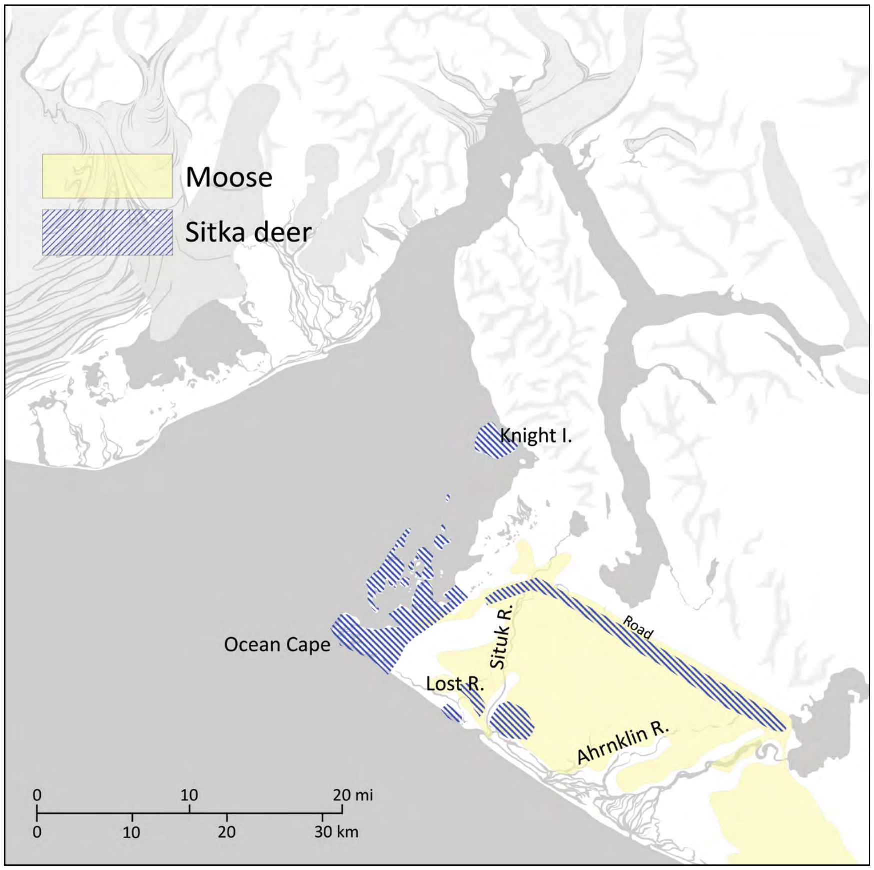

FIGURE 60. Harvest areas for moose and Sitka deer in 2015 (redrawn from Sill et al. 2017). Both species are hunted on the Yakutat foreland, including along the road from Yakutat to Harlequin Lake.

Black and brown bears are widely distributed in the forests but are hunted primarily along the shorelines of eastern Yakutat Bay and Disenchantment Bay where they forage for beach foods and are accessible by boat; black bears are also taken along the shores of Russell Fiord (Figure 61; Sill et al. 2015: fig. 2-30). Migratory waterfowl including sandhill crane, mallard, Canada goose, wigeon, teal, northern pintail, and white-fronted goose are taken primarily on lakes and wetlands of the foreland.

The broad spectrum of species harvested at Yakutat and the close correlation of contemporary harvest activities with areas and seasons of highest biological productivity indicate perpetuation of an extensive body of traditional ecological knowledge. Nonetheless, ongoing modification of the human ecological niche is also indicated, including changes in species hunted, technology, and land use patterns.

In the current period, residence in the town of Yakutat and at summer subsistence cabins is combined with day trips by motorboat or land vehicle to nearby harvesting areas, and despite this enhanced mobility compared with earlier days of canoe and foot travel, the subsistence catchment is more town centered and geographically restricted than in the past, primarily focusing on eastern Yakutat Bay and the western foreland. Seal hunting at Disenchantment Bay is only occasionally undertaken (see chapter 3, this volume) and little use is made of the western side of the fiord or the east side north of Redfield Cove, other than for halibut fishing and crabbing. Most hunting of land animals, including moose, deer, and black bear, is conducted near the road system where there is access by vehicle (truck, car, or four-wheeler) or along the ocean shore where there is access by boat, in large part because game taken at these locations can be readily transported back to town.

These changes reflect technological influences, competition from jobs and reduced time available for subsistence activities, participation by fewer individuals, and declining overall consumption of subsistence foods, yet deep connections to Yakutat as a natural world remain. For residents, the teeming ocean waters of the fiord and the broad Yakutat foreland offer seasonal bounties of fish, game, and edible plants that are accessible on the doorstep of the community and critical for its survival.

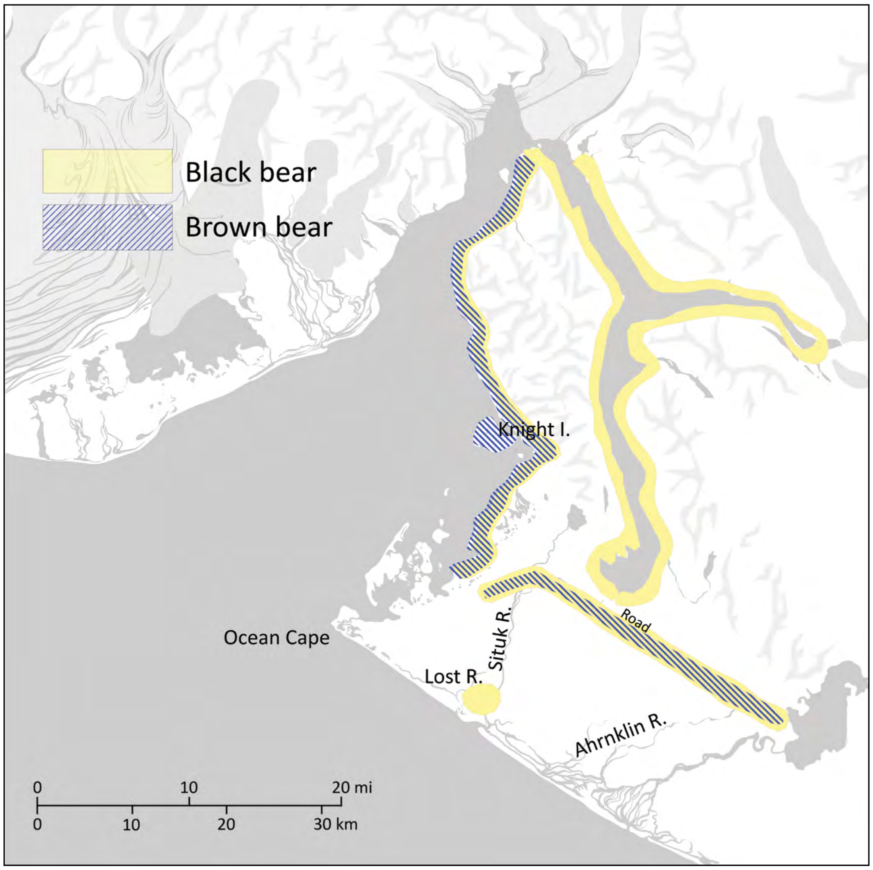

FIGURE 61. Harvest areas for black bear and brown bear in 2015 (redrawn from Sill et al. 2017). Hunting for both species is undertaken primarily along the shorelines of eastern Yakutat fiord and Russell Fiord because of easy access by boat. The Harlequin Lake Road provides vehicle access to the Yakutat foreland.

3

Indigenous Knowledge of Harbor Seals

Expert knowledge of harbor seals is held by many Yakutat residents, and according to Raymond Sensmeier, "Of all the foods we eat off the land, the seal is probably the most important" (R. Sensmeier, 12 June 2011, IN-6; Figure 62). George Ramos Sr. highlighted the centrality of sealing to the history and culture of the community (Introduction, this volume), and in project interviews elders and hunters discussed harbor seal behavior, natural history, hunting techniques, methods for preparing seal meat, organs, and hides, as well as interclan cooperation in harvesting seals, traditional management of sealing by clan leaders, and spiritual practices related to sealing. The special focus on seals in this chapter complements the broad overview of subsistence practices and traditional ecological knowledge presented in chapter 2.

FIGURE 62. Female harbor seals and pups on an ice floe, Disenchantment Bay, 2016. Photo by John Jansen. Photo courtesy of National Atmospheric and Oceanic Administration, Alaska Fisheries Science Center, Seattle.

Yakutat contributors to the documentation of sealing knowledge included George Ramos Sr., L'uknax̲.ádi (1930–2019), who learned to hunt from his maternal uncle, Jack Ellis (1892–1952) at Disenchantment Bay during the 1940s–1960s. A fluent Tlingit speaker, his knowledge included oral traditions about the retreat of the glaciers, ancestral sealing practices, and the series of seal camps used by Yakutat Natives from the eighteenth to twentieth centuries (Figure 63).

Elaine Abraham, Kwáashk'i K̲wáan (1929–2016), grew up with the Tlingit language, culture, and subsistence lifestyle of her parents, John and Susie Bremner, and her grandparents, Olaf and Susie Abraham, who were members of the last Yakutat generations to use the communal sealing camps at Disenchantment Bay. Elaine participated in subsistence sealing with her parents and later with her own family (Figure 64).

Lena Farkas, Kwáashk'i K̲wáan (1933–2017), was a fluent Tlingit speaker and respected knowledge keeper of her clan, with a rich store of memories about her family's way of life on the land. Their subsistence year included summer sealing at Disenchantment Bay, salmon fishing at the Situk and Ahrnklin Rivers, winter hunting and trapping on the Yakutat foreland, and spring harvesting of seals and eulachon at the Situk River. Lena was known for her expertise on Yakutat place names and Kwáashk'i K̲wáan oral traditions (Figure 65).

Raymond (Ray) Sensmeier, Kwáashk'i K̲wáan (born 1944), is a council member of the Yakutat Tlingit Tribe. He serves on the Alaska Native Harbor Seal Commission and has conducted annual community surveys of harbor seal use since 1993 for the ADFG. He is an observer of seal population trends and an advocate for their protection from modern threats, including disturbance by cruise ships (Figure 66).

Jeremiah James, G̲alyáx̲ Kaagwaantaan (born 1981), is one of the most active Yakutat seal hunters (Figure 67). He harvests 50–70 animals per year, giving away most of the meat to others and using the tanned hides to sew sealskin clothing. Jeremiah collaborated with the Smithsonian project to film a seal hunt with Gary Johnson at Disenchantment Bay in May 2014 and demonstrated seal skinning, butchering, hide preparation, and sewing.

Others who contributed to the documentation of sealing practices and traditions included Bertrand J. Adams Sr., L'uknax̲.ádi (born 1937); Kai Monture, Kwáashk'i K̲wáan (born 1990); Ted Valle, G̲alyáx̲ Kaagwaantaan (born 1938); Elizabeth "Janice" Piccard, Kwáashk'i K̲wáan (1945-2015); Ingrid L. Shodda, Wooshkeetaan (born 1946); Ronnie G. Converse, G̲alyáx̲ Kaagwaantaan (born 1952); Sheri Nelson, Kiks'sadi (born 1956); Judith Ramos, Kwáashk'i K̲wáan (born 1959); and David Ramos, Kwáashk'i K̲wáan (born 1960).

SEALS AND GLACIER SPIRITS

In the traditional Yakutat Tlingit worldview, spirits (*yeł*) animate all living creatures and features of the environment including mountains, glaciers, and the ocean (De Laguna 1972). As Elaine Abraham taught, "the whole land is sacred"

FIGURE 63. George Ramos Sr. indicating the location of the men's sealing camp on Haenke (Egg) Island in Disenchantment Bay, June 2011. Photo © Smithsonian Institution.

FIGURE 64. Elaine Abraham (center) with daughter Judith Ramos (left) and grandson Kai Monture (in back) discussing traditional place names and ancestral village locations, Yakutat, June 2013. Photo © Smithsonian Institution.

FIGURE 65. Lena Farkas (right) with son Gary Klushkan at Disenchantment Bay, 2013. Photo © Smithsonian Institution.

FIGURE 67. Jeremiah James at home in Yakutat with his leather-stitching machine, patterns, and materials for making harbor seal and sea otter clothing, May 2014. Photo © Smithsonian Institution.

FIGURE 66. Ray Sensmeier with a copper-bladed *wéiksh* used for skinning and flensing seals, a family heirloom. Photographed at the Alaska Native Brotherhood and Sisterhood Hall, Yakutat, 2017. Photo © Smithsonian Institution.

(E. Abraham, 10 June 2011, IN-1). Her words express a view of human relations with spirit beings that entail moral obligations of respect and proper action (Langdon 2019).

The spirit of Mount St. Elias is regarded as the preeminent guardian of the Yakutat area and adjacent coasts, while Sít' Tlein (Hubbard Glacier) has dominion over At'éik (Disenchantment Bay; Figure 68). Sít' Tlein is male, and adjacent Turner, Narrow, Valerie, Black, and Haenke Glaciers are his female wives (E. Abraham, 10 June 2011, IN-1). He is the caretaker of the seals, producing an abundant discharge of ice floes each spring to support and protect the females and newborn pups from predators, including killer whales, bears, and human hunters (D. Ramos, 10 June 2011, IN-1; K. Monture, 29 July 2013, IN-32). Sít' Tlein waits for the pups to swim and grow strong, then allows the loosening of the floe pack by tidal currents—the "break-away"—which opens pathways for the hunters' boats into the rookery (D. Ramos, 10 June 2011, IN-1; E. Abraham, 11 June 2011, IN-2; G. Ramos Sr., 11 June 2011, IN-3). In former times, the Kwáashk'i K̲wáan clan leader (e.g., Yaa X̲ooda Keit in the late nineteenth century) would send an observer to Disenchantment Bay to monitor when the seals were ready before giving permission for the hunt to begin (E. Abraham, 27 June 2013, IN-28).

In these ways, it is believed, Sít' Tlein nurtures the harbor seals so that they may provide sustenance to the human community. This provident relationship is reflected in the Gineix̲ K̲wáan migration story (chapter 5, this volume), in which the glaciers adopt the newly arrived Ahtna immigrants, communicating through dreams to teach them how to hunt seals

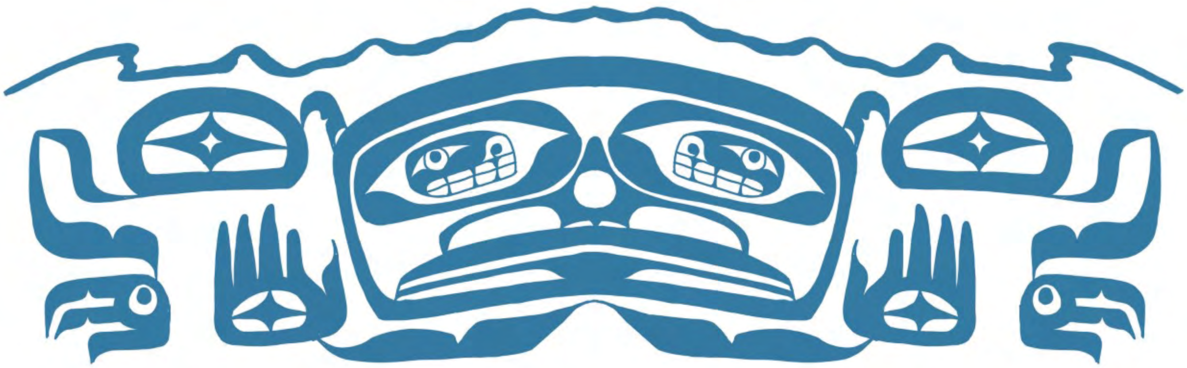

FIGURE 68. Sít' Tlein by Maka Monture. Artist statement: "Tlingit believed glaciers were alive and had spirits called Sit'tu Kwaani, inhabitants within the glacier. There were both male and female glaciers. This drawing represents Hubbard Glacier, Sít' Tlein—Big Glacier—because he extended all the way to the mouth of Yakutat Bay." Used by permission of the artist.

and to survive in the coastal environment (Elaine Abraham, 10 June 2011, IN-1).

Respect and gratitude toward the glacial spirits are conveyed by prayers and offerings. Before the trip to Disenchantment Bay for sealing, Elaine Abraham remembered her father "paving a road to the sacred lands" by maintaining a long silence to clear his mind and by burning tobacco to send prayers upward on the smoke (Elaine Abraham, 10 June 2011, IN-1). On arrival at the sealing ground, it is customary to place offerings of food and tobacco (*qánch*) on the water while asking for the glacier's protection and permission to hunt (G. Ramos Sr., 12 June 2011, IN-10; K. Monture, 29 July 2013, IN-32). A traditional offering is seal meat, seal oil, and dried fish wrapped in a rolled skunk cabbage leaf tied with a strand of beach grass, but other foods such as bread and hard candy may be given (E. Abraham, 10 June 2011, IN-1). "Talking to the glacier" (*ayaulkáns'i*) during the offering means telling it that "you honor its spirit, its greatness, and the land, and the family of the glacier, that means the wives, and Mt. St. Elias with all of his children going down to Mt. Fairweather" (E. Abraham, 10 June 2011, IN-1).

Offending, enticing, or showing disrespect toward a glacier can bring severe consequences. When one hunter made an offensive remark about the scarcity of ice floes in Disenchantment Bay, Sít' Tlein shed huge cascades of ice that trapped and nearly crushed his boat (E. Abraham, 10 June 2011, IN-1). Stories of glaciers overrunning villages in response to human provocations are known throughout the northern Tlingit and Tutchone regions (Dauenhauer and Dauenhauer 1987; Cruikshank 2001; Monteith et al. 2007), including at Icy Bay where an Eyak settlement is said to have been destroyed when boys teasingly invited the glacier to eat a Chinook salmon they had caught (De Laguna 1972:286–287). Traditional proscriptions included never cooking seal bacon at Disenchantment Bay because the scent of the grease might lure the glacier; avoiding loud talk or noise when sealing; not leaving trash at the sealing camps; and building only small fires because "glaciers and fire don't mix" (E. Abraham, 10 June 2011, IN-1; T. Valle, 12 June 2011, IN-7; G. Ramos Sr., 18 June 2012, IN-15). The nineteenth century Teik̲weidí clan leader Xatgawet severely admonished a man for making a fire to cook seagull eggs on Haenke (Egg) Island before the sealing season started, which disturbed both the glacier and the newborn seals (G. Ramos Sr., 18 June 2012, IN-15). Glaciers may also be repelled by human action, as when Hubbard Glacier retreated to the head of Yakutat fiord after the Kwáashk'i K̲wáan threw a dead dog in a crevasse (De Laguna 1972:239).

Other traditional observances concern the seals themselves. A hunter had to be "spiritually prepared and, after the kill, had to observe the proper rituals, for killing was an act of religious significance," according to De Laguna (1972:361–362). It is believed that animals can understand human thoughts and words, so hunters refrain from talking in advance about going out for seals and other game (De Laguna 1972:362; E. Abraham, 17 June 2012, IN-13B; I. Shodda, 21 June 2012, IN-26). In the past, hunters customarily bathed and avoided sexual relations before a hunt and asked for forgiveness after an animal's life had been taken (De Laguna 1972:813; E. Abraham, 17 June 2012, IN-13B). After a boy killed his first seal, he placed its head on a beach facing to the north and gave it fresh water in gratitude for its sacrifice (E. Abraham, 11 June 2011, IN-2). It is said that the seals are waiting to "give themselves to you" (I. Shodda, 21 Jun2 2012, IN-26), voluntarily providing "food and nourishment and to feed the elders" (R. Sensmeier, 18 June 2012, IN-16). There is distaste for wasting any part of the seal and a strongly held value that seal meat, oil, and other products should be shared with others in the community (R. Sensmeier, 12 June 2011, IN-6; I. Shodda, 21 June 2012, IN-26).

HARBOR SEAL CONSUMPTION

An ADFG survey in 2008 found that 57% of Yakutat Native households engaged in subsistence seal harvesting and 100% consumed seal products; annual consumption (0.3 seal/person) was the highest in Southeast Alaska and the second highest in the state (Wolfe et al. 2009: table 6). Oral testimony indicates that Yakutat seal consumption was much higher in the 1930s–1940s, at least two seals per person per year (E. Abraham, 11 June 2011, IN-2), and likely greater still in previous generations. Contemporary hunters give away much of their catch to relatives and elders beyond their immediate families (J. James, 22 May 2014, IN-44]), with 39% of households receiving seal meat and oil from others in 2015 (Sill et al. 2017: table 2-11).

The abundance of harbor seals in Yakutat fiord is a product of its glacially enriched marine ecosystem and thriving populations of the fish and invertebrates that constitute the seal diet (chapter 1, this volume). The annual concentration of seals at the ice floe rookery has long been one of the main attractions to permanent settlement, and archaeofaunal data demonstrate that harbor seals were the leading mammalian food species consumed by Yakutat residents throughout history (chapters 4–6, this volume).

Over much of the last two centuries harbor seals were also hunted for their commercial value. After the U.S. takeover of Alaska from Russia in 1867, the Alaska Commercial Company began trading for sealskins and oil with Indigenous residents of southern Alaska, and Yakutat Natives were among the leading suppliers (Crowell 2016). In reference to this industry, George Bird Grinnell called Disenchantment Bay "the greatest hair sealing ground on the coast" (Burroughs et al. 1901:161). A second wave of commercial harvesting and bounty hunting for the State of Alaska began in 1927 and peaked in the mid-1960s, ending with passage of the Marine Mammal Protection Act in 1972. During that second wave, hundreds of thousands of harbor seals were killed by Alaska Natives around the Gulf of Alaska, leading to an 80%–90% population reduction (Crowell 2020). Thousands of seals in excess of subsistence needs were killed by Yakutat hunters at Disenchantment Bay and Icy Bay during this period (G. Ramos Sr., 11 June 2011, IN-3; T. Valle, 12 June 2011, IN-7; B. Adams, 16 June 2012, IN-12), and it is recognized that most of the meat went to waste (G. Johnson, 27 May 2014, IN-41).

The means and methods of Yakutat sealing have changed over time, from the wooden dugout canoes, bone-tipped harpoons, and clubs used centuries ago to the rifles and outboard-powered skiffs employed today, yet intimate knowledge of the seals' life cycle, behavior, and seasonal movements, as well as understanding of winds, tidal currents, and the shifting movements of the ice pack, are no less requisite for hunting success and safety. Traditional ways of skinning and flensing a seal, extracting oil from the blubber, cooking the varied products of seal cuisine, and sharing the food with kin and elders remain essential elements of Yakutat culture (Ramos 2020).

HARBOR SEAL BIOLOGY AND NATURAL HISTORY

Scientific studies of harbor seals complement extensive local knowledge about their biology, feeding habits, seasonal movements, reproductive cycle, and behavior. Harbor seals are one of the most common Alaskan sea mammals, with a geographic range that extends from the southeast panhandle of the state to the western Aleutian Islands and Bristol Bay (Figure 69). They are nonmigratory, with genetically distinct regional subpopulations that differ in coloration, body size, pupping times, and other traits (O'Corry-Crowe et al. 2003).

Adult harbor seals reach 1.5–1.8 m in length and weigh about 85 kg on average, with males slightly larger than females. Females can be distinguished by their rounder faces and "fat heads" while males have longer snouts (R. Sensmeier, 12 June 2011, IN-6; J. James, 20 June 2012, IN-24). Harbor seals have a maximum life span of about 40 years, and females attain sexual maturity in 3–4 years. *Phoca vitulina* are "hair seals," with spotted pelts covered by short, stiff hairs, but they lack the thick undercoat of fur seals, relying instead on a subcutaneous blubber layer for insulation. Harbor seals can make feeding dives up to 15 minutes long and 500 m deep, foraging at varying levels of the water column for shrimp, walleye pollock, Pacific cod, capelin, eulachon, Pacific herring, salmon, flounder, sole, sculpins, octopus, squid, crabs, and many other prey species. They use rocks, reefs, sand bars, beaches, and ice floes as haulouts where they rest, avoid predators, give birth, nurse, and molt (Pitcher and Calkins 1979; Hoover-Miller 1994; Iverson et al. 2007).

At the Disenchantment Bay glacial rookery female seals give birth to single pups between early May and the beginning of July, with peak numbers of newborns observed in mid to late June, dropping off sharply by mid-July (Jansen et al. 2014). Pups are born with adult pelage, can crawl and swim within an hour of birth, and are weaned and fully independent of their mothers in 4–6 weeks (Pitcher and Calkins 1979; Hoover-Miller 1994).

Yakutat residents note special qualities of local harbor seals compared with other stocks. Their pelts tend to be a light silvery gray, providing protective coloration amidst Yakutat's ice floes, shoreline outcrops of white granite, and grayish rocky beaches, whereas Sitka seals tend to be much darker, matching the black slate beaches of that area (E. Hanlon, 17 June 2012, IN-14; J. James, 20 June 2012, IN-24, and 22 May 2014, IN-44). Another difference is said to be taste; "ice seals" from Disenchantment Bay and Icy Bay are reputed to have the most delicious meat and oil in Southeast Alaska because of their crab-rich diet (R. Sensmeier, 18 June 2012, IN-16; I. Shodda, 21 June 2012, IN-26).

Knowledge of the harbor seal's sensory capabilities and self-protective behaviors is critical for hunters. Seals are wary, and when surfacing they turn their heads in all directions to look for danger (G. Ramos Sr., 11 June 2011, IN-3), sometimes wiping their eyes with a flipper to clear their vision (R. Sensmeier, 12 June 2011, IN-6). They have good eyesight both above and below water, so hunters in Disenchantment Bay wear light-colored clothing (formerly of grayish sealskins) and drape their boats

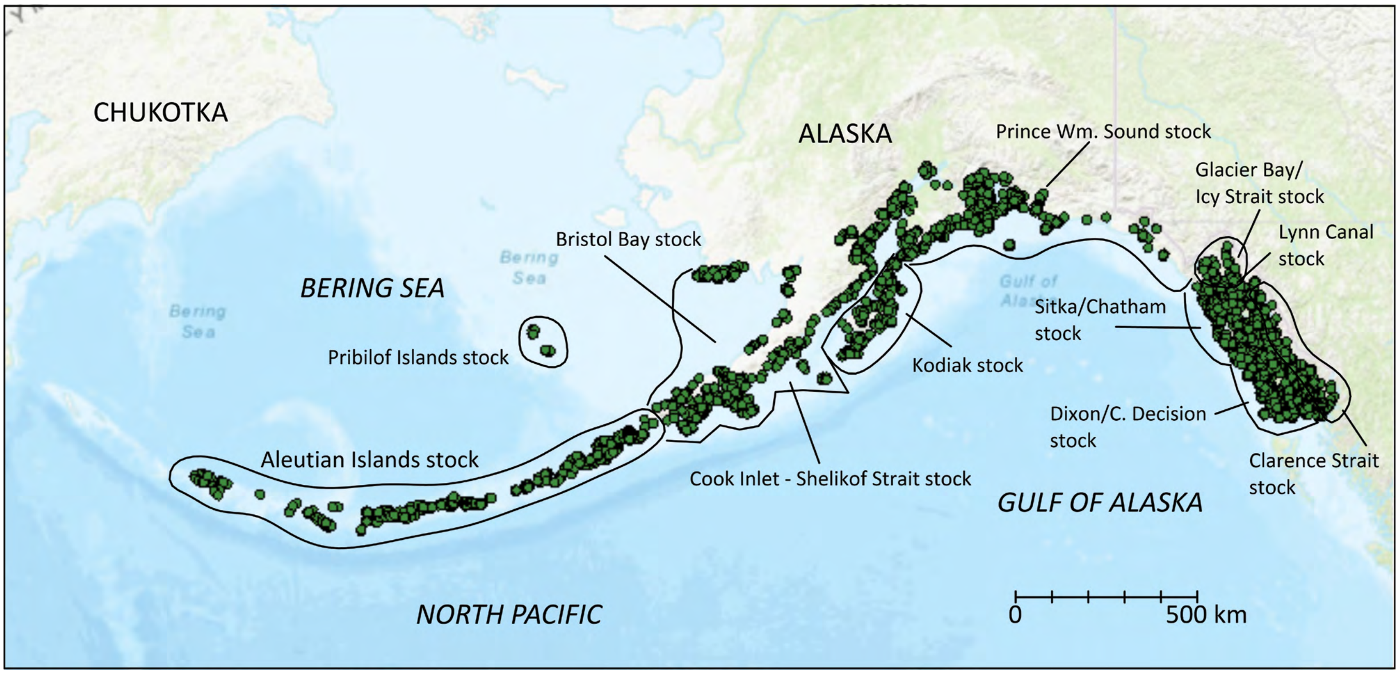

FIGURE 69. Range and observed haul-out locations for harbor seals in coastal Alaska (London et al. 2015) and recognized genetic stocks (Muto et al. 2016). Range and haul-out data available at https://noaa.maps.arcgis.com/home/webmap/viewer.html?layers=2c6ca3e595024d3990127bfe061d7ed3. National Oceanic and Atmospheric Administration, National Marine Fisheries, Alaska Fisheries Science Center.

with white sheets to blend in with the background of ice floes (Emmons 1991:121; R. Sensmeier, 12 June 2011, IN-6; T. Valle, 12 June 2011, IN-7). Men hunting seals on shore during winter at Dry Bay hid under white sheets with their guns, to blend in with the snow (De Laguna 1972:374). It is important to pay attention to the direction of the wind because seals can detect human scent (R. Sensmeier, 12 June 2011, IN-6). Their sense of hearing is also acute, so hunters traditionally used hand signals to communicate silently with their canoe partners about seals and other animals spotted in the water or along shore (G. Ramos Sr., 11 June 2011, IN-3). For these reasons, patience, care, and silence are the keys to successful hunting (G. Ramos Sr., 13 June 2011, IN-8).

Blubber thickness is a key consideration for hunters, both because blubber is one of the most valued seal products and because fat content affects how quickly a seal will sink when shot, especially in fresh water (B. Adams, 16 June 2012, IN-12; J. James, 20 June 2012, IN-24, and 26 May 2014, IN-46). This is a problem when hunting seals in the Situk and Alsek Rivers and also at Disenchantment Bay, where a layer of fresh water from glacial melting, several meters deep, is stratified above the denser sea water (R. Sensmeier, 26 May 2014, IN-53).

Yakutat observers say that female seals generally have more body fat than males and are less likely to sink. This is particularly true going into spring when they build up a thick blubber layer to sustain them through birthing and lactation on the ice floes, a period when they do not leave their pups to feed (J. James, 20 June 2012, IN-24; S. Nelson, 21 June 2012, IN-25; R. Sensmeier, 26 May 2014, IN-53). Supporting this observation, three lactating females shot by Jeremiah James and Gary Johnson at Disenchantment Bay on 25 May 2014 had empty stomachs and blubber layers 4.8–5.1 cm thick (field measurements and J. James, personal communication, 25 May 2014). Male seals feed in all seasons and build up a thick fat layer for winter (B. Adams, 16 June 2012, IN-12).

Harbor seals can be harvested in the Yakutat area throughout the year, one of the reasons for their traditional preeminence as a subsistence species (E. Abraham, 16 June 2012, IN-13A). Seals "follow their food" to different parts of the fiord and foreland on an annual cycle (Figure 70) and are sought by hunters in these places according to season (Goldschmidt and Haas 1998:46–48; J. James, 22 May 2014, IN-45).

During late fall and winter, harbor seals feed on herring and other forage fishes as well as winter Chinook salmon and coho salmon (J. James, 22 May 2014, IN-45). Reported winter hunting locations include Russell Fiord and Calahonda Creek (R. Sensmeier, 12 June 2011, IN-6, and 18 June 2012, IN-16) as well as many locations along the east side of Yakutat Bay, including Knight Island, Chicago Harbor, Humpback Cove, Redfield Cove, and Khantaak Island (R. Sensmeier, 12 June 2011, IN-6; G. Ramos Sr., 18 June 2012, IN-15I; Shodda, 21 June 2012, IN-26;

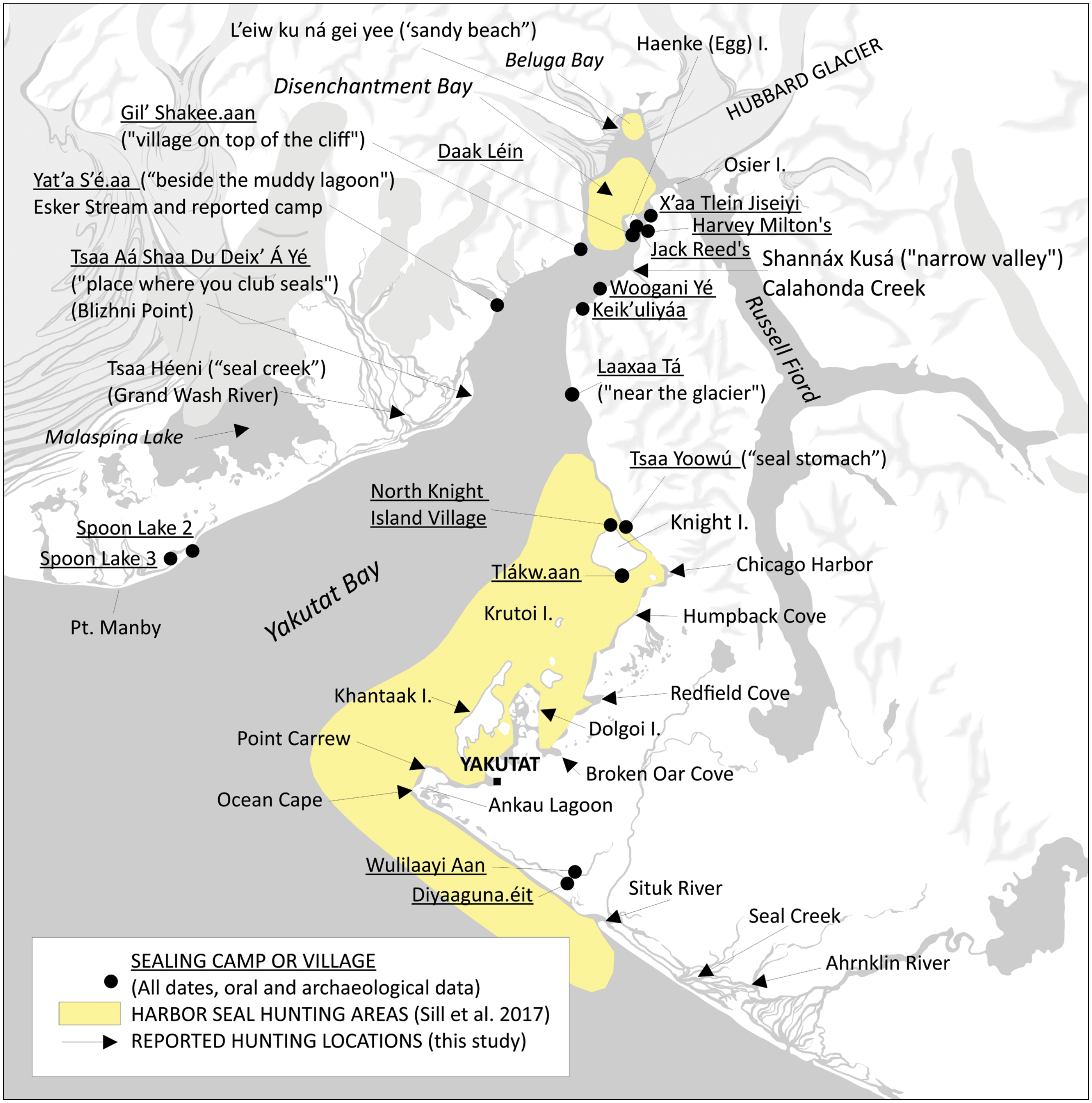

FIGURE 70. Yakutat harbor seal hunting locations, camps, and villages, compiled from oral knowledge and archaeological data. © Smithsonian Institution.

J. James, 20 June 2012, IN-24; S. Nelson, 21 June 2012, IN-25). Seals may be taken at Ankau Lagoon where they feed on a late run of coho salmon until December or January (J. James, 26 May 2014, IN-46) and are hunted throughout the year at Ocean Cape, where they forage in tidal eddies (J. James, 20 June 2012, IN-24). Seals also frequent the Yakutat foreland during winter and are shot at the mouths of streams; in former times they were killed there with harpoons or clubs (De Laguna 1972:374).

In March, seals gather in large numbers to feed on spawning eulachon at the Situk River (L. Farkas, 11 June 2011, IN-4; J. James, 26 May 2014, IN-46) and at the Alsek River in Dry Bay (G. Ramos, 11 June 2011, IN-3; B. Adams, 16 June 2012, IN-12), where hunters pursue them both in the rivers and offshore. After the eulachon runs, female seals carrying pups begin traveling toward the Disenchantment Bay and Icy Bay rookeries and can be shot as they swim past Ocean Cape and Point Carrew during April and early May (L. Farkas, 11 June 2011, IN-4; G. Ramos, Sr., 11 June 2011, IN-3; E. Abraham, 4 August 2013, IN-29). Some pregnant seals are taken in Yakutat Bay during June as they move up the fiord (J. James, 20 June 2012, IN-24). Harbor seals also feed on spawning herring at Chicago Harbor on the east side of Yakutat Bay during March–June (J. James, 20 June 2012, IN-24).

By late May and June most seals of breeding age, including males and females, are gathered at the Disenchantment Bay rookery (Figure 71) or at Icy Bay, where they have gathered in exceptionally large numbers in recent years, possibly because they are not disturbed there by cruise ships (R. Sensmeier, 18 June 2012, IN-16; Jansen et al. 2013). Females nurse their pups on the ice floes and mate after weaning, although by that time many of the males have "abandoned their families" to head for salmon runs in the fiord and along the outer coast; boars that stay behind are seen on the ice tending groups of females and pups (J. James, 26 May 2014, IN-46). The remaining rookery seals disperse as the pups mature and the ice floes diminish in mid-summer. A few seals give birth at other locations, including the beach at Blizhni Point on the west side of Yakutat Bay (I. Shodda, 21 June 2012, IN-26).

In mid to late summer seals are found "everywhere" around Yakutat fiord and along the outer coast (J. James, 20 June 2012, IN-24), a pattern that continues through the successive spawning runs of the different salmon species into the fall. Groups of seals gather at river mouths or reefs wherever there is a large food source while "loner" seals, typically males, prefer shallow reef areas with little current (J. James, 20 June 2012, IN-24). Seals are fearful of killer whales and seek shallow water to avoid them, so tidal reefs are a good place to hunt when these predators are present in the fiord (J. James, 20 June 2012, IN-24). Seals congregate at Humpback Creek when the pink salmon are running

FIGURE 71. Aerial view of harbor seals on ice floes in Disenchantment Bay near Hubbard Glacier, 2016. Photo by John Jansen. Photo courtesy of National Atmospheric and Oceanic Administration, Alaska Fisheries Science Center, Seattle.

(E. Hanlon, 17 June 2012, IN-14) and at other prey locations in eastern Yakutat Bay, including Dolgoi ("Doggie") Island, Krutoi Island, Chicago Harbor, Redfield Cove, Broken Oar Cove, Chicago Harbor, and Khantaak Island (T. Valle, 12 June 2011, IN-7; R. Sensmeier, 18 June 2012, IN-16; J. James, 20 June 2012, IN-24; E. Abraham, 27 June 2013, IN-28). On the west side of Yakutat Bay seals can be hunted between Point Manby and Esker Stream (Goldschmidt and Haas 1998:47; I. Shodda, 21 June 2012, IN-26) and also in Malaspina Lake (G. Ramos Sr., 18 June 2012, IN-15). Seals are hunted at the Ahrnklin River, Seal Creek (which empties into Ahrnklin Lagoon), and other foreland locations during the summer salmon fishing season (I. Shodda, 21 June 2012, IN-26).

SEAL HUNTING METHODS

Sealing methods used at Yakutat, now and in the past, include (1) open water hunting by canoe or small boat, originally with hand-thrown harpoons and later with rifles; (2) harpooning, clubbing, or shooting seals at their haulouts on beaches and rocks; and (3) hunting seals among the ice floes at Disenchantment Bay, originally with harpoons and by the late nineteenth century with firearms (De Laguna 1972:373–377; Emmons 1991:121–122). Some sealing methods known from the Sugpiat region of southern Alaska, such as casting seal darts from throwing boards and netting seals at the mouths of coves, were not employed at Yakutat or by other Tlingit people (Birket-Smith 1953; Crowell et al. 2001).

Open Water Hunting

Harpooning seals in open water was evidently practiced during ancestral times, although the difficulty of bringing a canoe within harpoon range without cover from ice floes must be appreciated. Well-preserved faunal remains from the Tlákw.aan village site on Knight Island, occupied circa 1500–1750 CE, included thousands of bones of harbor seals (see chapter 5, this volume), and while a significant portion were from pups only a few months old—therefore most likely hunted at the glacial rookery—many were also from juveniles and adults that could have been taken in waters around the island. The ability to harpoon seals in open water is suggested by the parallel example of harbor porpoises, fast swimmers, that were also killed using harpoons and whose bones are common at Tlákw.aan.

The traditional sea mammal harpoon consisted of a wooden shaft 3–4 m long, usually of buoyant cedar wood, with a notched butt to accommodate the thrower's index finger; a tanged, detachable bone head with three or four barbs, called an *aadá*; and a line running from a hole in the tang to a float made from the whole skin of a young seal or the bladder of a seal or bear (De Laguna 1972:376–377; Emmons 1991:121; E. Abraham, 11 June 2012, IN-2). A dozen barbed heads from sea mammal harpoons were found at Tlákw.aan (De Laguna et al. 1964:131–134; chapter 5, this volume). When a seal was struck with a harpoon the float was thrown overboard to drag behind the wounded animal until it was exhausted and could be killed with a club (E. Abraham, 11 June 2011, IN-2). Elongated slate blades found at the Diyaaguna.éit, Wulilaayi Aan, and Tlákw.aan archaeological sites were tips for lances used to kill seals and other sea mammals after they were harpooned (Birket-Smith 1953:25), although this method was apparently abandoned by the eighteenth century and never reported at Yakutat by Western observers.

Present-day seal hunters use outboard-powered aluminum or fiberglass skiffs to access all parts of the fiord where seals congregate. Hunters favor light, small-caliber rifles using .17, .22, or .222 magnum or hollow point ammunition. These guns are quiet, allowing multiple shots without alerting the seal; they balance well in a rolling boat; and the cost of ammunition is low (G. Ramos Sr., 11 June 2011, IN-3B; R. Sensmeier, 12 June 2011, IN-6; B. Adams, 16 June 2012, IN-12; E. Hanlon, 17 June 2012, IN-14; J. James, 20 June 2012, IN-24). Some hunters mount scopes on their sealing rifles, while others prefer open sights. Hitting a seal's head in the water at a distance of 30-40 m from a bobbing boat requires skilled marksmanship; as Eli Hanlon explained, "If the boat is going up and down, try to line up on the seal and pull the trigger on the way down. As you're coming down, as soon as you see the seal, you pull the trigger" (E. Hanlon, 17 June 2012, IN-14). Hunters try to shoot seals in the back of the head as they are looking away or to the side, which pushes the head forward and keeps air in the lungs, helping to delay or prevent them from sinking (R. Sensmeier, 12 June 2011, IN-6; B. Adams, 16 June 2012, IN-12; J. James, 20 June 2012, IN-24, and 22 May 2014, IN-44).

Even after acquiring rifles for hunting, Yakutat sealers carried harpoons to secure dead or wounded seals (E. Abraham, 11 June 2011, IN-2; T. Valle, 12 June 2011, IN-7). Today most employ a gaff hook or a long pole with a halibut hook lashed to it to snag floating animals or to bring them up from underwater (J. James, 20 June 2012, IN-24). Another trick is circling a sunken seal with the outboard engine running in reverse to create a vortex that lifts it off the bottom (R. Sensmeier, 12 June 2011, IN-6).

Seal Hunting On Shore

Clubbing seals at their haulouts on land was an important ancestral practice. Information about this method pertains to Dry Bay and the west side of Yakutat Bay (Figure 70), in particular Blizhni Point at the outlet of Grand Wash River, a location known in Tlingit as Tsaa Aá Shaa Du Deix' Á Yé ("place where you club seals"; G. Ramos Sr., 11 June 2011, IN-3, and 18 June 2012, IN-15). The Grand Wash River itself is called Tsaa Héeni ("seal creek"; Thornton 2012:18). Hunters armed with clubs would swim to a beach where seals were resting, then rush from the water, striking the backs of the animals' heads as they tried to escape. Seals were also clubbed at the outlet stream of Spoon Lake near Point Manby (G. Ramos Sr., 11 June 2011, IN-3).

Commenting on a Tlingit seal club at the National Museum of the American Indian (Figure 48), Mr. Ramos described how young men at Dry Bay would train to "fight the seals" by sitting in the glacially fed Alsek River to build their tolerance to cold (G. Ramos Sr., 18 May 2005). As recently as the 1950s, Yakutat hunters went by boat to club seals at Blizhni Point, particularly young pups that could not easily escape and whose soft, silky pelts were valued for making moccasins (I. Shodda, 21 June 2012, IN-26).

Shooting seals from shore as they swim by or stalking them on reefs, beaches, and rocks where they haul out, is a common practice (E. Abraham, 27 June 2013, IN-28). In the morning and at twilight, seals sleep on rocks and can be closely approached (J. James, 20 June 2012, IN-24). Seals are curious and can be attracted within weapon range by imitating the cries of pups (De Laguna 1972:374; G. Ramos, Sr., 11 June 2011, IN-3; J. James, 20 June 2012, IN-24), and children sometimes helped to lure them by squirming inside gunny sacks "pretending to be seals" (L. Farkas, 11 June 2011, IN-4; E. Abraham, 17 June 2012, IN-13B). Jack Ellis used to attract seals at K'waats'eela, a reef off Knight Island (Thornton 2012:21), by "flipping around" on the ground like a seal (G. Ramos Sr., 18 June 2012, IN-15).

Ice Floe Sealing At Disenchantment Bay

Canoe hunting at the ice floe rookery has been a principal method of sealing in Yakutat fiord since the beginning of occupation. Eyak settlements of 600–800 years ago at Point Manby were situated close to the glacial front of that time, allowing access to the incipient rookery (chapter 4, this volume). Archaeofaunal evidence from the 500-year-old Tlákw.aan site on Knight Island (Etnier 2017; Crowell 2022; chapter 4, this volume) reveals reliance on rookery hunting, confirming an oral tradition that Kwáashk'i K̲wáan men of the village hunted "at the seals' home" near the glacier (Swanton 1909:347–368).

After Tlákw.aan village was abandoned in the eighteenth century, rookery sealing was undertaken from summer camps located progressively farther up the fiord, following Hubbard Glacier as it retreated from its late Little Ice Age maximum at Blizhni Point (Figure 70). In oral tradition, the oldest was Tsaa Yoowú ("seal stomach") on the mainland across from Knight Island (G. Ramos Sr., 18 June 2012, IN-15; Thornton 2012:21), although another candidate is the North Knight Island Village archaeological site, dated to about 1500 CE. The second known camp, just south of Point Latouche, was Laax̲aa Tá ("near the glacier"), used "before the natives had rifles" and still active when Malaspina explored Yakutat fiord in 1791 (De Laguna 1972:67; L. Farkas, 16 June 2012, IN-13A; Thornton 2012:20). Subsequent camps were established in Disenchantment Bay, including Woogaani Yé (about 1805) and K̲eik'uliyáa (about 1840).

Rookery sealing in the pre-firearm era was undertaken from specialized dugout canoes called *goodi.yee*, which were designed for quiet passage through the ice floes (G. Ramos Sr., 11 June 2011, IN-3; Figure 72). A prong wrapped with sealskin projected from the bow to noiselessly deflect chunks of ice. The stern, which had a curved cutwater, became the bow when the *goodi.yee* was switched end-for-end for travel in open water. When approaching seals, hunters crouched low in the boat and paddled with their hands or used short, one-handed paddles (G. Ramos Sr., 13 June 2011, IN-8), techniques that avoided splashes and presented a minimal profile to the prey. As described by George Ramos Sr., the men wore sealskin clothing for warmth and camouflage and waterproof mittens made of sealskin or intestines to protect their hands while paddling and pushing aside chunks of ice. The sealing harpoon, attached by line to a sealskin float, was wielded by the man in the bow, who stood up to throw or thrust it when a seal was in range. Ballast rocks were carried in the bottom of the boat and dropped overboard as their weight was replaced by seal carcasses.

Hunting methods, equipment, and the scale of the hunt changed significantly in the early 1870s, when firearms became readily available to Yakutat Natives and a commodity market for seal products developed. The Alaska Commercial Company's Nuchek post in Prince William Sound began providing rifles, ammunition, and a wide range of manufactured goods to "Kolosh" (Tlingit) traders from Yakutat in exchange for harbor sealskins, seal oil, and the pelts of sea otters, foxes, bears, and other animals (Alaska Commercial Company 1869–1905; Ketz and Arndt 2010; Crowell 2016). Commercial trading was also conducted at Sitka and, after 1886, at the Alaska Commercial Company store in Yakutat. During the last decades of the nineteenth century and up until about 1915, Yakutat residents and hunting parties from other Tlingit communities exploited the harbor seal rookery at Disenchantment Bay for both commercial and subsistence harvests, with annual takes in the range of 1,000–3,000 seals (Burroughs et al. 1901; Crowell 2016).

Each spring, as early as mid-May but usually by the beginning of June, nearly the entire population of Yakutat would leave Khantaak village for Disenchantment Bay, traveling in large family canoes and double-ended hunting canoes that replaced the ancestral *goodi.yee* (Goldschmidt and Haas 1998:47; Johnson 2014:14). Hunters were armed with post–Civil War firearms including .32-40 and .44 caliber breech-loading Winchester rifles and muzzle-loading .44 caliber rifle/12-gauge shotgun combination guns (Alaska Commercial Company 1869–1905; Abercrombie 1900:395; chapter 6, this volume). These firearms could kill seals at longer range than hand-thrown harpoons but were loud and disturbed the rookery. Harpoons were still carried but only to prevent wounded animals from sinking. Grinnell observed in 1899 that "the shot is fired, and if the animal is wounded both men paddle to him as fast as possible, and the hunter tries to spear [harpoon] him, either by throwing or thrusting with the spear [harpoon]" (Grinnell 1901:164). The seal was then hauled in on the harpoon line and struck on the head with a club if still alive.

The starting date for the sealing season was determined by the Kwáashk'i K̲wáan clan leader, who waited for word from a lookout on Haenke Island that newborn seals were visible on the ice floes. Other signs of pupping included the appearance of eagles, which eat the afterbirth, and seagulls, which peck at the coats of newborn seals to pull off hair and draw blood

FIGURE 72. Ancestral sealing at Disenchantment Bay as recounted by George Ramos Sr. The *goodi.yee* hunting canoe had a skin-covered ice bumper that projected from the bow, visible on the boat in foreground. The hunters wore sealskin clothing, spruce root hats, and waterproof mittens and propelled the canoes with long or short paddles or with their hands. The detachable harpoon head was connected by line to an inflated sealskin float that was thrown overboard after a seal was hit to hinder its escape. A club (visible in the stern of the foreground canoe) was used to kill the harpooned seal. Illustration by Emily Kearney-Williams. © Smithsonian Institution.

(G. Ramos Sr., 11 June 2011, IN-3). When pupping was well started, the leader invited the Teikweidí, L'uknax.ádi, Galyáx Kaagwaantaan, and Shankukeidí clans to join the Kwáashk'i Kwáan for hunting. De Laguna was told that if the hunt began too early the seal herd would be frightened away by the noise of the guns, but that once the pups were born the mothers would remain with them even under hunting pressure (De Laguna 1972:373–376). Hunting continued until the end of July or beginning of August when the ice floes dwindled and the seals' pelts began to lose quality prior to the autumn molt.

Ethnographic and photographic documentation of Keik'uliyáa sealing camp (Figure 73), located just north of Point Latouche, was recorded by the Harriman Alaska Expedition in 1899 (chapter 6, this volume). Keik'uliyáa was a "family camp" that served as a residential area for men, women, and children, and a center for seal processing activities (E. Abraham, 10 June 2011, IN-1). Smaller "men's camps" were set up on Haenke Island and other locations where hunters might stay for several days before returning with their catch (G. Ramos Sr., 13 June 2011, IN-8, and 18 June 2012, IN-15). Other camps on the west side of the bay were reportedly used by non-Yakutat hunters, including Yat'a S'é.aa ("beside the muddy lagoon," Esker Stream; L. Farkas, 16 June 2012, IN-13A; Thornton 2012:19) and Gil' Shakee.aan ("village on top of the cliff") at Bancas Point (E. Abraham, 16 June 2012, IN-13A; L. Farkas, 16 June 2012, IN-13A; Thornton 2012:20; for camp locations, see Figure 70).

The pattern of intensive early summer sealing at Disenchantment Bay ended around 1915, after petroleum products replaced seal and whale oil as commercial lighting fuels, demand and prices for sealskins declined, and commercial salmon fishing offered competing employment at Yakutat starting in mid-June. However, even into the 1960s, some hunters and families still traveled to

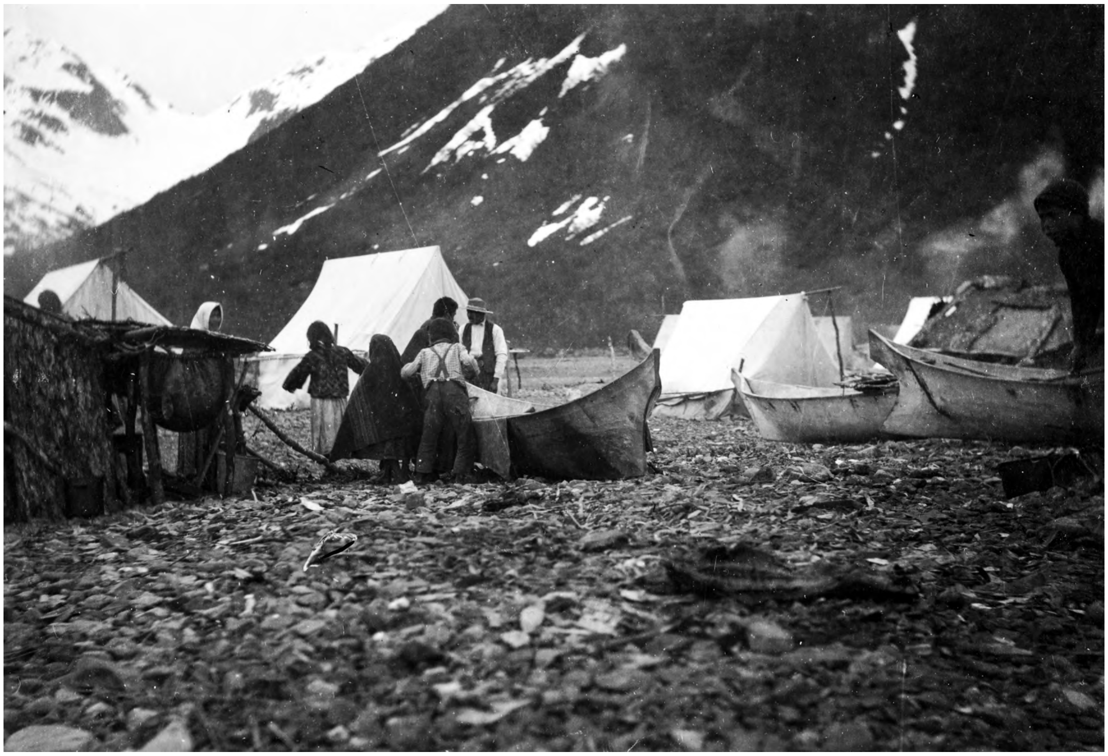

FIGURE 73. K̲eik'uliyáa sealing camp at Disenchantment Bay (also known as Shaanáx̲ Kuwóox̲', "wide valley") in June 1899. Yakutat men, women, and children stand near canvas tents and a bark-covered smokehouse; a blubber-rendering vat made of sealskins mounted on a wooden stand is at the far left; and hunting canoes have been drawn up on the beach. A second smokehouse is visible at the far right. Photograph by Edward S. Curtis, Harriman Alaska Expedition, July 1899. Bancroft Library, University of California Berkeley, C. Hart Merriam Collection Misc-P3 Vol. 43 No. 17. Courtesy of the Bancroft Library.

Disenchantment Bay and stayed at K̲eik'uliyáa, Woogaani Yé, or Shannáx̲ Kusá ("narrow valley" or Calahonda Creek) for sealing and other subsistence activities during May and June, leaving when fishing began on the Situk River (E. Abraham, 10 June 2011, IN-1, 11 June 2011, IN-2, 16 June 2012, IN-13A, and 27 June 2013, IN-28; L. Farkas 17 June 2012, IN-13B; I. Shodda, 21 June 2012, IN-26). In addition to sealing, they hunted black and brown bears, fished for halibut and Chinook salmon, collected gull and tern eggs on Haenke Island, and dug clams and cockles.

George Ramos Sr. underwent his apprenticeship as a seal hunter with his maternal uncle Jack Ellis in the late 1930s and 1940s, starting when he was eight years old. On his first trip to Disenchantment Bay his uncle told him to stay under a tarp as the canoe rounded Point Latouche. When he emerged, he saw the glaciers, floating ice, and barren shores of the bay, which he remembered as "the land where there's no trees" (G. Ramos Sr., 11 June 2011, IN-3). They stayed at Daak Léin camp on the west side of Haenke Island, where the men used flat rocks as plates and cooked seal meat in a large kettle (G. Ramos Sr., 11 June 2011, IN-3, and 19 June 2012, IN-18).

Other men's sealing camps included Jack Reed's on the southeast side of Haenke Island, a camp on shore called X'aa Tlein Jiseiyi ("area below the big point," Thornton 2012:22), and Harvey Milton's camp (G. Ramos Sr., 18 June 2012, IN-15, and 19 June 2012, IN-18). The old camp at Woogaani Yé was also used, particularly during the commercial hunting period of the late 1950s and 1960s when a ramshackle cabin (the "Tiltin' Hilton") was built to accommodate hunters (see Figure 70 for locations and chapter 6, this volume).

In the years before and after World War II, seal hunters used a locally built style of flat-bottomed plank canoe with a squared-off stern for mounting an outboard (T. Valle, 12 June 2011, IN-7; S. Nelson, 21 June 2012, IN-25; I. Shodda, 21 June 2012, IN-26), although paddles were still employed when stalking seals in the ice (Figure 74). The hunters were armed with .22 caliber rifles, an improvement over the large-bore guns used in previous generations because they were whisper quiet, making "just about the same noise that a glacier makes when a small chunk of ice falls from high and hits the water" (G. Ramos Sr., 11 June 2011, IN-3). This allowed the killing of

FIGURE 74. George Ramos Sr. steers a flat-bottomed plank canoe with an outboard motor at Disenchantment Bay in the early 1960s, with a pair of light-caliber seal hunting rifles ready for use. Family photograph used by permission of Judith Ramos.

alert guard seals without disturbing others sleeping nearby, a technique called "picking off the watchman" (T. Valle, 12 June 2011, IN-7). They draped sheets over the canoes for camouflage and used rocks as ballast until killed seals were taken into the boat (R. Sensmeier, 12 June 2011, IN-6; T. Valle, 12 June 2011, IN-7).

Daily and seasonal tidal cycles determined the hunting strategy. Hunters would paddle north on the incoming tide and south back to their camps as it ebbed, going with the flow to avoid getting trapped by the moving ice (D. Ramos, 10 June 2011, IN-1; G. Ramos Sr., 13 June 2011, IN-8, and 18 June 2012, IN-15). During the peak amplitude tides of June, unusually strong, fast currents would race out of Russell Fiord on the ebb, splitting open the floe pack in front of Hubbard Glacier, a phenomenon described in Tlingit as *dax̱' ayá was'el* ("taking your mouth and stretching it"; G. Ramos Sr., 11 June 2011, IN-3). The men would watch the movement of the ice from an observation point at Osier Island off Gilbert Point, then paddle into the open lead; "It's just like something running along there, and you're hoping it will open up on a seal sitting on the ice" (G. Ramos Sr., 11 June 2011, IN-3, and 18 June 2012, IN-15). Mr. Ramos further described this maneuver and the method of picking off sentinel seals:

> You can see the current pushing on that ice and breaking it open, and you hope that it will open. . . . And if it should break into a herd, that they are not aware of you coming down through there. . . . One seal will keep his head up, and he'll watch, and the rest of them sleep. And if you catch them that way, you take your time and shoot the one that's got his head up. And the rest of them will pop up their heads, look around, while the one who was watching—he's lying down now—as long as they don't see the blood gushing out of him [they won't be alarmed]. . . . And then another one will hold his head up when they all go back to sleep, and you shoot that one. And you can shoot up to five seals if you're lucky. (G. Ramos, Sr., 11 June 2011, IN-3)

Another traditional hunting location is the northwest corner of Disenchantment Bay, known as "Beluga Bay," because it is frequented by a small pod of beluga whales (Figure 70). Freshwater outflows from Turner, Haenke, and Miller Glaciers keep it relatively free of floating ice and accessible by boat, even when other areas are jammed up (J. James, 20 June 2012, IN-24). Beluga Bay is a favorite spot for taking pups in July when they have tender meat and silky fur for making moccasins (I. Shodda, 21 June 2012, IN-26). Seals haul out at L'éiw Kunageiyí ("sandy beach") in front of Miller Glacier (Thornton 2012:21), where they can be hunted on land, and in the past hunters would fire their guns to drive seals off the beach and out into the ice pack for other boats to pursue (G. Ramos Sr. 13 June 2011, IN-8, and 18 June 2012, IN-15).

A high level of risk attended hunting from canoes in the loose, shifting field of floating ice. Large bergs might suddenly overturn, shooting up underwater "roots" to smash a canoe from below. Strong winds or tidal currents could pack the ice together, crushing a boat caught in the middle. Massive blocks fell from the 100 m high face of Hubbard Glacier, generating waves that could swamp or overturn canoes or wash away a shoreline camp (G. Ramos Sr., 11 June 2011, IN-3, and 13 June 2011, IN-8). Hunters watched Mount St. Elias for weather signs, especially snow blowing off the peak, which signals dangerous north winds (G. Ramos Sr. 11 June 2011, IN-3; S. Nelson, 21 June 2012, IN-25). One man survived by paddling ashore on an ice floe after his boat was crushed, a feat that took three days (G. Ramos Sr., 11 June 2011, IN-3). Food, water, a blanket, ammunition, and other emergency supplies were carried in the canoes in a metal lard can in case of being trapped in the ice or stranded on a beach (G. Ramos Sr., 11 June 2011, IN-3).

Today, seal hunters make less frequent use of Disenchantment Bay, for the most part finding enough seals to meet subsistence needs closer to home in Yakutat Bay or along the foreland. The 60 km run up to Hubbard Glacier from Yakutat is costly in gas, especially for heavy metal skiffs with large outboard engines (G. Johnson, 27 May 2014, IN-41). When hunters do use the area, the techniques of going in and out of the ice pack with the tide, drifting or paddling silently to within 30–40 m of a seal with the engine cut, and shooting it with a light-caliber rifle are employed (Figure 75).

Knowledge of seal behavior and the influences of wind, weather, currents, and ice is essential, combined with skill and persistence. Jeremiah James said, “Seal hunting is all about patience. Just like most hunting, it’s about patience and waiting and not jumping the gun or rushing into it” (J. James, 20 June 2012, IN-24; Figure 76).

PREPARATION AND CONSUMPTION OF SEALS

The preparation and consumption of harbor seals includes field dressing, skinning, removing the blubber, cutting up the carcass, rendering oil from the blubber, smoking and cooking the meat and organs, processing the hide, and using sealskins to make clothing and moccasins.

When a seal is shot, hunters retrieve it with a gaff hook, put a rope around the back flippers, and let the blood drain out (either from the wound or by slitting the throat) before bringing the animal into the boat (Figure 77). Hunters split open and gut seals within a short time to avoid spoilage, saving the heart, liver, and other edible organs, then tow them behind the boat to cool (B. Adams, 16 June 2012, IN-12; J. James, 20 June 2012, IN-24). The seal may be butchered on a beach near the hunting location or taken back to town for processing (Figure 78). Traditionally, the skin and adhering blubber layer were removed from the carcass as a single piece, using a butcher knife. The fat-laden skin was then draped over a “fleshing board” and the blubber separated from it using a *wéiksh,* or semilunar knife (Figure 54).

As Elaine Abraham remembered, “Everything was eaten with seal oil. Before lard, you fried your food in seal oil, you preserved your meats and dried fish in seal oil, and you used it as butter” (E. Abraham, 11 June 2011, IN-2). Lena Farkas recalled, “They used seal oil to eat with boiled fish, to eat with dry fish, to eat with cockles and clams” (L. Farkas, 17 June 2012, IN 13B). Seal oil is still consumed “with just about everything,” including fish and other subsistence foods, and even as a snack with crackers or as a pizza

FIGURE 75. Kai Monture and George Ramos Sr. seal hunting at Hubbard Glacier in May 2014. Photo © Smithsonian Institution.

FIGURE 76. Jeremiah James with female harbor seal shot on an ice floe at Disenchantment Bay, May 2014. Photo © Smithsonian Institution.

topping (R. Sensmeier, 12 June 2011, IN-6). It is recognized for its exceptional nutritional values, including high levels of omega-3 fatty acids, and its concentrated calories that warm the body (T. Valle, 12 June 2011, IN-7). Raymond Sensmeier said, "It's really important when you're out hunting because if you get cold you can drink seal oil; it warms you up. The old man [his uncle] told me that if someone fell overboard in the icy water that they would give them warm seal oil immediately" (R. Sensmeier, 12 June 2011, IN-6).

People take special pride in their recipes for making seal oil (R. Sensmeier, 12 June 2011, IN-6; B. Adams, 16 June 2012, IN-12). Thinly sliced blubber strips are placed in a bucket or hanging cloth bag to let the oil slowly express from the fat, a process that takes a week or longer depending on the air temperature and how strong a flavor is desired. The blubber is then slowly heated in a pot to extract more oil (R. Converse, 21 June 2012, IN-27, and 28 May 2014, IN-54; Figure 79). At Keik'uliyáa, vats for cold blubber rendering were made of sealskins attached to wooden frames (Figure 73), and after aging the fat was heated in iron kettles over open fires (Burroughs et al. 1901:158–160). The slow-cooked blubber pieces turn into chewy "bubble gum," especially the fat from male seals (R. Converse, 21 June 2012, IN-27; R. Converse and J. Piccard, 28 May 2014, IN-54). Lena Farkas said, "They aged the seal fat and then they cooked it slowly to make a gum out of it. . . . You chew it, and it's good" (L. Farkas, 17 June 2012, IN-13B). Slices of fresh blubber edged with meat are "seal bacon," which when fried makes a treat that "even kids like" (R. Converse, 28 May 2014, IN-54). Seal bacon can be smoked and salted to enhance the flavor (Figure 80).

Virtually all parts of the seal are eaten including the liver, heart, intestines, kidneys, lungs, breasts, flippers, and muscle meat, the latter divided into cuts including ribs, shoulders, and rump (R. Sensmeier, 12 June 2011, IN-6; T. Valle, 12 June 2011, IN-7). In the traditional camps, seal meat and organs were boiled, roasted, and/or hung up to cure in the bark-covered smokehouses. Intestines were washed and cleaned, stuffed with meat and fat, braided, coiled, and cooked in a covered pot with hot rocks on top; kidneys

FIGURE 77. Jeremiah James (left) draining blood from seal, May 2014. Kai Monture (with video camera) and Gary Johnson are in the stern of the skiff. A white sheet that covered the boat for stalking has been removed, but the top of the outboard is still draped with a white cloth. Photo © Smithsonian Institution.

FIGURE 78. Jeremiah James cutting the front quarter of a harbor seal on the dock at Yakutat small boat harbor, May 2014. James has first removed the skin, which he will keep for tanning and sewing, leaving the blubber and meat which he will distribute to elders and kin. Photo © Smithsonian Institution.

FIGURE 79. Janice Piccard (left) and Ronnie Converse (center) slice blubber and meat from a seal quarter provided by Jeremiah James (see Figure 78), May 2014. Piccard and Converse aged blubber strips in a plastic pail, stored in the smokehouse behind them, then heated them to extract the oil. Photo © Smithsonian Institution.

were thrown into a stew pot with the liver, lungs, and other perishable organs or preserved by drying and smoking; and racks of ribs were boiled and smoked. Seal meat was packed with seal oil in bentwood boxes, wooden barrels, lard cans, or enamel pots with tied-down lids (De Laguna 1972:395–398; E. Abraham, 11 June 2011, IN-2; L. Farkas, 11 June 2011, IN-4; T. Valle, 12 June 2011, IN-7) or in barrels with salt (E. Abraham and L. Farkas, 17 June 2012, IN-13B). These preserved seal foods were staples of the diet during the fall and winter months.

Other traditional seal cuisine includes baked breasts from nursing females, considered to be a special food for elders (E. Abraham, 11 June 2011, IN-2; R. Sensmeier, 18 June 2012, IN-16; R. Converse and J. Piccard, 28 May 2014, IN-54). Flippers can be prepared by soaking overnight in salt water, searing off the hair, and boiling or cooking them over a hot fire (E. Abraham, 11 June 2011, IN-2; L. Farkas, 17 June 2012, IN-13B; R. Converse and J. Piccard, 28 May 2014, IN-54). Other favorite seal foods include fried seal meat or liver with onions, seal meat jarred with oil, backbone marrow, and roasted shoulder or rump.

The traditional tanning of sealskins included soaking and washing them multiple times in warm water, using soap or urine to remove the oils; stretching them on square or oval wooden frames with strings looped through slits around the edge of the hide; using a long-handled scraper to clean fat and flesh from the inner surface; and further scraping to thin and soften them (De Laguna 1972:423–424; L. Farkas, 11 June 2011, IN-4; T. Valle, 12 June 2011, IN-7; E. Abraham, 17 June 2012, IN-13B; R. Converse, 21 June 2012, IN-27; J. Wheeler, 27 June 2013, IN-30). Some initial scraping was done with the skin nailed to a pole or oar before it was lashed onto the frame for further drying, scraping, and stretching. Today, no one goes through this entire time-consuming sequence. Instead, skins are washed and salted to avoid staining the hair with oil; stretched out on plywood and

FIGURE 80. Ronnie Converse, Yakutat's "seal chef," holding a piece of seal meat and blubber that will be thinly sliced, salted, and smoked to make bacon, May 2014. Photo © Smithsonian Institution.

pinned down with screws to dry; scraped to remove the flesh and fat; and sent out to tanneries in Anchorage and Sitka for final treatment and softening (J. James, 20 June 2012, IN-24).

Sealskins were used for many items of apparel including boots, moccasins ("slippers"), pants, hats, shirts, vests, bags, packs, and waterproof mittens for seal hunting (E. Abraham, 11 June 2011, IN-2, and 17 June 2012, IN-13B), and contemporary Yakutat artists including Jeremiah James and Jennie Wheeler continue this tradition (J. Wheeler, 27 June 2013, IN-30; Figure 81). The relatively thin, soft skins of juvenile females or pups are preferred for sewing, and white lanugo fur from unborn pups is used for trimming dance moccasins and other regalia (R. Sensmeier 18 June 2012, IN-16; E. Abraham, 27 June 2013, IN-28). Sealskin moccasins and bags were made for the late nineteenth and early twentieth century tourist trade and sold on the docks to steamship passengers (E. Abraham, 17 June 2012, IN-13B; Figure 82). Women did beadwork at the Disenchantment Bay sealing camps (E. Abraham, 27 June 2013, IN-28), as shown by glass beads found during the archaeological investigations at K̲eik'uliyáa (chapter 6, this volume).

THE FUTURE OF SEALS AND SEALING

It is a matter of concern in Yakutat that harbor seal numbers declined so precipitously during the Gulf of Alaska-wide population crash of the late 1960s and early 1970s. While no quantitative estimates of population changes in Yakutat fiord and Icy Bay are available, George Ramos Sr. remembered that in the years before the crash the ice floes were "just black, I'm talking about thousands of seals" (G. Ramos Sr., 11 June 2011, IN-3). Today the spring rookery population in Disenchantment Bay peaks at about 2,100 animals (Jansen et al. 2006), far below the precrash number. Seals are still relatively abundant at Icy Bay, peaking in summer at about 5,700 animals (Jansen et al. 2006).

The 1960s–1970s crash is attributable to overhunting spurred by Alaska Department of Fish and Game bounties of $2–4 per seal (seals were considered to be "pests" that depressed salmon numbers) and the 1960s boom in prices for seal hides, which averaged $16–18 for adult skins but could go as high as $50 or more for premium skins (Institute of Social, Economic, and Government Research 1966; Paige 1993; Crowell 2020). Yakutat observers generally agree that overhunting was the primary cause of the crash but note that the Yakutat seal population has continued to decline over the last several decades, even after commercial hunting was banned by the Marine Mammal Protection Act in 1972, possibly due to dwindling numbers of Chinook salmon, herring, and other species of seal prey (T. Valle, 12 June 2011, IN-7; B. Adams, 16 June 2012, IN-12; E. Hanlon, 17 June 2012, IN-14; R. Sensmeier, 18 June 2012, IN-16; E. Abraham, 27 June 2013, IN-28).

This trend parallels other areas of the Gulf of Alaska, where the failure of harbor seal stocks to regenerate has been attributed to rising sea surface temperatures during the post-1976 warm period of the North Pacific Decadal Oscillation, the accompanying ocean regime shift, and increased predation on harbor seals by killer

FIGURE 81. Yakutat artist Jennie Wheeler showing sealskin mittens that will be lined with cloth or sea otter fur. Other projects include beaded sealskin moccasins and a spruce root basket, to her left. June 2013. Photo © Smithsonian Institution.

FIGURE 82. Women with beaded sealskin moccasins and bags for sale at the Yakutat steamship dock, circa 1907. University of Washington Libraries, Special Collections, 564: Ee-14.

whales (Benson and Trites 2002; Springer et al. 2003; Spies et al. 2007; Estes et al. 2009; Womble et al. 2010; Litzow and Mueter 2014). Cruise ships, which make 100–175 visits per year to the fiord starting in May, are also blamed for disturbing the rookery in Disenchantment Bay and driving the seals away to Icy Bay and other locations (Jansen et al. 2006; R. Sensmeier, 12 June 2011, IN-6, and 18 June 2012, IN-16; G. Ramos Sr., 18 June 2012, IN-15; S. Nelson, 21 June 2012, IN-25; G. Johnson, 27 May 2014, IN-41).

Hunting and consumption of harbor seals at Yakutat are also declining, independent of the downward trend in the seal population (R. Sensmeier, 12 June 2011, IN-6; G. Ramos Sr., 18 June 2012, IN-1). Paralleling a general decline in subsistence sealing across Southeast Alaska (about 60% from 1992 through 2008), there were fewer hunters at Yakutat and lower success rates per hunter, resulting in drop in the number of seals harvested from 640 in 1996 to 115 in 2008 (Wolfe et al. 2009).

Fewer young people are interested in seal hunting, generating concern among adult hunters and elders about associated cultural losses. Gary Johnson said:

> When we were young, it was an honor to go seal hunting, because it's what our uncles did, our parents, our fathers did. We would look forward to it. There were no video games or anything; it was a simpler life. Now there's almost zero interest. You find a kid, every once in a while, who shows interest, but it's tough. I wonder, fifty years from now is there going to be anybody like myself still around to sustain the elders with seal meat, and sustain interest in the harvest? (G. Johnson, 27 May 2014, IN-41)

Some Yakutat seal hunters are dedicated to teaching the next generation. Eli Hanlon talked about passing on the family heritage to his son Brandon, who got his first seal at age 10: "I wouldn't make him do it if he didn't want to. It's an option I give him, and I try to help him as much as I can. . . . He'll be old enough to do it by himself soon, so I'll show him as much as I can before he takes off and does his own thing" (E. Hanlon 17 June 2012, IN-14).

4

The Eyak Period, 900–1500 CE

ORAL TRADITIONS

Settlements founded during the Eyak Period (Table 1, Figure 7) are distributed on the Yakutat foreland and in outer Yakutat fiord, which was deglaciated by the mid-fifteenth century. A number of toponyms in these areas are from the Eyak language, several referring to the enlarging fiord and proximity of the glacier, such as Ła'xa' ("near the glacier"), Di:ya'guda't ("mouth of body of salt water"), and Galawas ("water extends in indefinite shape," Knight Island) and others, such as Ganawaaník Tá (Eyak-Tlingit, "wild rhubarb"), Ga:ndak (Eyak, "lupine"), K'ulat'áalk' (Eyak–Tlingit [ducks or seabirds] "shaking their wings"), and Kwa:shk' (Eyak, "humpback salmon"), indicating subsistence harvesting locations (Thornton 2012).

Relatively few oral traditions dating from the Eyak period of settlement have been preserved at Yakutat, just as the language itself has also been lost. According to stories recollected by elders in the 1950s, Eyak clans of the Yakutat foreland and fiord were the Koskedi, Hmyedi, and Staxadi (Raven moiety) and the Ł'uxedi, Yinyeidi, and Laaxaayík Teikweidí (Eagle moiety; De Laguna 1972:220–221; also, Emmons n.d.; Swanton 1909). The Ł'uxedi and Laaxaayík Teikweidí (possibly two branches of the same Eagle clan) were the autochthonous inhabitants of the Yakutat area and the builders of settlements in the Lost River area, including Diyaaguna.éit, Wulilaayi Aan, Naasoodat, Gooch Shakee Aan, Áa Ká (Aka Lake Village), and Nets'eł hwuw.aan (Figure 7). Their original home was probably Galyáx Kwáan along the Gulf of Alaska coast from Icy Bay to Controller Bay (Thornton 2012:3–9; Figure 35). The Galyáx Kaagwaantaan residents of that area are said to have descended from Kaagwaantaan voyagers from Southeast Alaska who settled at the Kaliakh River (De Laguna 1972:101; Deur et al. 2015:29–30). Origins of other early clans are obscure; all were Eyak speakers but may have splintered away from Athabascan groups in the interior or from Tlingit clans to the south (De Laguna 1972:75–76, 220–221).

As the glaciers began to retreat, the Eyak population expanded up the eastern shores of the fiord as far as Kwa:shk' (Humpback Salmon Creek) and Galawas (Knight Island; Ganawás in Tlingit; Figure 7). Two undated archaeological middens in the outer bay islands—Dolgoi Island (YAK-005) and Canoe Pass (YAK-004)—may be from this period. Eyak clans residing in the fiord were the Koskedi, Hmyedi, or Yinyeidi, according to Gineix Kwáan stories (De Laguna 1972:231-236). The Hmyedi prevented the Gineix Kwáan from fishing at Humpback Salmon Creek and gathering wild strawberries on Knight Island, acts aimed at protecting these resources from outsiders. The conflict was resolved when the Gineix Kwáan purchased Yakutat fiord from the Eyak (chapter 5, this volume).

There is even less oral information about the west side of the fiord, although Point Manby is remembered as where travelers listened from inside a hollow tree for storm winds before attempting to cross the bay (De Laguna 1972:59, 256). This story is undatable, although the presence of old forests at Point Manby, where glacial ice withdrew by 1200–1300 CE, lends it plausibility. There is also a tradition that camps and settlements on the west side of Yakutat fiord belonged to the Laax̱aayík Teik̲weidí (E. Abraham and L. Farkas, 17 June 2012, IN-13B).

DIYAAGUNA.ÉIT: THE EARLIEST EYAK VILLAGE

The name Diyaaguna.éit is Eyak and has been variously translated as "a change in the river course" (De Laguna 1952), "where the salt water comes up and people moan for fresh water" (Emmons n.d.; Thornton 2012:21), and "salt water comes in there" (E. Abraham, 16 June 2012, IN-13A). The site was briefly investigated by Frederica de Laguna (De Laguna et al. 1964:24–26) and extensively excavated by U.S. Forest Service archaeologist Stanley Davis (Davis 1996).

Diyaaguna.éit is the oldest known village in the Yakutat area, established on the bank of Tawah Creek on the Yakutat foreland in about 900 CE. The surrounding environment at the time of settlement included mature forests, wetlands, and rivers, and the village was originally situated by a small bay, providing the inhabitants with ready access to both marine and terrestrial resources (Davis 1996:164–173). Coastal flooding—possibly due to isostatic depression as nearby glaciers advanced during 800–1200 CE—may have given rise to the Eyak name of the village, followed by rebound that shifted the site to its present inland position about 200 m from the Gulf of Alaska shore.

The original occupants were Eyak of the Ł'uxedi or Laax̱aayík Teik̲weidí clans who held the village from its founding until the eighteenth century, when it was taken over by the Tlingit Teik̲weidí (De Laguna et al. 1964:25; De Laguna 1972:222). Diyaaguna.éit was abandoned following the 1839–1840 smallpox epidemic (De Laguna 1972:76–77).

Site Description

The archaeological site extends 200 m along on the west bank of Tawah Creek and includes three occupation areas (Localities A, B, and C) covered by layers of charcoal-stained sandy midden up to 1.5 m deep (Figure 83). The front edge of the deposit has been eroded by the creek, leading to the deposition of artifacts and fire-cracked rock at the base of the cut bank, but most of the site appears intact. Numerous cultural depressions are visible on the surface including rectangular pits identified as the sunken floors of Eyak and Tlingit plank houses. There are 7 houses at Locality A; 13 at Locality B; and 5 at Locality C (Davis 1996:192–200). In most instances there is a central pit delimiting the main floor of the house surrounded by a shallow depression where benches and sleeping platforms were located (Davis 1996:253–302).

Among the houses and scattered to the north in Locality C are dozens of small depressions (1–2 m long) interpreted as the foundations of plank-walled food storage caches. Other remains include a steam bathing shed containing large quantities of fire-cracked rock and a possible menstrual seclusion hut, both at Locality B. Other circular and rectangular pits visible on the surface or discovered in lower strata were cremation facilities containing beds of charcoal and fragments of human bone. The large size of the settlement, the presence of clan houses with excavated floors, and numerous food caches indicate that Diyaaguna.éit was a permanent winter village that would have been occupied by most residents throughout the year.

Architecture

Davis excavated test pits and trenches in all areas of the site to obtain artifacts and radiocarbon samples and to determine which houses belonged to the Eyak and Tlingit periods of occupation. Nine tested dwellings were identified as Eyak based on artifacts, architecture, and calibrated dates: H-1, 1284 (1416) 1631 cal. CE (Beta 33020); H-4, 1055 (1263) 1396 cal. CE (Beta 27911); H-5, 1295 (1360) 1440 cal. CE (Beta 27909); H-7, 1410 (1550) 1798 cal. CE (Beta 32112); H-8, 1305 (1436) 1631 cal. CE (Beta 27912); H-9, 1416 (1480) 1633 cal. CE (Beta 32113); H-12 (no date); H-14, 774 (933) 1025 cal. CE (Beta 31473); and H-15 (no date) (Davis 1996: table 8; dates calibrated in OxCal 4.4.4).

Most of the Eyak houses were ≤6.5 m long, similar to historic Eyak dwellings (Birket-Smith and De Laguna 1938:32–43; De Laguna 1990a), with the exception of House 1 (12 × 14 m) and House 4 (15 × 15 m), which were comparable to Tlingit houses of the period after Western contact (De Laguna 1972:294–299, 1990b:207–208; Emmons 1991:59–68; chapter 2, this volume; Figure 43). In construction, the Eyak houses were semisubterranean with central pits up to 2 m deep. In three of the structures (H-14, H-4, and H-8) there was no bench or sleeping platform, and the walls extended straight to the bottom of the pit. This was the simplest and possibly oldest type of construction, comparable to House 3 at Wulilaayi Aan (Davis 1996:226–229) and House 8 at Tlákw.aan (De Laguna et al. 1964:51–58). House 9 was intermediate in style, with an earthen bench surrounding the central floor and walls at the back edge of the bench. In the remaining houses (H-15, H-1, H-5, H-12, and H-7) there was both a bench and a stepped sleeping platform. This "two-step" cross-section profile (Figure 84) resembles the multilevel interiors of Tlingit houses (Figure 45).

Although little evidence was preserved of the aboveground portions of the houses, ethnohistoric data suggest a framework of wooden posts and beams that supported plank-covered walls and roof, with a smoke vent above the centrally located hearth. The architectural resemblances of precontact Eyak houses at Diyaaguna.éit to Tlingit dwellings suggest long-standing regional interaction between these two groups as well as a similar relationship between hierarchical, matrilineage-based societies and the organization of domestic space (De Laguna 1990a).

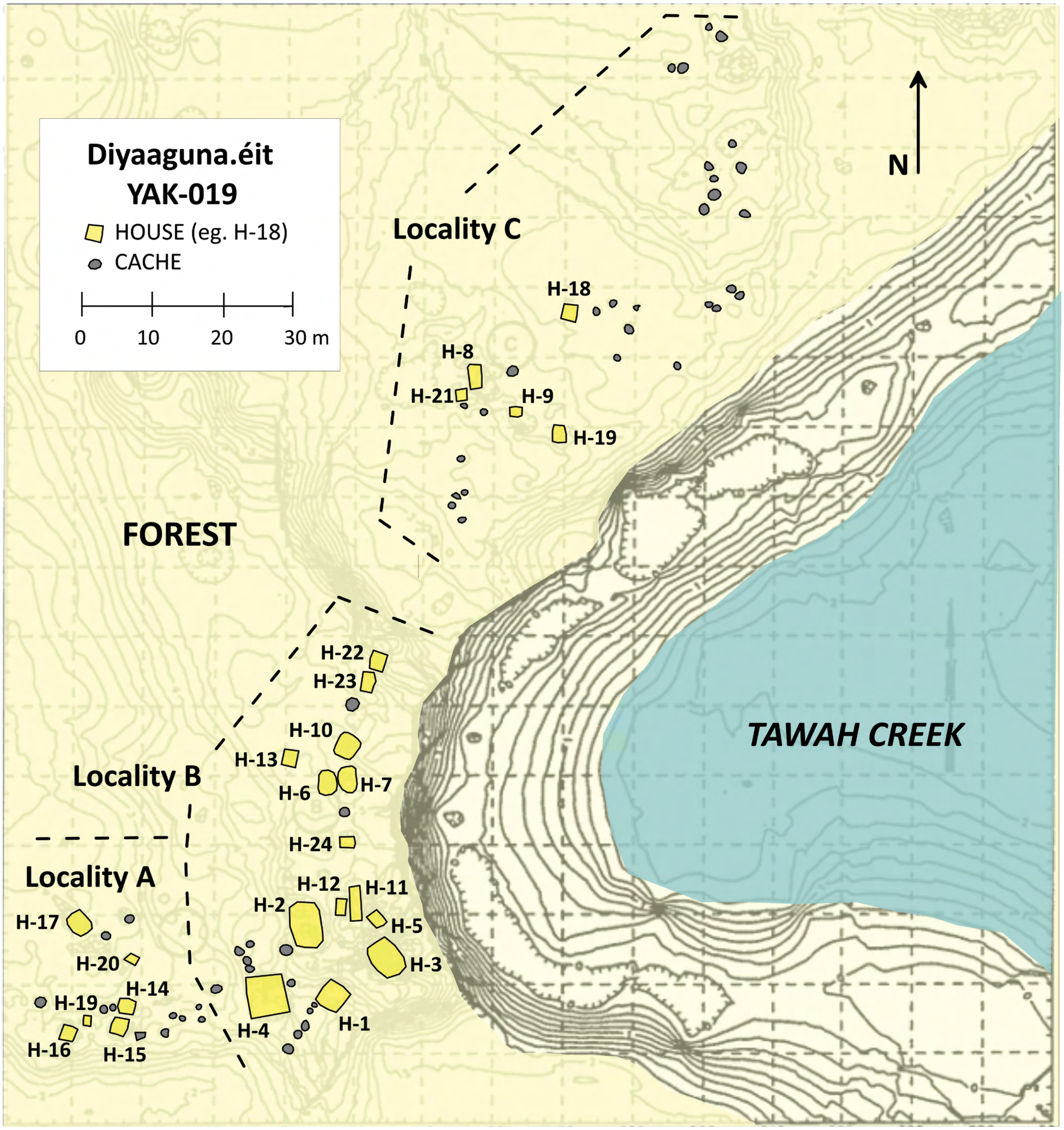

FIGURE 83. The Diyaaguna.éit archaeological village site (YAK-019), showing house pits, cache pits, and localities (redrawn from Davis 1996: fig. 26).

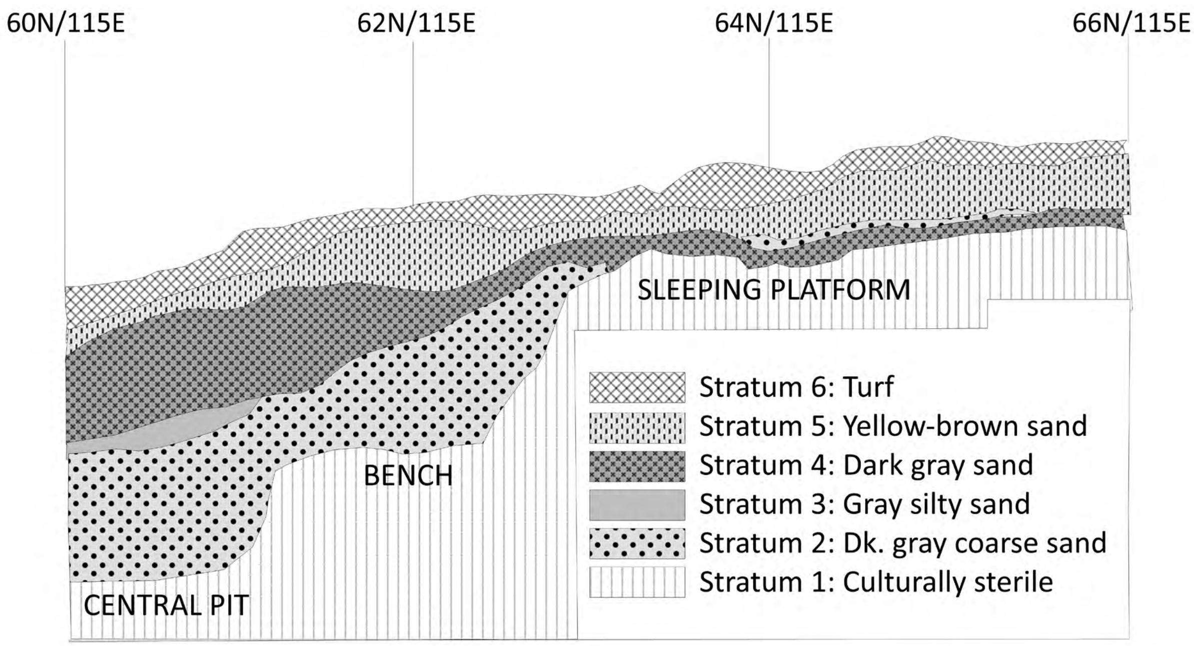

FIGURE 84. Stratigraphic profile of House 1, Locality B, at Diyaaguna.éit, showing a two-step foundation with central pit, bench, and sleeping platform levels (redrawn from Davis 1996: fig. 44). The profile extends from 60–66 m north at 115 m east of site datum.

Based on 19 radiocarbon dates from different areas and levels of the site (Davis 1996: table 8), Davis suggested that the original village was confined to Locality A, with a gradual shift in residence over the succeeding centuries to Localities B and C. Tlingit occupation during the eighteenth and early nineteenth centuries was principally at Locality B, where a row of lineage houses was constructed along the bank of Tawah Creek (Davis 1996:303–305). These data suggest growth of the Diyaaguna.éit population over time. Hypothetically, if an original group of six houses at Locality A were inhabited by 8–12 people each, then the founding population would have been around 50–70. Oral tradition indicates that during the Tlingit Period Diyaaguna.éit was a fortified settlement with as many as eight lineage houses (De Laguna 1972:76–77), roughly corresponding to the larger house pits at Locality B and suggesting a population of about 150.

Artifacts

Artifacts from Eyak house floors and midden levels at Diyaaguna.éit represent a full tool kit for coastal forest living, although bone components that would be expected (e.g., harpoon heads, arrow points, fishhooks) were not preserved in the acidic forest soils. A summary of the types recovered is presented here (see Davis 1996:451–520).

Numerous complete and broken ground slate projectile points were found along with slate debitage and preforms indicating on-site manufacture. Points up to 11.5 cm long with barbed bases, medial ridges, and squared stems (Figure 85A, B) were probably endblades for sea mammal lances (Birket-Smith 1953:25) but might also have tipped spears for land hunting. This type is widely distributed in southern coastal Alaska as far west as Cook Inlet and Kodiak Island and is considered to be a horizon marker for 1000–1200 CE (De Laguna 1956, 1975; Clark 1974a, 1974b; Jordan and Knecht 1988; Betts et al. 1991). Smaller slate and chert endblades (Figure 85C–F) were points for arrows (De Laguna et al. 1964:138–141; Emmons 1991:127–128; Davis 1996:496–509).

Other tools included sharp-edged cobble spalls for cutting fish and scraping hides (Figure 85H); flaked stone scrapers; ground slate knives (Figure 85I); and a stone weight for a spindle used to twist mountain goat wool into yarn (Figure 85L). There were small planing adzes (Figure 85J,K) and large spitting adzes (Figure 86D) for woodworking as well as slate chisels, notched scrapers for shaving spear and arrow shafts, a stone hammer with hafting notches (Figure 85G), hammerstones, mauls, abraders, and whetstones. Ten small stone lamps for burning sea mammal oil were found inside the houses (Figure 86A–C). Organic artifacts, most recovered from a limited area on the oldest occupation floor at House 8, included a wooden arrow point, arrow shaft fragments, and pieces of spruce root basketry, matting, and cordage (Davis 1996:509–520). A few items fashioned from native copper were found, including knives, awls, and a bracelet.

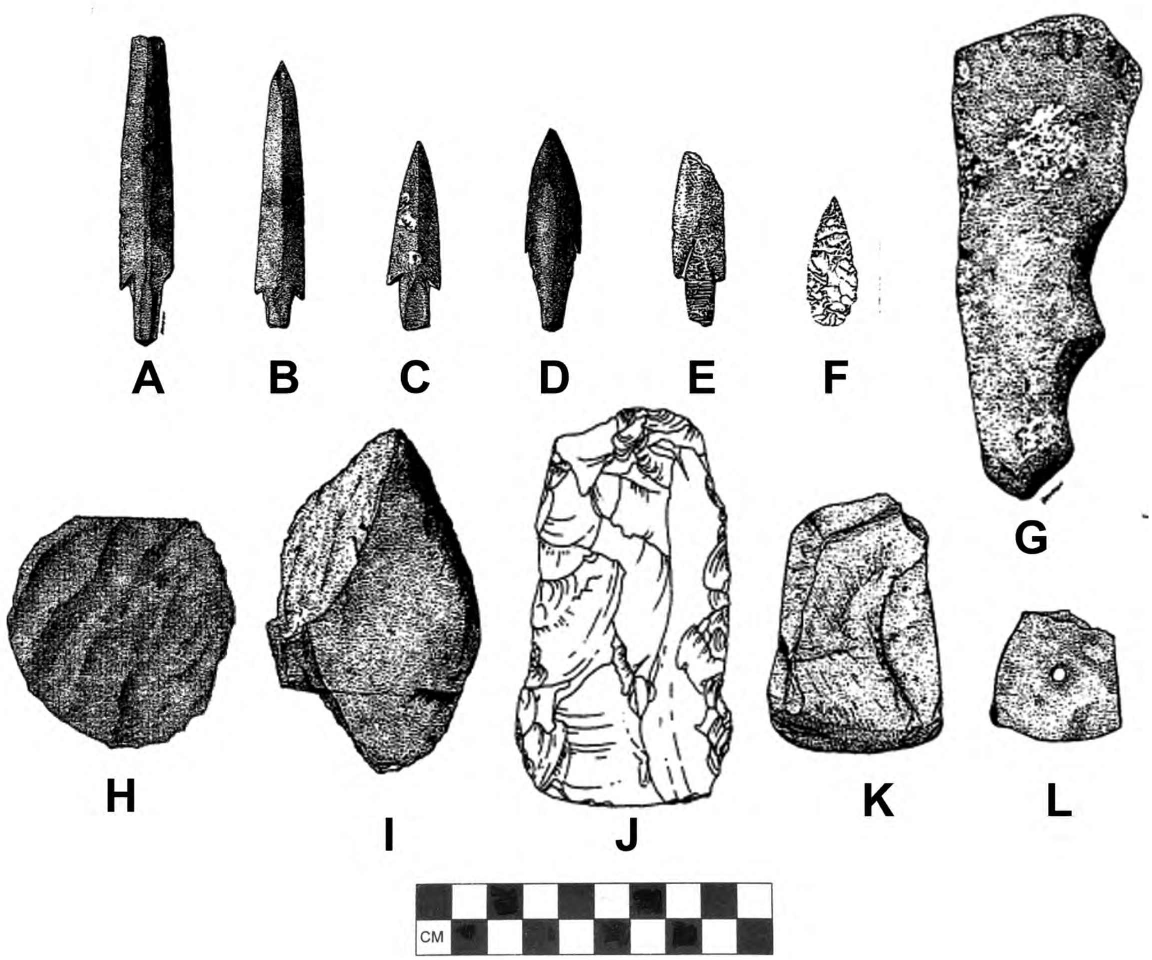

FIGURE 85. Selected artifacts from Diyaaguna.éit: (A–E) stemmed slate projectile points; (F) flaked chert projectile point; (G) pecked stone hammer or maul; (H) cobble spall knife or scraper; (I) ground slate knife; (J) flaked chert planing adze; (K) slate planing adze with ground edge; (L) weight for spindle. Drawings reproduced from Davis (1996: figs. 83–86, 90).

The Diyaaguna.éit artifacts are consistent with Eyak culture and point to migration of the founding population from coastal areas to the north, most likely around the Copper River Delta. Among the artifacts that show cultural connections in this direction are barbed slate endblades (both lance and arrow points), which are common in late precontact sites of Prince William Sound (De Laguna 1956), Cook Inlet (De Laguna 1975), the Kenai Peninsula (Betts et al. 1991; Crowell and Mann 1998; Crowell et al. 2008; Crowell 2010), and Kodiak Island (Clark 1974a, 1974b) but rare in Tlingit sites south of Yakutat (Davis 1990; Moss 1998; Crowell et al. 2013a). Pecked stone splitting adzes occur over a similar area after about 1000 CE (De Laguna 1956; Clark 1974a, 1974b). A similar distribution also applies to stone lamps, which were common at Prince William Sound (De Laguna 1956), Cook Inlet (De Laguna 1975), Kodiak Island (Heizer 1956; Knecht 1995), and across western and northern Alaska but have a much more limited occurrence in Southeast Alaska; they are known only from Groundhog Bay 2 on Icy Strait (Ackerman 1968) and Daax Haat Kanadaa near Angoon (De Laguna 1960). Native copper artifacts are a distinctive cultural signature of the Copper River, suggesting its Gulf of Alaska delta as the most likely original home of the Diyaaguna.éit people (Cooper et al. 2008).

Faunal Remains

Faunal bone was poorly preserved at Diyaaguna.éit, and only a small sample of 316 fragments was recovered, of which 92 were identifiable to species or generic level (Table 5; Davis

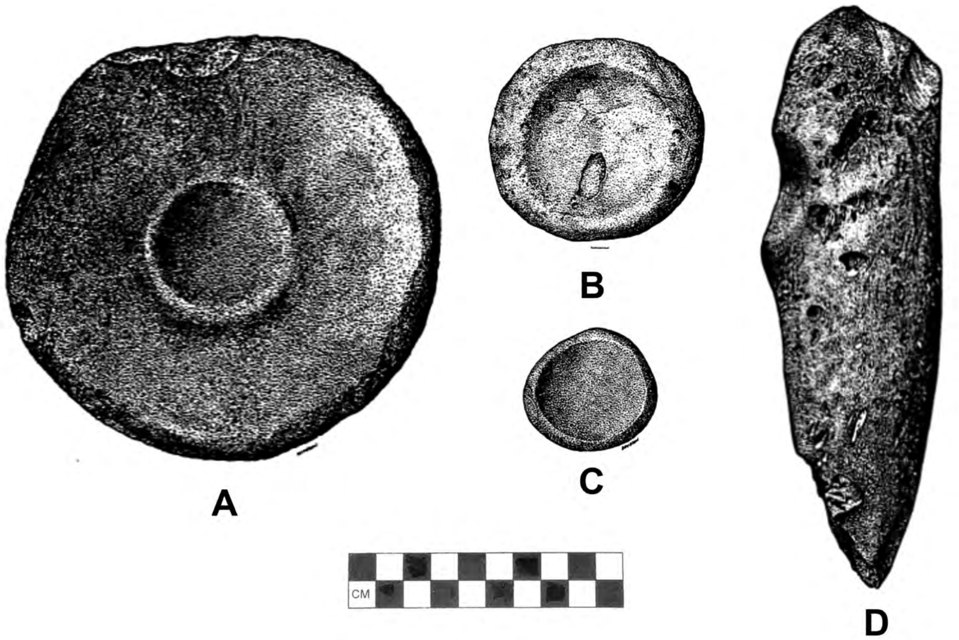

FIGURE 86. Selected artifacts from Diyaaguna.éit: (A–C) stone lamps; (D) splitting adze. Drawings reproduced from Davis (1996: figs. 91–94).

1996:531–539). Use of both marine and terrestrial environments near the village was indicated by elements of salmon, ducks, harbor seal, unspecified whale (probably a drift animal), porpoise, bear, beaver, marmot, Arctic hare, river otter, and probable mountain goat. Clams and other bivalves were not harvested, and the absence of acid-buffering calcium carbonate from shells explains the meager preservation of bone in the midden. Macrobotanical samples indicate use of hemlock (*Tsuga heterophylla*), spruce (*Picea sitchensis*), and alder (*Alnus rubra*) for the manufacture of wooden objects. Rolls of cedar bark (*Chamaecyparis* sp.) were found, probably for plaiting mats and baskets (Davis 1996:313–335). Seeds of *Sambucus* sp. (elderberry), *Rubus* spp. (salmonberry, cloudberry, nagoonberry), and *Vaccinium* spp. (blueberry, huckleberry, cranberry) were recovered, indicating summer berry harvesting in the surrounding forest and wetlands.

WULILAAYI AAN: DAUGHTER VILLAGE OF DIYAAGUNA.ÉIT

Oral tradition holds that Wulilaayi Aan (Tlingit, "shallow water town"; Thornton 2012:21) was founded on the Yakutat foreland by the Eyak Ł'uxedi and later taken over by the Tlingit Teik̲weidí (De Laguna et al. 1964:26; De Laguna 1972:76–77). It changed to Kwáashk'i K̲wáan ownership during the Western colonial period and was abandoned during the smallpox epidemic. Wulilaayi Aan might have been established by one or several house groups that moved away from the older village of Diyaaguna.éit, located 250 m to the southwest. The two communities existed side by side throughout the rest of their histories, suggesting close social ties.

Site Description

The archaeological site of Wulilaayi Aan (YAK-020) extends for approximately 150 m along the southwest bank of the Lost River (Davis 1996:189–192; no map available). When first built eight centuries ago, Wulilaayi Aan was situated on the Gulf of Alaska shore, but it has been elevated by isostatic uplift and is now about 300 m inland (Davis 1996:167–173). The site's environs provided access to wild foods from the ocean as well as the forests, rivers, and wetlands of the Yakutat foreland.

De Laguna tested the site in 1949, reporting 25–50 cm of charcoal-stained sandy midden containing glass beads and other Russian trade items (De Laguna et al. 1964:26), and Davis returned in 1987 to carry out deeper and more extensive excavations (Davis 1996). The oldest radiocarbon dates from the site, 1054 (1270) 1403 cal. CE (Beta 33030) and 1231 (1355) 1459 cal. CE (Beta 33029), attest to its founding during the Eyak Period, while more recent dates indicate continued Eyak occupation until the Tlingit arrived (Davis 1996: table 8). Artifacts from the upper strata, including abundant Russian trade goods, are consistent with Teik̲weidí and Kwáashk'i K̲wáan habitation during the eighteenth and early nineteenth centuries.

The tidally influenced Lost River has eroded away a substantial part of the archaeological deposits at Wulilaayi Aan. As a result, houses that may have formerly lined the riverbank have been lost while storage pits and other structures built in rear areas of the settlement have survived. Features visible on the surface include 14 rectangular cache pits and three intact house depressions (H-1, H-2, and H-3; Davis 1996:219–239). Based on radiocarbon dates from test pits, Houses 1 and 2 were built during the late Eyak or Ahtna Periods. Stone tools

TABLE 5. Faunal remains from Diyaaguna.éit (YAK-019). *Percentages are provided only for subtotals and totals. (Data are from Davis 1996: table 32.

Common name or descriptor	Taxonomic identification	Number of elements	Percent*
Fish			
Salmonids	Salmonidae	54	
Birds			
Duck	Anatidae	2	
Raptor or eagle	Accipitridae/Strigidae	1	
Sea mammals			
Seal	Pinnipedia	1	
Harbor seal	*Phoca vitulina*	1	
Whale	Cetacea	3	
Porpoise	Cetacea	2	
Sea otter	*Enhydra lutris*	1	
Land mammals			
Bear	*Ursus* spp.	4	
Brown bear	*Ursus arctos*	1	
Beaver	*Castor canadensis*	4	
Marmot	*Marmota caligata*	13	
Arctic hare	*Lepus americanus*	3	
River otter	*Lutra canadensis*	1	
Cervid	Cervidae	1	
Total identified species		92	29.11%
Indeterminate mammal		136	43.04%
Indeterminate bird		9	2.85%
Indeterminate fish		24	7.59%
Indeterminate other		55	17.41%
Total all elements		**316**	

were found in the lower levels while the upper levels contained glass beads, metal buttons, iron nails and other Russian period items. Both structures were relatively small (3–4 m long) with two-step foundations including a narrow bench around the central floor and elevated sleeping platforms. This style of construction was identical to the later Eyak houses at Diyaaguna.éit.

Storage caches at Wulilaayi Aan took the form of 1–2 m long rectangular pits with straight sides and flat bottoms. Although no traces of wood superstructures remained, it is likely that the caches had roofs and walls constructed from split planks. In two instances fiber matting was found on the floors (Davis 1996:232–239). A radiocarbon date from one of these features was 1277 (1382) 1484 cal. CE (Beta 33031), indicating construction during the Eyak Period.

Evidence of cremation was extensive at Wulilaayi Aan, with charcoal and burnt fragments of human bone found in shallow basins and deep rectangular pits across the site (Davis 1996:239–251). The traditional Tlingit practice was to lay a deceased person on a crib of logs and to feed the cremation fire with seal oil, afterward collecting the ashes to place in a grave house or memorial pole (De Laguna 1972:534–547; Emmons 1991:275–286). Most of the cremations at Wulilaayi Aan were found just beneath the modern forest mat, likely representing deaths during the smallpox epidemic. Radiocarbon dates indicate that pit cremation, a practice that has not been reported at other sites in the Northwest Coast culture area, began at Wulilaayi Aan as early as 1231 (1355) 1459 CE (Beta 33029) during the Eyak Period (Davis 1996:247–250).

Artifacts

Because of the site's eroded condition and relatively thin midden, as well as the modest extent of archaeological testing, fewer Eyak artifacts were collected than at Diyaaguna.éit. Types included cobble spalls, a flaked chert knife, a flaked chert side scraper, whetstones, splitting adzes, planing adzes, and ground slate projectile points with barbed bases. The Wulilaayi Aan collection included no stone lamps or native copper artifacts.

Faunal Remains

Archaeofaunal remains were poorly preserved at Wulilaayi Aan due to acidic soils and were fragmented due to burning, leaving only a small number of pieces (about 1% of almost 20,000) that could be identified. Taxa included salmon, ducks, crow, eagle, harbor seal, unidentified whale, porpoise, bear (brown and possibly also black), beaver, marmot, and probable mountain goat. Today the Lost River hosts large salmon runs, land mammals can be hunted and trapped on the foreland, and harbor seals are available throughout much of the year in the rivers and coastal lagoons.

SPOON LAKE 3: THE FIRST RESIDENTS OF POINT MANBY

Point Manby (Yaat'áak) lies at the western end of the glacial moraine that extends across the mouth of Yakutat Bay and was covered by ice until Malaspina Glacier began to retreat circa 1200 CE (chapter 1, this volume). The Point Manby area, including "Spoon Lake" (local name), was one of the earliest available locations for human settlement in outer Yakutat fiord (Figure 7).

In oral tradition the receding glacial front was located nearby when members of the migrating Ahtna Gineix̱ Ḵwáan paddled to Point Manby from Icy Bay in approximately the late fifteenth century (De Laguna 1972:241, 330). During the Gineix̱ Ḵwáan migration to Yakutat Bay over Malaspina Glacier some boys ran ahead of the group and saw blood from seal hunting on ice floes near Point Manby, indicating that people who lived nearby—possibly Eyak residents at Spoon Lake—had been hunting at the rookery (De Laguna 1972:237; G. Ramos Sr., 18 June 2012, IN-15). In later times, the sandbar at the mouth of Spoon Lake's outlet stream was known as a harbor seal haulout, where hunters rushed the animals from the ocean and killed them with clubs (G. Ramos Sr., 11 June 2011, IN-3). Beluga whales formerly frequented the Point Manby area and were reported to swim up the stream into the lake as late as the 1950s, although the river is now too shallow for this to occur (Raymond Sensmeier, personal communication, 12 March 2017).

Two small settlements with houses and cache depressions—Spoon Lake 3 (YAK-076) and Spoon Lake 2 (YAK-075)—were discovered during a 1996 Smithsonian Institution–National Park Service cultural resource survey of coastal Wrangell–St. Elias National Park and Preserve conducted as part of the Strategic Archaeological Inventory Program (Crowell 2011a). Radiocarbon dates from test pits indicated that these sites belonged to the earliest period of postglacial human occupation in Yakutat fiord. Neither settlement is named or specifically mentioned in surviving oral traditions. The Yakutat–Smithsonian project carried out mapping and excavations at Spoon Lake 3 from July 21 to August 6, 2014 (Figure 87).

Geomorphology and Environmental Setting

Spoon Lake, located 5.0 km east of Point Manby, is separated from Yakutat Bay by a 900 m wide beach bar (Figure 88). The Spoon Lake 3 site is situated 90 m south of the lake in spruce–hemlock forest with an understory including devil's club, salmonberry, blueberry, and ferns. Surrounding areas of the Malaspina foreland are a mosaic of woodlands, lakes, streams, and marshes.

The Spoon Lake bar began as a beach spit that grew to the northeast through the deposition of sand and gravel discharged by Manby Stream and carried along the shore by ocean currents. The growing spit extended across a small inlet, barring it off to create a saltwater lagoon that later became Spoon Lake as the result of isostatic uplift. The oldest living spruces at the southwest end of the bar near Spoon Lake are estimated to be 400–500 years old while trees to the northeast near the mouth of Spoon River are <150 years as determined by coring, an age trend that tracks extension of the spit with a lag of a century or more before germination of the trees. When the Spoon Lake 3 settlement was established in the late thirteenth century it was probably situated on the leading edge of the spit, as indicated by an old shoreline that skirts the edge of the site at 3–4 m above the modern lake. Few if any trees would have been present at that time, but archaeological charcoal from Spoon Lake 3 indicates that willow, birch, balsam poplar, and spruce were present by the mid-fifteenth century.

Site Description

The Spoon Lake 3 site covers an area of approximately 100 ×150 m on terrain that slopes up from the old lagoon shoreline to a 2 m high ridge (Figure 89). Surface features include House 1, a rectangular depression (8 × 6 m and 0.6 m deep) at the east end of the site; House 3, a smaller depression (7 × 5 m and 0.5 m deep) adjacent to House 1; and House 2, a deep, subrectangular house pit (9 × 9 m and 1.6 m deep) on the crest of the ridge (Figure 90).

Fifteen surface pits interpreted as storage caches (Features A through O) are circular to rectangular in outline, 1.0–2.5 m in diameter/length, and 0.4–0.7 m deep (Figure 90). Thirteen are

FIGURE 87. Excavation of House 1 at Spoon Lake 3 (YAK-076), July 2014, view to northwest. The spruce–hemlock forest has grown since the site was occupied 600–800 years ago. Photo © Smithsonian Institution.

on the slope below House 2, and two are near Houses 1 and 3. Shovel tests indicate that a 20 × 30 m area of cultural midden ≤20 cm deep surrounds Houses 1 and 3, containing charcoal-stained sand, fire-cracked rock, stone tools, debitage, and a few fragments of burnt bone. A buried cache pit, not visible on the surface, was found in this midden adjacent to House 1. Two additional small middens ≤10 cm deep were found near House 2.

Based on mapping and subsurface testing, the vicinity of House 1 and House 3 was interpreted as a warm-season residential zone adjacent to the former lagoon. The two dwellings were built next to the old shoreline, and activities that took place outside the houses, such as processing fish and game, cooking, scraping hides, and making stone tools contributed to buildup of the surrounding midden. A winter occupation zone was located on higher ground to the west, where House 2 was constructed inside a deep pit for insulation against the cold, and numerous storage caches were built close by to hold supplies of preserved foods.

House 1

The surface contours of House 1 and the area excavated in 2014 are shown in Figure 91. A 16 m^2 block of 1 × 1 m excavation units was aligned on a bearing of 310° north to match the orientation of the house, covering about 80% of the interior and extending through the south wall into the midden. The laser mapping instrument was set up over the 1996 datum near the southwest corner of the house to record the excavation. Squares were named for their northwest grid corners, for example, 4N/1E (4.0 m north, 1.0 m east).

Post-occupation soil layers covering the house pit were stratum 1, consisting of 4–5 cm of A-horizon humus, and stratum 2, 6–10 cm of mineral-leached B-horizon gray silt. Stratum 3 below was mineral-stained, C-horizon coarse sand interlayered with charcoal, fire-cracked rock, and other cultural deposits. Excavation of stratum 3 by 10 cm levels revealed a relatively rock-free central house floor with a pit hearth

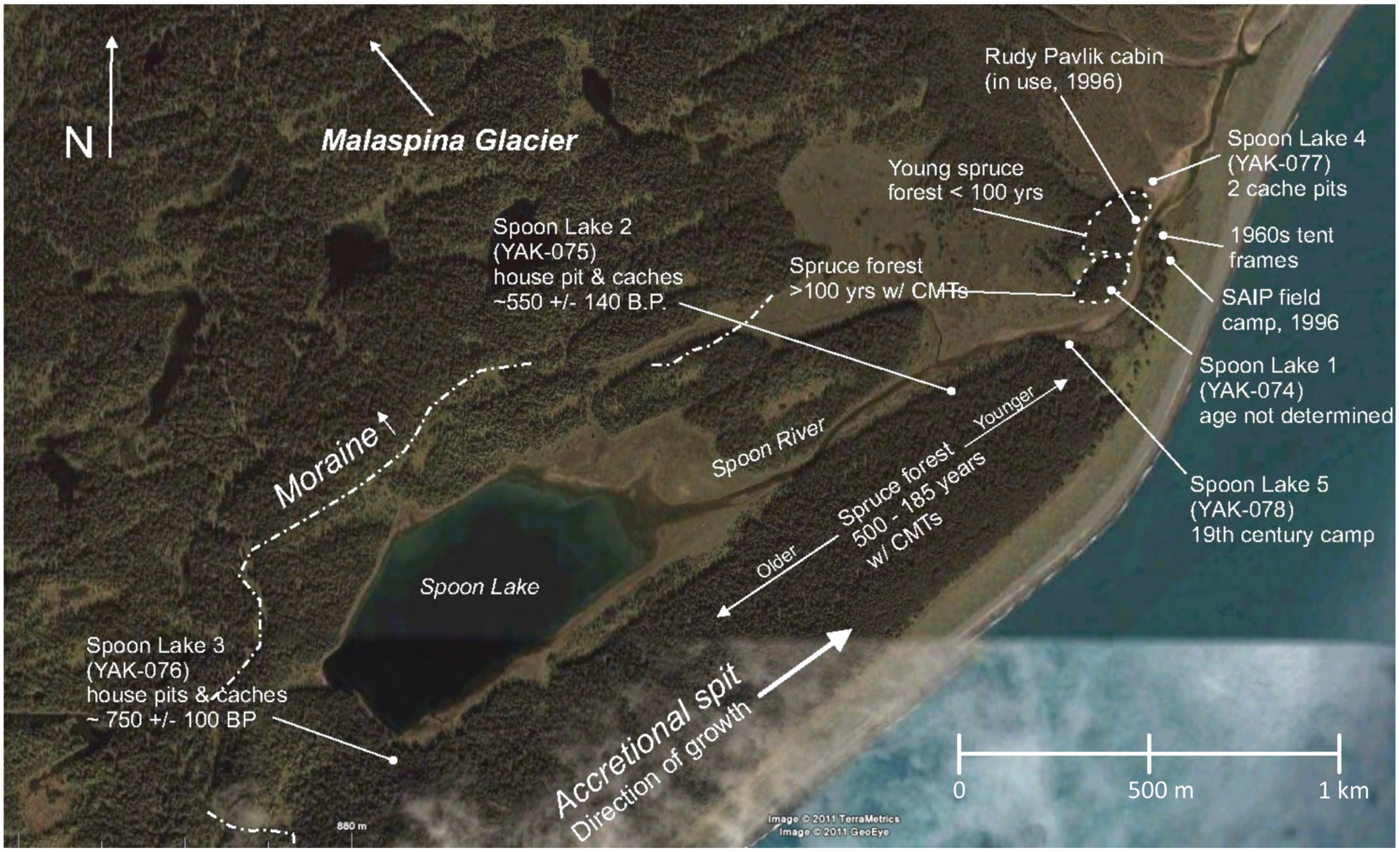

FIGURE 88. Geomorphology and archaeological site locations in the Spoon Lake area, Yakutat Bay, and the Strategic Archaeological Inventory Program (SAIP) camp. Culturally modified trees (CMTs) are noted with forest ages. Google Earth satellite image, 9 August 2007. © 2011 TerraMetrics and GeoEye.

near its center (Figure 92). This hearth (Subsurface Feature 3, SF-3) was 40 cm deep by 30 cm in diameter, filled with layers of charcoal, and encircled by fire-cracked cobbles. Above the house floor were approximately 40 cm of C-horizon sand containing little cultural material other than scattered fragments of charcoal and fire-cracked rock, interpreted as post-occupation fill.

An elevated bench of packed sand (25–30 cm high, 50–70 cm wide) was found to surround the central floor (Figures 92, 93). On the bench were discrete concentrations of charcoal and fire-cracked rock, designated as subsurface features SF-5, SF-6, SF-7, SF-8, SF-9, SF-10, and SF-11. A large slate slab (80 cm long) that might have served as a table, with a smaller supporting slab beneath it, was in situ on the bench. In Figure 93, SF-6, SF-5, and the rock slab can be seen at 70–75 cm below datum, with the central floor and pit hearth (SF-3) visible below at 85–95 cm below datum. The edge of the bench is demarcated by a color shift from black, charcoal-stained sand to clean, reddish sand fill overlying the central floor.

A stratigraphic cross section of the house reveals other aspects of its construction and history (Figure 94). The A-horizon humus (stratum 1, black–gray, Munsell color 2.5) and B-horizon silt (stratum 2, very dark gray, Munsell 7.5 3/1) form the uppermost strata, underlain by C-horizon stained sands (stratum 3, dark brown, Munsell 7.5 YR 3/4) containing lenses of charcoal and fire-cracked rock. The south edge of the house pit is demarcated by a 45 cm vertical wall cut extending from the old ground surface to 75 cm below datum, level with the bench. Midden deposits slumped or were shoveled into the house after it was abandoned, burying the base of this wall. The cross section shows the face of the bench along the east side of the house and layers of charcoal, fire-cracked rock, and greasy sand that accumulated on its surface during occupation. About 15 cm of these deposits underlay the rock slab (only the larger top slab is visible on the drawing), indicating that it was installed late in the occupation period. The profile shows several thin lenses of charcoal and fire-cracked rock beneath the bench in C-horizon sands, suggesting that the bench may have slumped or been widened over time

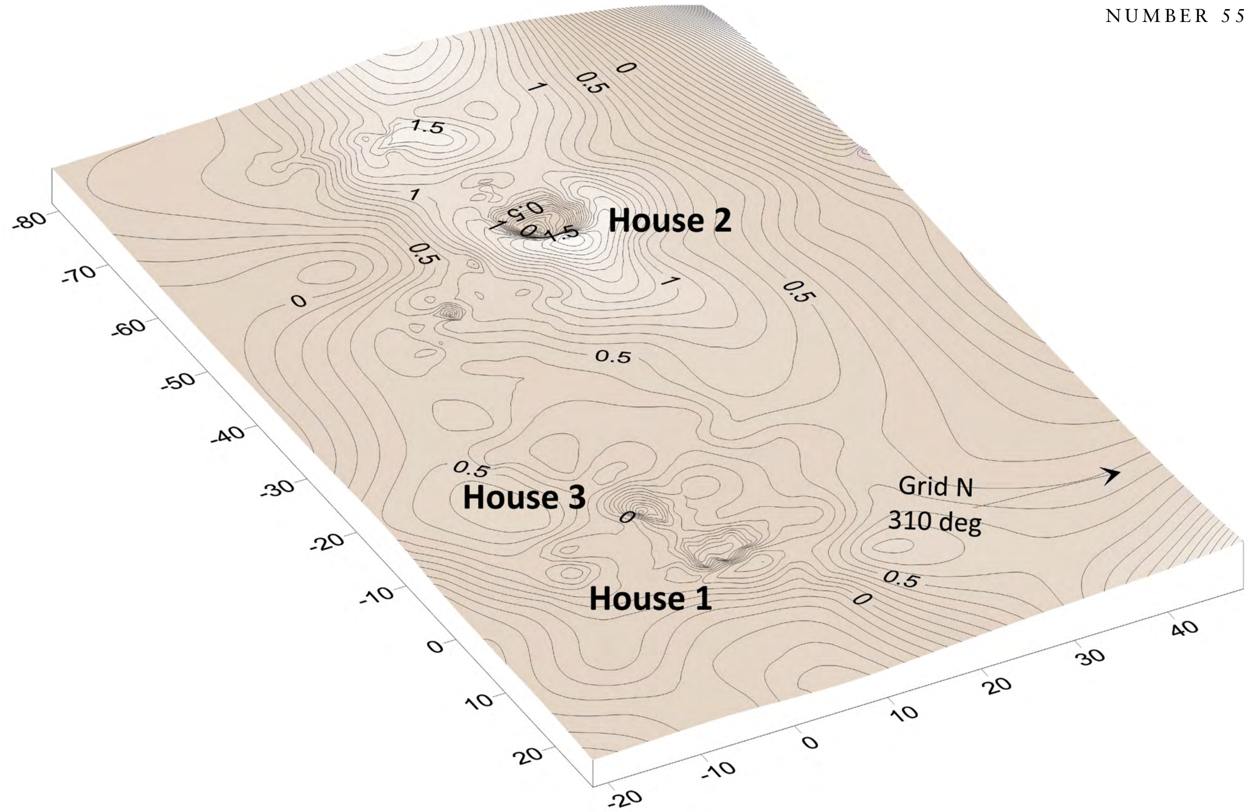

FIGURE 89. Topography of the Spoon Lake 3 (YAK-076) site including Houses 1, 2, and 3. The view to the west has the same orientation as Figure 87. Axis units are 1.0 m and the contour interval is 10 cm. The mapping grid was oriented on a bearing of 310° north. © Smithsonian Institution.

toward the center of the house, covering older floor deposits. At the base of the cross section is culturally sterile brown beach sand (Munsell 7.5 YR 4/4). A basement level of beach cobbles lies at 140 cm below datum.

Most artifacts and chert debitage from inside the house were found on the bench rather than on the central floor or in the fill. These included ground slate projectile point fragments, a double-ended greenstone chisel, chert microblade cores, chert gravers, and a cobble spall. The horizontal distribution of artifacts and debitage is shown in Figure 95, and the vertical distribution of artifacts in Figure 94, demonstrating their strong spatial association with the surface of the bench. A few tools (hammerstone, cobble spall scrapers, microblade core) were found next to the central pit hearth (SF-3). This pattern suggests that most tool-using and tool-making activities took place on the bench although the low incidence of artifacts in the center of the house might also have resulted from cleaning of the floor by the residents.

The construction of House 1—with a relatively shallow sunken floor, central hearth pit, and low earthen bench around the perimeter—resembles House 9 at Diyaaguna.éit, an intermediate Eyak Period style (Davis 1996). However, in the structures at Diyaaguna.éit and Wulilaayi Aan, fires were built only in the central hearth, not around the perimeter of the house on top of the bench as in House 1 at Spoon Lake 3. A plausible interpretation of this unusual pattern at House 1 is that it was a smokehouse, equivalent to historic Yakutat structures used for curing meat and fish on racks above smoldering fires, and also occupied as a summer dwelling (De Laguna 1972:302–304). The thin hearths on the House 1 bench (Figure 93) are consistent with low-temperature smudge fires whereas hearths for cooking and heating were typically contained in well-formed rock enclosures or pits. Some historic smokehouses had plank walls and roofs and post-and-beam frames, while others, like those constructed at the Disenchantment Bay sealing camps, had pole frames covered with strips of spruce bark (Figure 46). The latter interpretation is suggested for House 1, principally because there was little evidence of interior posts that would be needed to support a heavy plank or sod-covered roof.

Three AMS radiocarbon dates from House 1 (Table 6) indicate that it was occupied during the early to mid-fifteenth century. The dates were 1415 (1434) 1451 cal. CE on *Picea* (spruce) charcoal from bench hearth SF-11 (PRI-5595); 1433 (1456) 1607 on conifer charcoal from bench hearth SF-6 (PRI-5596); and 1428 (1448) 1474 cal. CE on Salicaceae (willow) charcoal from the central pit hearth SF-3 (PRI-5597; Kováčik 2017). The latter sample included two seeds of elderberry (*Sambucus* sp.).

TABLE 6. Radiocarbon dates and palaeobotanical identifications for Spoon Lake 2 (YAK-075) and Spoon Lake 3 (YAK-076). Accelerated mass spectroscopy = AMS; Beta = Beta Analytic Radiocarbon Dating Laboratory (Miami); PRI = Paleoresearch Institute (Golden CO); Subsurface Feature = SF; n.d. = not determined; a dash (—) indicates data not applicable.

Sample number	Context	Botanical ID	Standard ^{14}C date	AMS ^{14}C date	2-Sigma calibrated date	Median date	$\delta^{13}C$ (0/00)
			SPOON LAKE 3 (YAK-076)				
Beta 96769	House 1 midden SF-12	n.d.	750 ± 100	—	1045–1406 CE	1257 CE	–25.0
PRI-5595	House 1 SF-11	*Picea*	—	477 ± 22	1415–1451 CE	1434 CE	–23.9
PRI-5596	House 1 SF-6	Conifer twig	—	422 ± 22	1443–1607 CE	1456 CE	–26.2
PRI-5597	House 1 SF-3	*Betula, conifer, Picea, Salicaceae, Sambucus*	—	439 ± 22	1428–1474 CE	1448 CE	–25.9
PRI-5598	House 2 test pit	*Conifer, Salicaceae, Populus*	—	422 ± 22	1433–1607 CE	1456 CE	–26.2
			SPOON LAKE 2 (YAK-075)				
Beta 96768	—	n.d.	550 ± 140	—	1180–1655 CE	1397 CE	–25.0

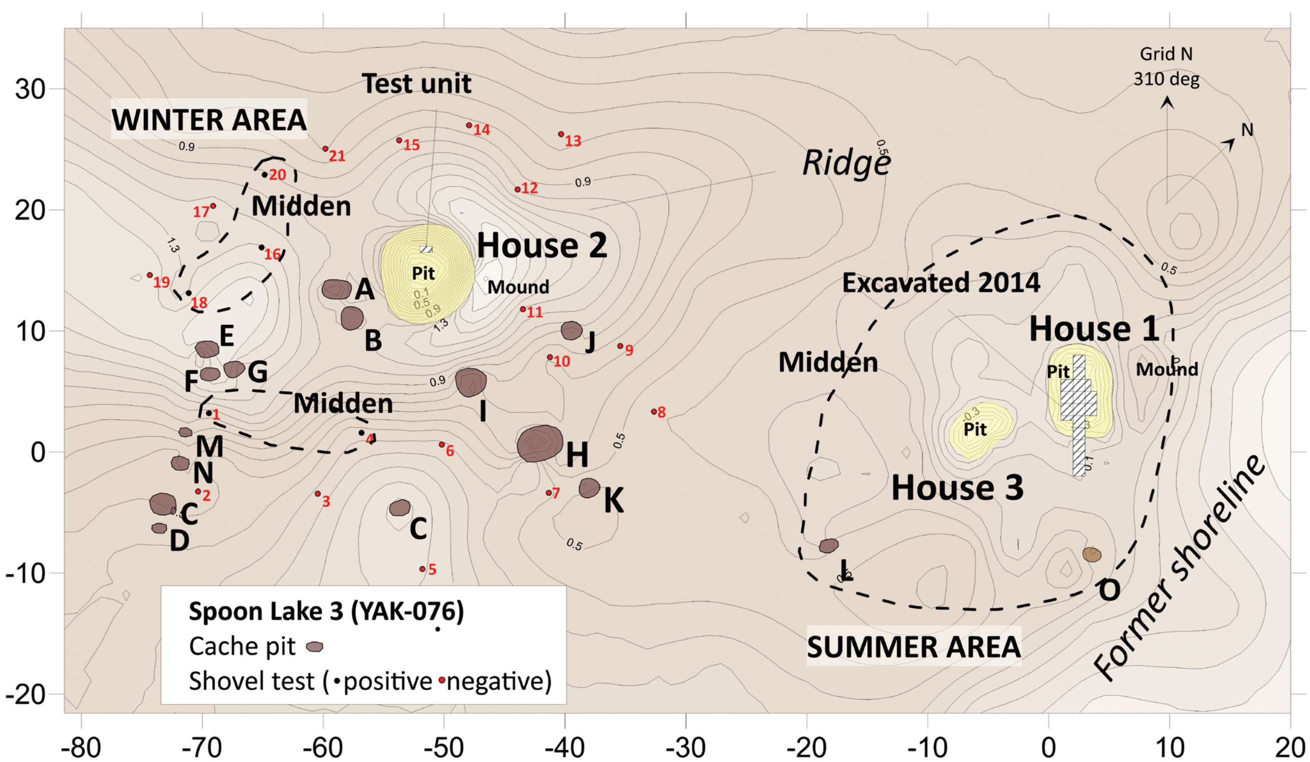

FIGURE 90. Plan map of the Spoon Lake 3 site showing summer and winter occupation areas, house depressions, cache pits, areas excavated in 2014, and numbered locations of shovel tests used to determine the extent of cultural deposits. Axis units are 1.0 m and the contour interval is 10 cm. © Smithsonian Institution.

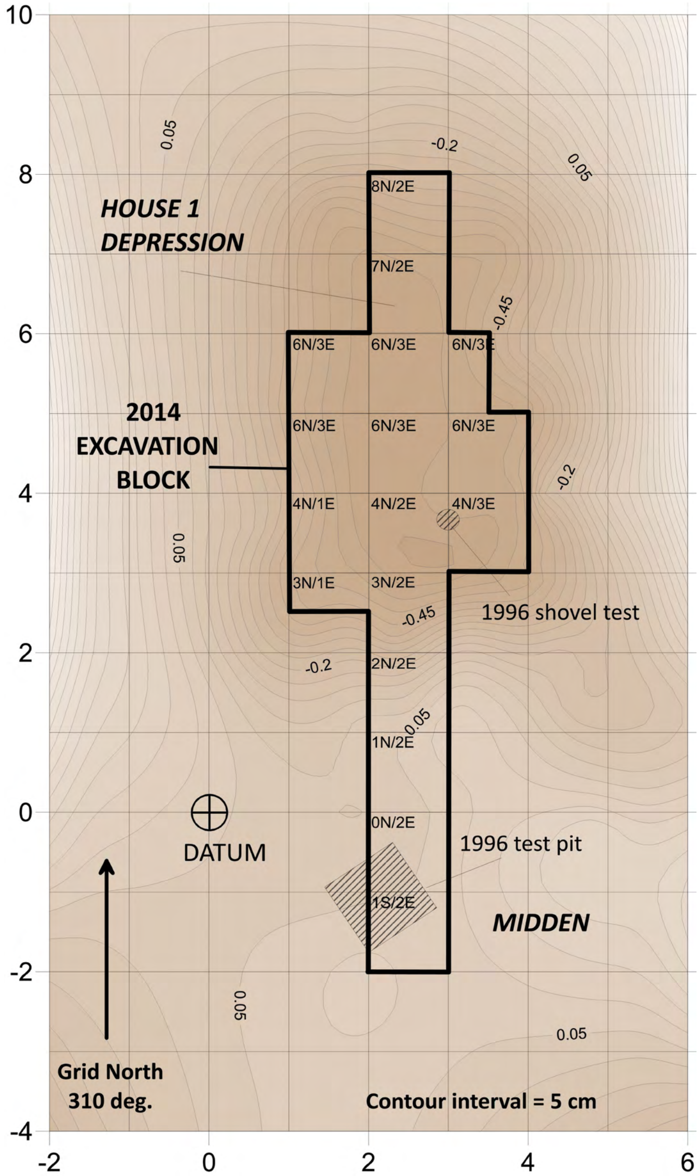

FIGURE 91. Surface contours of Spoon Lake 3 House 1 and units excavated in 2014. Axis units are 1.0 m and the contour interval is 5 cm. Units are named for their northwest corners. Datum is the central mapping point, with coordinates of 0.0 m north, 0.0 m east, and 0.0 m elevation. Locations of the 1996 midden test unit and shovel test into the house floor are also shown. © Smithsonian Institution.

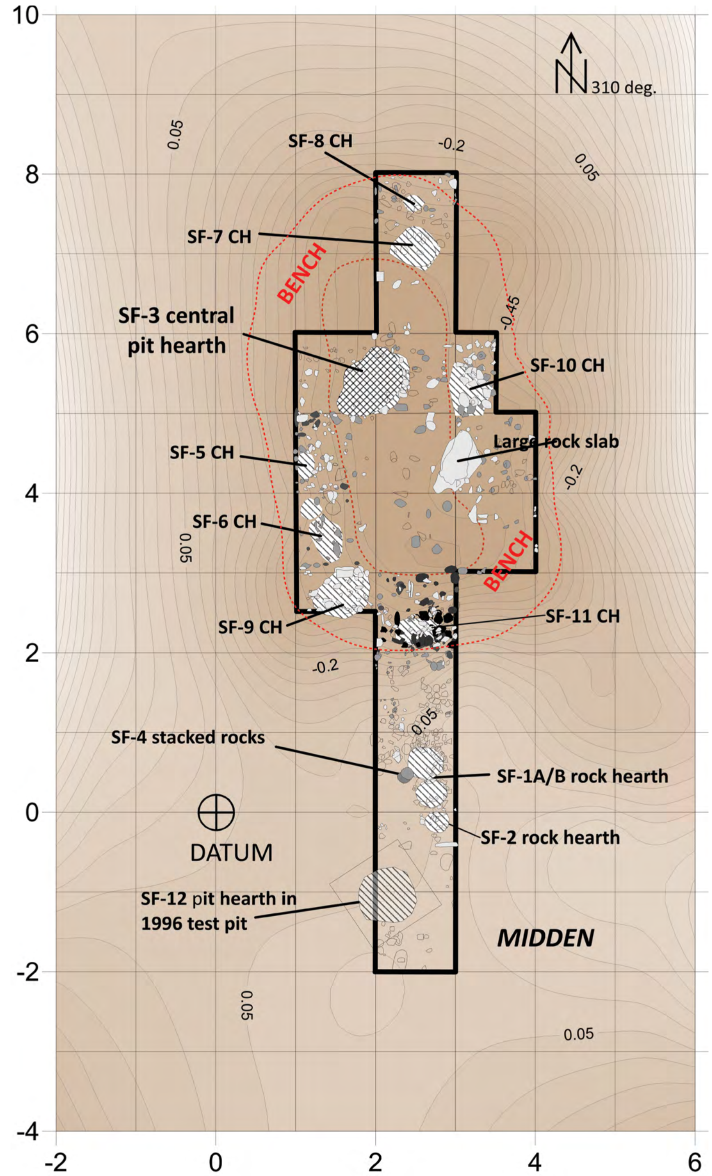

FIGURE 92. Spoon Lake 3 House 1 and the midden trench after excavation in 2014, showing subsurface features (SF) with charcoal (CH, hatched), rocks (shaded), and an earthen bench that surrounded the central floor. Axis units are 1.0 m. Rocks are shaded to indicate depth, with the darkest closest to the surface. Note the large rock slab, possibly a cutting table, on the bench at the east side of the house. The contour interval is5 cm. © Smithsonian Institution.

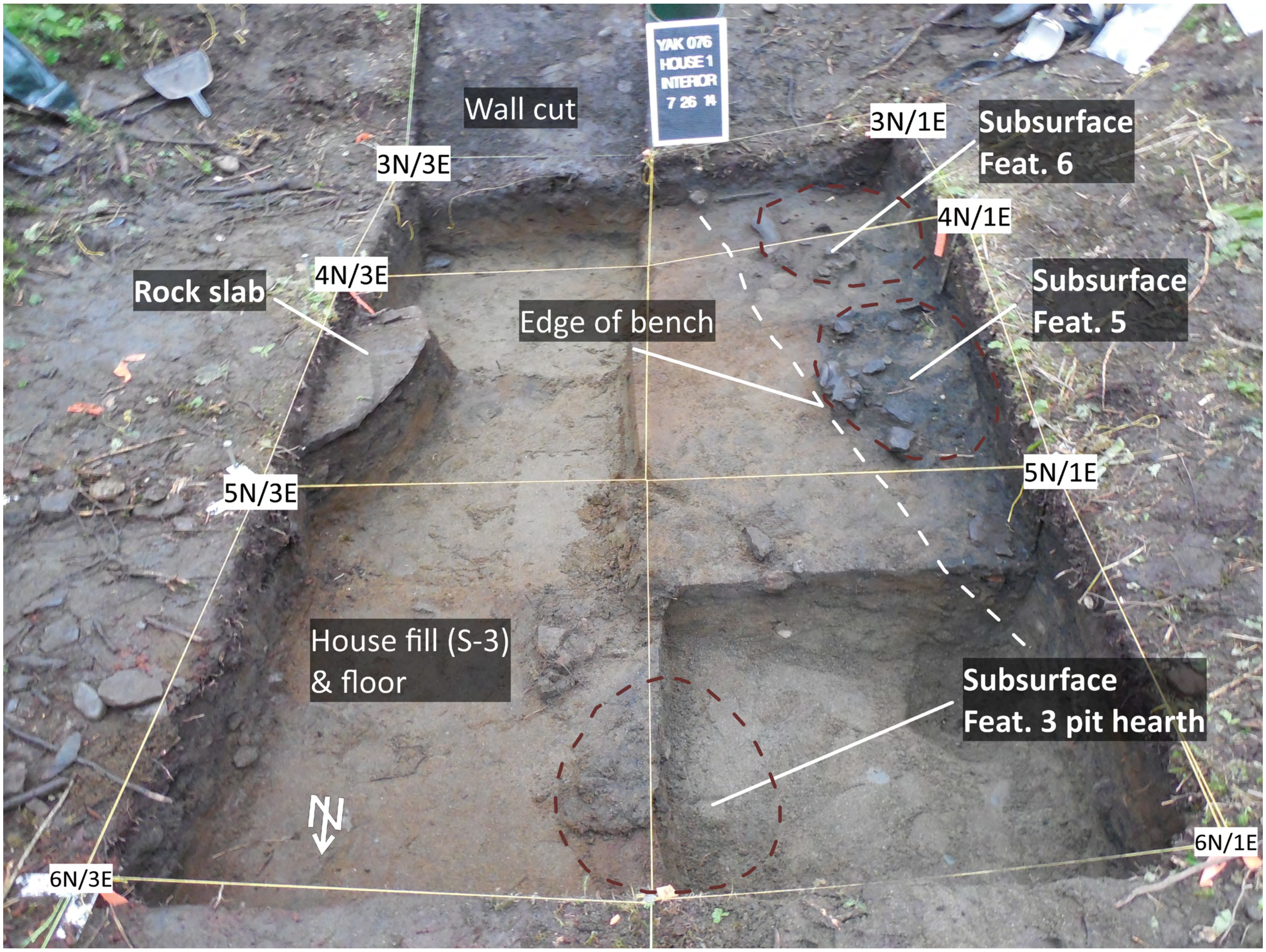

FIGURE 93. The Spoon Lake 3 House 1 central floor and surrounding bench after excavation, viewed toward grid south. The central hearth (SF-3) has been partially uncovered. Note the elevation difference and contrast in soil color between the bench (charcoal stained) and central floor and fill (mineral-stained reddish sand). Corner stakes are marked with coordinates for reference to the drawings. © Smithsonian Institution.

In an artist's depiction of summer life at Spoon Lake 3 based on the archaeological data (Figure 96), residents of House 1 (shown in a cutaway view) are slicing salmon on the stone table, tending smudge fires on the earthen bench, and smoking fish and meat on overhead racks. House 3 is shown behind House 1, based on the site perspective rendered in Figure 89. Outside in the midden area, a woman flenses blubber from a sealskin by use of a stone knife, another weaves a spruce root basket, a man unloads a hunting canoe, and children play on the shore of the lagoon. Scraped sealskins on stretchers lean against the houses. Cooking, processing of game, and manufacturing activities such as these were indicated by features and artifacts found during excavation of the midden trench. Visible in the distance is the roof of the winter house (House 2) and storage cache H with its wooden superstructure. The beach is treeless, representing the recently deglaciated landscape.

Midden Trench

The 2014 excavation was extended as a 4 m long trench through the south wall of House 1 into the exterior midden, intersecting the 1 × 1 m square 1996 test excavation (Figures 92, 95). As shown on the stratigraphic profile (Figure 94), modern humus and B-horizon silt overlay midden deposits consisting of sand, charcoal, and fire-cracked rock. Cultural deposits were up to 70 cm thick immediately adjacent to House 1, where a pit

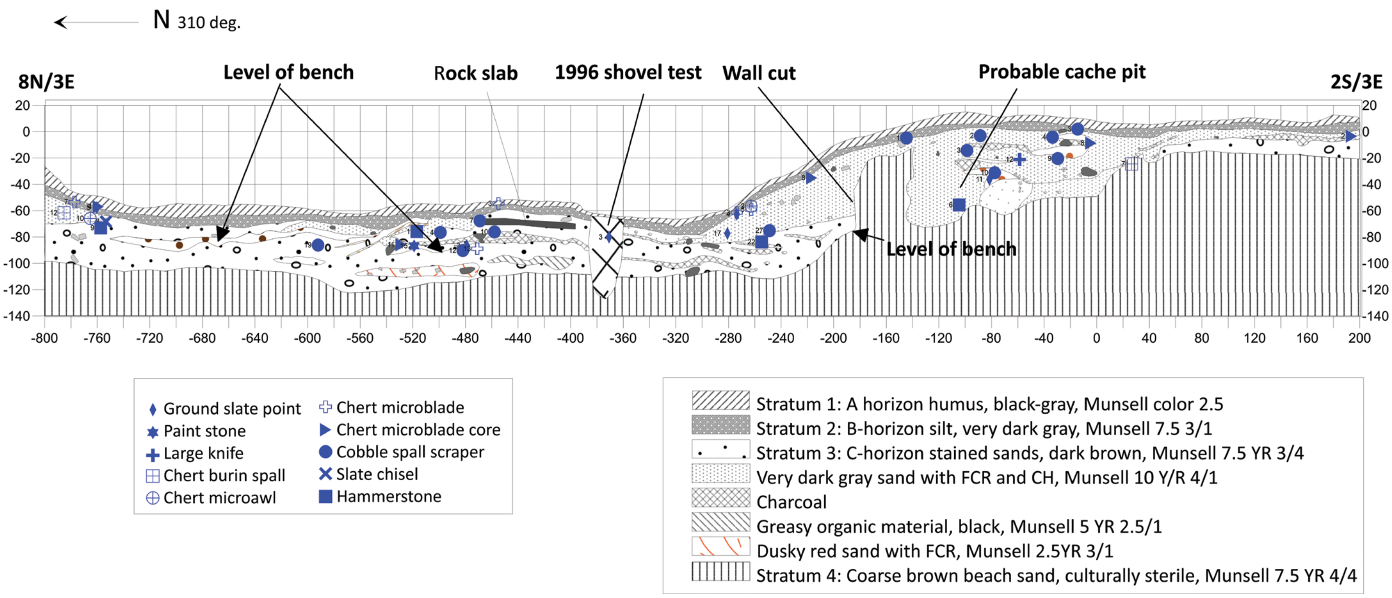

FIGURE 94. Longitudinal section of House 1 (north-south at 3 m east of datum) and the midden test trench, showing cultural strata and the vertical distribution of artifacts. Layers of charcoal (CH) and fire-cracked rock (FCR) are shown. The horizontal and vertical scales are in cm. The house has a one-step profile (central floor and bench), compared with the two-step profile (central floor, bench, sleeping platform) of some houses at Diyaaguna.éit (Figure 84). © Smithsonian Institution.

(1.6 m wide) had been excavated and backfilled with perturbed soils. This pit, which has a vertical north wall and sloping south wall, is interpreted as a possible storage cache. It was likely built prior to House 1 and filled with spoils from its construction.

Several cooking hearths were found in the upper midden deposits adjacent to House 1 and above the filled-in cache pit. These were SF-1A/1B, a pair of U-shaped cobble enclosures filled with charcoal (Figure 97), and SF-2, an oval, cobble-enclosed hearth 30 cm long (Figure 98). Subsurface feature 4 (SF-4) consisted of two water-rounded flat stones, each 10 cm long and 4 cm thick, arranged one on top of the other with a thin layer of charcoal between; the purpose is unknown (Figure 99). Stone tools found around these features included cobble spall scrapers, a large cobble spall knife, and a notched semilunar knife.

A hearth (SF-12) was discovered in the 1996 1 × 1 m square test excavation (Figure 95). Charcoal from this feature returned the oldest radiocarbon date at Spoon Lake 3, 1045 (1257) 1406 cal. CE (Beta 96769; Table 6). A concentration of gray chert debitage was found in and around SF-12 and extended into the adjacent unit to the south (1S/2E), marking an apparent locus of stone tool manufacture.

House 2

House 2, the winter house, is a deep, subrectangular depression (9 × 9 m square × 1.6 m deep) with a possible extension on its east side. It is likely that the original shape and depth of the structure have been obscured by slumping of the steep-sided pit. House 2 was not extensively investigated, but a 1.0 × 0.5 m test unit was excavated at the edge of an apparent shelf or bench in the bottom of the depression (Figure 90). Stratigraphy was similar to House 1, consisting of surface humus, B-horizon silt, and 10–20 cm of mineral-stained sand containing charcoal and fire-cracked cobbles. There was no layer of collapsed roof sods as would be typical of a Sugpiat winter dwelling (Knecht 1995), indicating that House 2 was probably roofed with planks.

An AMS radiocarbon date from *Populus* (balsam poplar) charcoal sampled at 33 cm below the ground surface in the House 2 test pit was 1433 (1456) 1607 cal. CE (PRI-5598). This result is identical to PRI-5596 from House 1 (Table 6), indicating that House 1 and House 2 were coeval. This finding supports the interpretation that Spoon Lake 3 was a year-round settlement where residents alternated between warm and cold season occupation areas.

Artifacts

The artifact assemblage from Spoon Lake 3 (Table 7) is distinctive. Compared with other Late Period archaeological sites in southern coastal Alaska there was very limited use of slate; instead, most tools were percussion flaked from chert or made on spalls of coarse-grained plutonic rock. Small, stemless ground slate projectile points—the only slate tools found at Spoon Lake 3—are identical to points from Palugvik in

TABLE 7. Spoon Lake 3 artifacts.

Artifact type	Material	#
Ground projectile points	Slate	6
Arrowpoint preform	Chert	1
Gravers/awls	Chert	2
Microblade cores	Chert	3
Microblades	Chert	3
Cobble spalls	Rhyolite	12
Notched cobble spall	Rhyolite	1
Large cobble spall knife	Rhyolite	1
Hammer	Rhyolite	1
Hammerstones	Rhyolite	2
Dish or paint stone	Metamorphic	1
Chisel	Greenstone	1
Debitage	Chert	544
Debitage	Slate	12
Total		590

eastern Prince William Sound near the Eyak–Sugpiat border, suggesting possible migration from that area to Point Manby (De Laguna 1956, 1990a). Chert microblades, cores, gravers, and a burin spall from Spoon Lake 3 have affinities with the Late Denali complex of the Alaskan interior (Shinkwin 1979; Dixon 1985; Proue et al. 2011), consistent with migration from the north and with a broadly Na-Dene, if not specifically Eyak, identity. Cultural connections to the south are relatively weak, although chipped stone gravers and burins occur in the Early Developmental (3000–1000 BCE) and Middle Developmental (1000 BCE–1000 CE) stages of Southeast Alaska (Davis 1989, 1990).

Ground Slate Projectile Points

Small ground slate projectile points (*n* = 6) are represented by one tip, four midsections, and a base (Figure 100). The reconstructed form is proportionally long and slender with an acutely angled tip, nearly parallel sides, a thin (<0.6 cm) diamond-shaped cross section, and a rounded base without stem or barbs. One example (Figure 100E) is slightly broader with a hexagonal cross section. While none are complete, the longest fragment (Figure 100A, length = 6.4 cm) was from a projectile point that would have been 8–9 cm long when intact. All have sharp edges with no signs of wear.

The most closely comparable Alaskan artifacts are from the Palugvik site on Hawkins Island in eastern Prince William Sound (De Laguna 1956:36–58). Occupation at Palugvik began as early as 761–49 cal. BCE (Mills 1994) and lasted until about

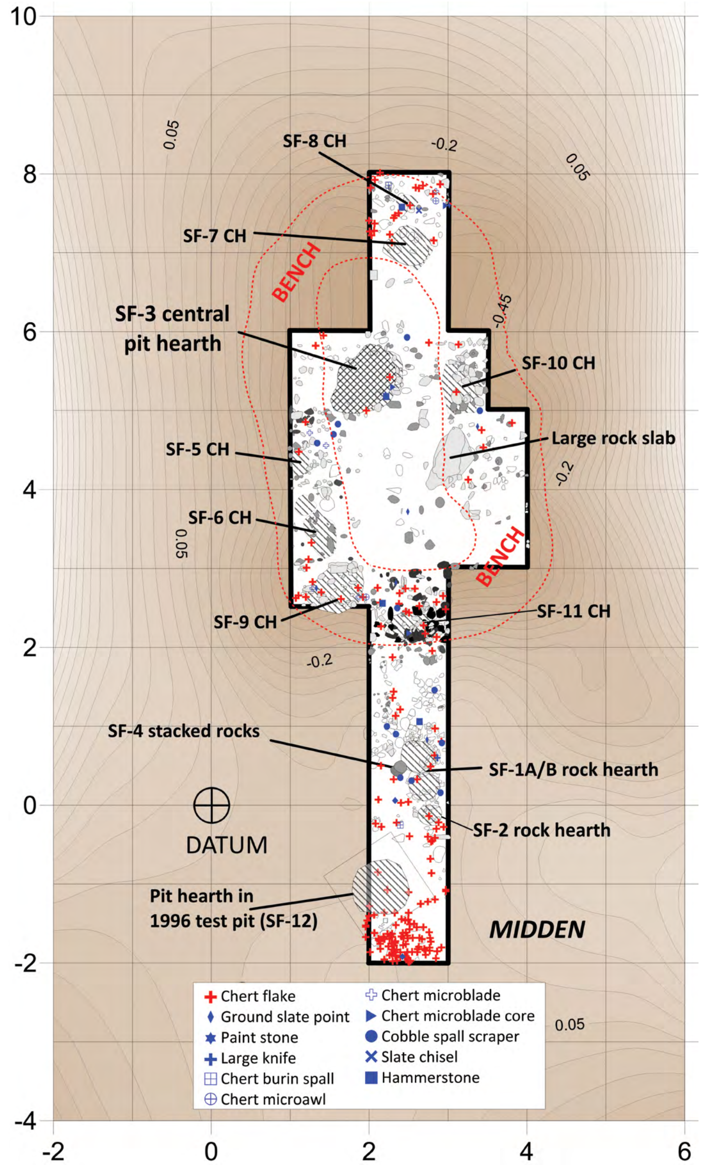

FIGURE 95. The horizontal distribution of artifacts and chert percussion flakes (debitage) at House 1, Spoon Lake 3. The axis units are 1.0 m and the contour interval is 5 cm. Stone tools and debitage inside the house are concentrated on the bench and around the central hearth; outside the house, they occur in association with hearth features, especially SF-12 in the 1996 test unit. © Smithsonian Institution.

1100 CE (Yarborough and Yarborough 1998). Slate projectiles very similar to the Spoon Lake 3 examples were found in all levels at Palugvik, varying in length from 7 cm to 27 cm (De Laguna 1956:158–163, plates 30, 31). The largest of the Palugvik points may have been used on whaling darts; coated with aconite poison, the fragile blade was designed to penetrate the animal's skin

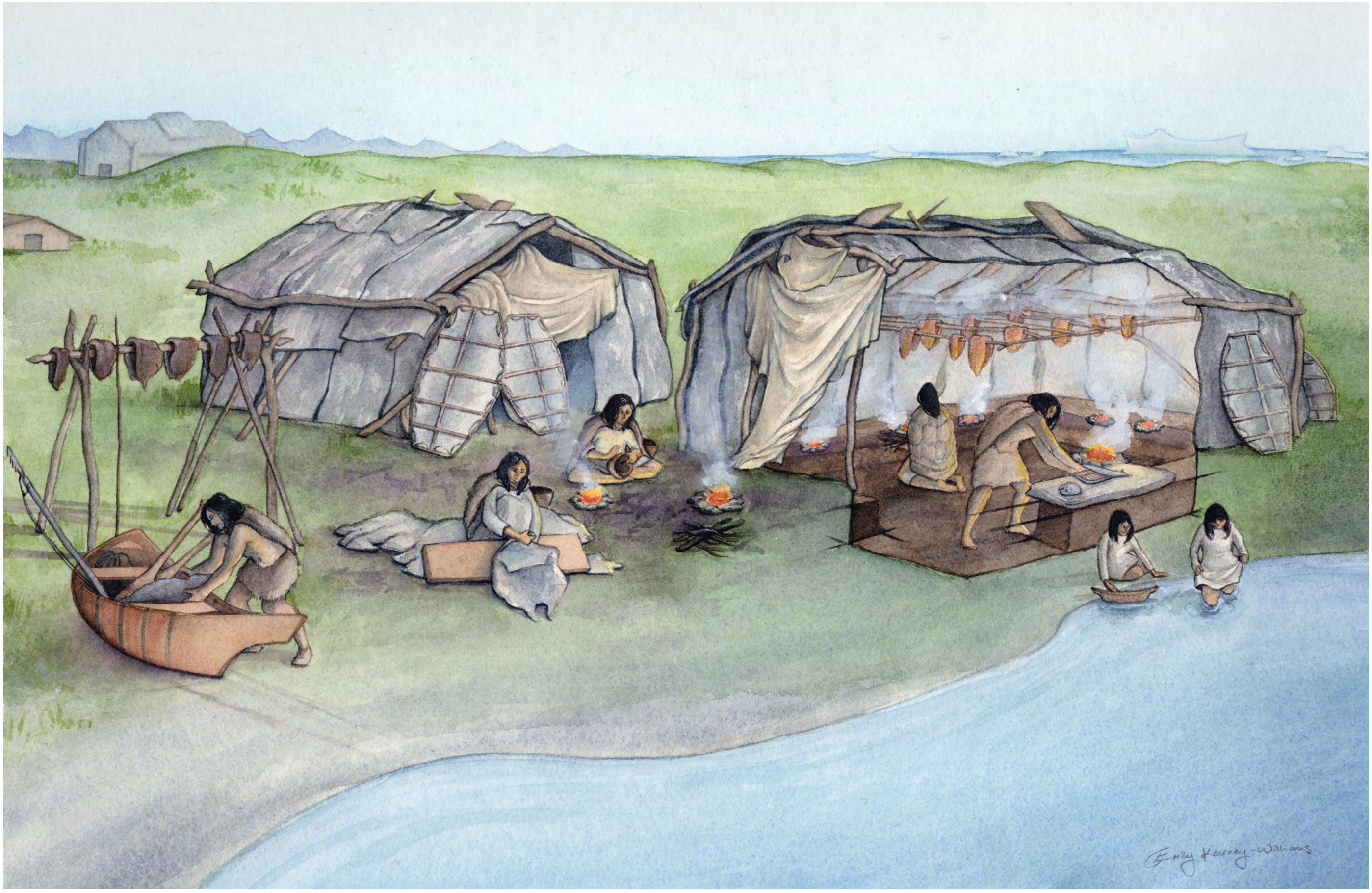

FIGURE 96. Reconstructed view of the Spoon Lake 3 settlement, derived from archaeological data. House 3 (left) and House 1 (right, in cutaway view) are shown as smokehouses/summer dwellings adjacent to the lake. Activities inside House 1 include cutting and smoking meat and fish, while other residents work and play outside. The large winter dwelling (House 2) and one of the storage caches (H) are visible on rising ground to the west. The treeless landscape reflects recent deglaciation. Illustration by Emily Kearney-Williams. © Smithsonian Institution.

and blubber and break off inside the wound, a method historically documented for the Sugpiat region and the eastern Aleutian Islands (Birket-Smith 1941; Crowell 1994). The relatively small slate points from Spoon Lake 3 and Palugvik (≤10 cm) were probably inserted in arrows used for hunting birds or other small animals.

Additional analogs for the Spoon Lake 3 artifacts are several “awl-like” ground slate points with rounded bases from the Tlákw.aan site in Yakutat fiord (De Laguna et al. 1964:127–129; see chapter 5, this volume). These have diamond-shaped or hexagonal cross sections but are proportionally wider than the Spoon Lake 3 examples. However, two narrow strips of sawn slate found at Tlákw.aan (De Laguna et al. 1962: fig. 14f) appear to be blanks for making points of the Spoon Lake/Palugvik type. There is no evidence for slate point manufacturing at Spoon Lake 3 and very little slate debitage.

Flaked Chert Arrow Point Preform

A roughly shaped preform for an arrow point was found in the midden just outside House 1 in 3N/2E (Figure 101I). It is made of opaque gray chert, has a rounded base, and is 2.5 cm long.

Chert Gravers or Awls

Two thumbnail-sized gray chert bifaces have sharp projections that indicate their use as gravers for inscribing wood or bone. The working tip on 20983 (Figure 101G) is relatively blunt whereas the tip on 21150 (Figure 101H) is needle sharp and suitable for fine etching or possibly as an awl for perforating skin or for tattooing. Chipped stone gravers were found in the upper component (1000 BCE–650 CE) at the Hidden Falls site on Baranof Island in Southeast Alaska (Davis 1989:276–278).

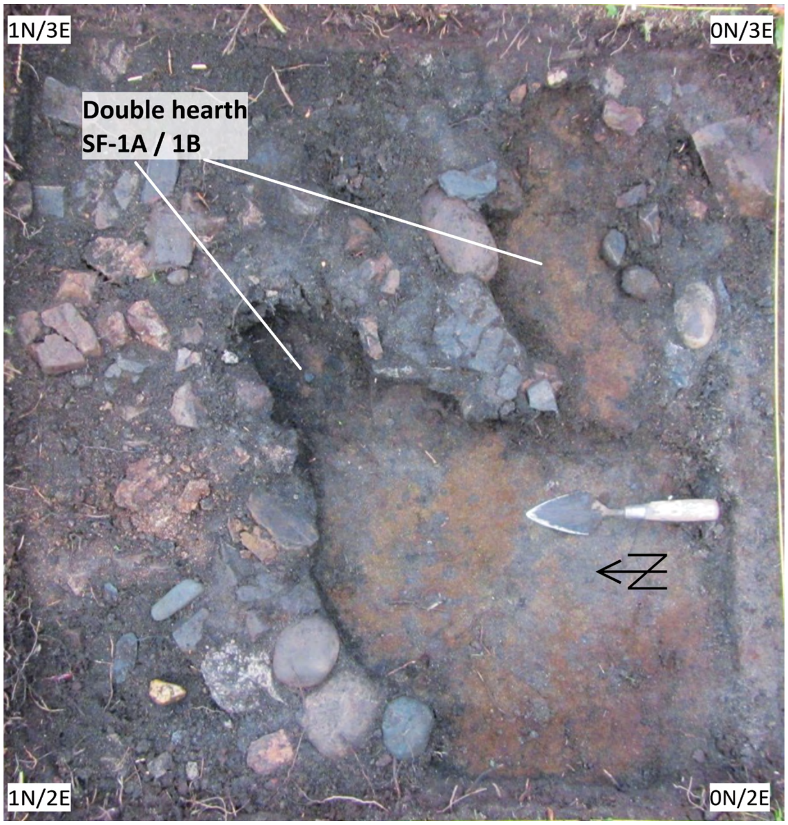

FIGURE 97. A double hearth outside House 1 (SF-1A/1B). Cobble spall scrapers, a large spall knife, and a hammerstone were found adjacent to this feature. Photo © Smithsonian Institution.

Microblade Cores

Three small microblade cores were recovered at Spoon Lake 3. Core 20999 is of red chert, 2.3 cm long, with a prepared platform and two parallel blade removal scars (Figure 101A). Core 20825 (Figure 101B) is of tan chert, 2.7 cm long, with a prepared platform and a single blade scar. Core 20853 (Figure 101C) is of gray chert, 3.7 cm log, with two removal scars.

Although early Holocene microblade traditions did not carry over into the late prehistoric period in the Sugpiat region (Clark 1984), southeastern Alaska (Davis 1990), or the northern Northwest Coast (Matson and Coupland 1995), evidence from Lake Healy Village and other sites in interior Alaska demonstrate ancestral Athabascan use of microblades during the last millennium, representing continuation of the Late Denali Complex (Dixon 1985). For example, chert cores and microblades found in the upper component of the Dixthada site near Tanacross were radiocarbon dated to the twelfth–sixteenth centuries CE (Shinkwin 1979:120–125), and obsidian microblades from the Hayfield site on the upper Kuskokwim River were associated with a calibrated date of 1450–1630 cal. CE (Proue et al. 2011). Both sites overlap in age with Spoon Lake 3 and support a Na-Dene, presumably Eyak origin of the Spoon Lake dwellers. Microblades and cores have not been found at any other Yakutat sites.

Microblades

Three linear flakes of grey translucent chert with longitudinal ridges were classified as microblades (Figure 101D–F) although they are very small (length = 1.2–1.6 cm).

Burin Spall

Artifact 20810 (Figure 101J) is a burin spall, struck longitudinally from a chert biface to create a squared-off working edge for shaping bone. Transverse chert burins and burin spalls are present in the upper component at Dixthada (Shinkwin 1979:125–126). Burins also occur in the upper component at Hidden Falls on Baranof Island, dated 1000 BCE–650 CE (Davis 1989, 1990:200–201).

Cobble Spalls

Cobble spalls (n = 12) are large flakes struck from water-rounded beach cobbles of rhyolite, andesite, and other plutonic rocks. Cobble spalls display water-worn cortex from the parent rock on one side and a bulb of percussion on the other. Cobble spalls were expedient hand tools (Figure 102) that served as skin scrapers, knives, or saws, and have been found at sites of all time periods around the Gulf of Alaska, in the Alaskan interior, and on the Northwest Coast (De Laguna 1956, 1960; Heizer 1956;

FIGURE 98. A small hearth in the midden activity area outside House 1 (SF-2). Photo © Smithsonian Institution.

FIGURE 99. A matched pair of waterworn cobbles with a thin layer of charcoal between them (SF-4); the purpose is unknown. Photo © Smithsonian Institution.

FIGURE 100. Small, unbarbed slate projectile points from Spoon Lake 3 including (A–B) tips, (C–E) midsections, and (F) a base. All are of smoothly ground black slate with medial ridges. Scans © Smithsonian Institution.

De Laguna et al. 1964; Clark 1974a; Shinkwin 1979; Davis 1989; Matson and Coupland 1995; Crowell and Mann 1998). Twelve cobble spalls with retouched or use-worn edges were recovered from House 1 and the House 1 midden, with a size range of 5–15 cm long (Figure 103).

Notched Cobble Spall

One cobble spall (length = 12.0 cm) was notched for hafting as a semilunar knife or scraper (Figure 104A). A slotted wooden handle would have been secured to the top of the spall with lashings that passed through the notches. The tool was found in midden deposits adjacent to House 1 and might have used for scraping or flensing seal hides. No modified spall tools of this type have been identified in other archaeological collections although notched crescentic knives made of slate are common.

Large Cobble Spall Knife

A large rhyolite cobble spall (length = 17.2 cm) was retouched around its perimeter to make a heavy-duty knife with a pointed tip and curved working edge (Figure 104F). The tool was found in the House 1 midden near the notched cobble spall tool, suggesting that the two artifacts might have been part of the same tool kit for processing animal hides and meat. The knife lacks evidence of hafting and may have been handheld. No equivalents were identified at other sites.

Hammer

A rhyolite beach cobble (length = 9.5 cm) has pecked or battered notches in four places around its perimeter and pecked concavities on both sides (Figure 104B). These modifications suggest possible hafting as a hammer, with the top of a wooden handle fitting into the central cavity and lashings passing through two of the notches. Battering damage during use may have caused the other two notches, or the tool may have been rehafted.

Hammerstones

Two small beach cobbles (21031 and 21149) with battered ends were classified as hammerstones.

Dish or Paint Stone

A flat, oval cobble (length = 11.4 cm) of fine-grained metamorphic rock has a smoothly worn concavity on one side (Figure 104D), suggesting use as a small dish or paint stone (palette) for grinding and mixing red ocher or other pigments (De Laguna et al. 1964:110). A small lump of red hematite or ocher was found in the midden.

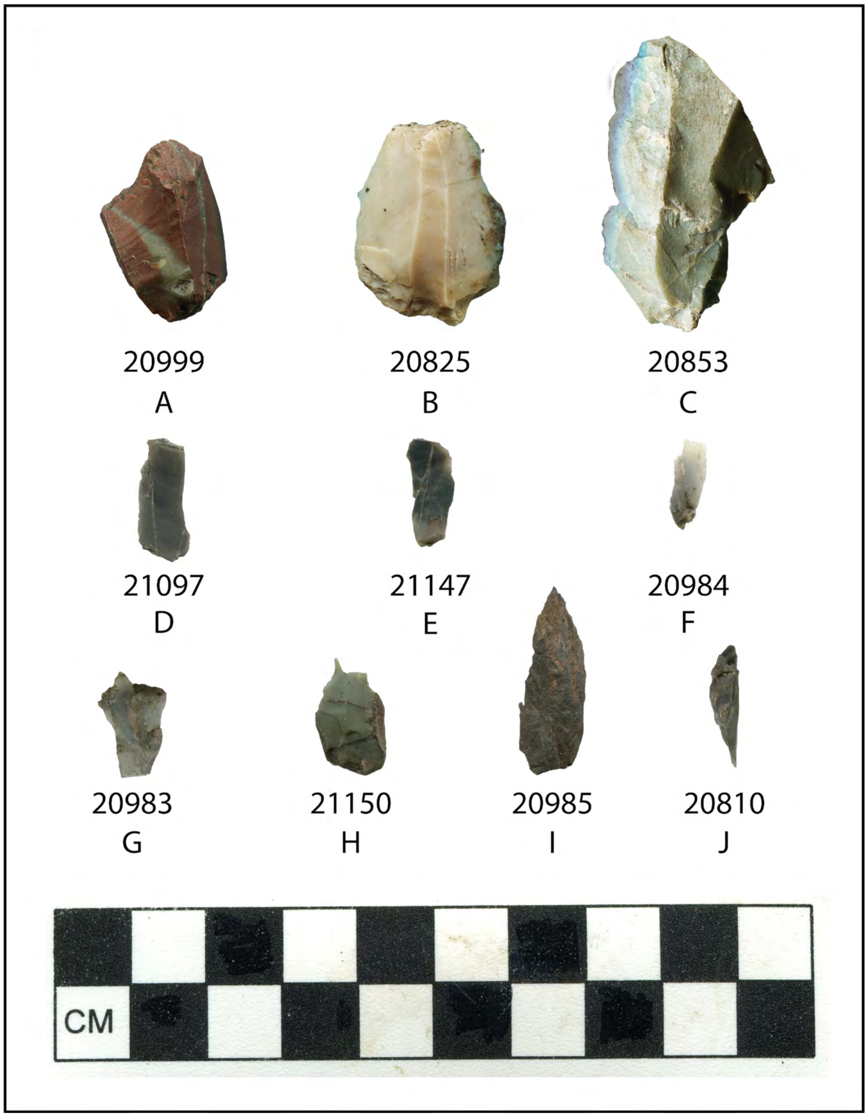

FIGURE 101. Chert microtools from Spoon Lake 3 including (A–C) microblade flake cores; (D–F) microblades; (G–H) gravers; (I) arrow point preform; and (J) burin spall. Scans © Smithsonian Institution.

Chisel

A handheld woodworking chisel (length = 14.4 cm) made of greenstone with smoothly ground cutting edges (0.9 cm wide) at both ends (Figure 104E) was found on the bench at the north end of House 1. Chisels occur at sites in Prince William Sound and Southeast Alaska (De Laguna 1956:118–120; De Laguna et al. 1964:95–98; Davis 1989, 1990), but the double-ended type appears to be unique to Spoon Lake 3. The narrow blades at both ends would have been useful for carving grooves in wood.

Whetstone

An oblong, water-rounded cobble of fine-grained igneous rock (length = 10.0 cm) appears to have been smoothed and worn by use as a whetstone (Figure 104C).

Chert Debitage

Chert debitage (*n* = 544), consisting of small thinning flakes and shatter, was recovered in House 1, the midden trench, and the 1996 midden test pit. Virtually all pieces were of a gray, translucent chert of unknown origin but included a small number in red and tan. Concentrations of flakes were found in and around pit hearth SF-12 and on the House 1 bench around SF-8, SF-9, and SF-11. The amount of debitage suggests on-site manufacture of flaked chert tools.

Slate Debitage

Fragments of slate (*n* = 12) were insignificantly represented at House 1, and no preforms or saw-cut pieces were found, suggesting that projectile points of this material (Figure 100) were manufactured elsewhere.

FIGURE 102. A cobble spall tool, held in the hand for cutting or scraping. Photo © Smithsonian Institution.

Faunal Remains

Bone preservation at Spoon Lake 3 was very poor andexcavations yielded only a few unidentifiable burnt fragments (*n* = 12). In the absence of usable archaeofaunal evidence, resources potentially available to the site's residents may be considered. Harbor seals were probably hunted on ice floes at the nearby glacier or at beach haul-outs in the Point Manby area, as recalled in oral tradition. The presence of elderberry seeds hints at plant gathering in the developing forest, and other marine and terrestrial animals and plants would have been available as the coastal ecosystem matured. Resources of the Spoon Lake area today include harbor seal, trumpeter swan and other migratory waterfowl, coho salmon, brown bear, moose, wolf, marten, and river otter. The surf-pounded, sandy ocean beach is not a productive intertidal zone and no clams or other shellfish were found at the site.

Site Discussion

Striking contrasts between the Spoon Lake 3 assemblage and the artifacts from Diyaaguna.éit and Wulilaayi Aan add unexpected complexity to the settlement history of Yakutat fiord. Spoon Lake 3 may represent a separate Eyak migration from coastal regions to the north around 1200 CE or the arrival of an unknown Na-Dene group from the Alaskan interior rather than territorial expansion by Eyak on the Yakutat foreland to the western shore of the enlarging fiord. Sugpiat occupation at Spoon Lake 3 appears less likely, given the lack of diagnostic traits other than ground slate projectile points similar to a type found at Prince William Sound.

Spoon Lake 3 represents pioneering use of the fiord ecosystem at an early period of its development. The area around Point Manby, although then newly deglaciated and restricted by the ice, was capable of supporting year-round residence by a group of perhaps 15–20 people. Winter and summer residences were built at the same location, implying that there was little or no seasonal movement between separate villages and camps as in later times, consistent with the limited dispersion of resource locales in the still largely glacier-covered fiord. Given the early stage of terrestrial succession, it is likely that marine resources such as harbor seals and salmon were the primary initial focus of food getting.

SPOON LAKE 2: POINT MANBY IN THE LATE EYAK PERIOD

Spoon Lake 2 (YAK-075) is located about 800 m northeast of Spoon Lake and 175 m south of Spoon River (Figure 88). Given the formation history of the Spoon Lake bar, the position of Spoon Lake 2 near its northeastern end would indicate that the site is younger than Spoon Lake 3.

Site Description

The largest living spruce trees in the vicinity of Spoon Lake 2 are 1.5 m or more in diameter and over 200 years old, with occasional rotten or toppled snags of older trees. Numerous trees with vertical scars left by the removal of bark strips are present in the surrounding forest, and in many instances, regrowth burls around the edges of the scars indicate that the bark was peeled away decades ago (Figure 105; Mobley and Eldridge 1992). The sap-rich cambium layer of hemlock and spruce bark was a traditional spring food of Yakutat residents (De Laguna 1972:406–407), and bark strips were also used as roofing material for summer shelters.

Spoon Lake 2 was discovered in 1996 during a Smithsonian Institution–National Park Service coastal survey of Wrangell–St. Elias National Park (Crowell 2011a). It occupies a 30 × 40 m area in a forest clearing covered by salmonberry, devil's club, and ferns (Figure 106). Cultural features include a rectangular house depression (House 1) measuring 5.0 m long, 3.5 m wide, and 1.1 m deep (Figure 107). A 1996 shovel test in the center of the house was negative for charcoal or other cultural material, suggesting brief occupation. Three bark-stripped trees are located nearby, including one on a standing dead snag. A rectangular storage pit (Feature 1) is located

FIGURE 103. Unmodified cobble spall tools from the Spoon Lake 3 site. Scans © Smithsonian Institution.

28 m southwest of the house and measures 2.6 m long, 2.2 m wide, and 0.6 m deep. Two other 0.8 m wide circular pits (Features 2 and 3are probably also cultural. Shovel testing defined two areas of midden ≤10 cm thick containing charcoal and fire-cracked rock.

Stratigraphy recorded in a 2 × 2 m square test pit in the southern area of midden included 4–5 cm of A-horizon organic forest soil; 1–5 cm of B-horizon grayish-brown silty subsoil; a cultural level 5–8 cm thick consisting of coarse reddish-brown C-horizon sand containing charcoal fragments and thermally fractured rock; and underlying sand and cobbles (Figure 108). No artifacts, bone, or debitage were found. A conventional radiocarbon assay of charcoal fragments (species not identified) from the cultural stratum yielded a date of 1180 (1397) 1655 cal. CE (Beta 96768; Table 6). This result indicates that Spoon Lake 2 was established about 150 years later than Spoon Lake 3. Bark-stripped trees in the vicinity are much more recent than the site, probably the result of early twentieth century harvesting.

Discussion

Although architectural details of House 1 cannot be determined without excavation, its size is consistent with dwellings at Diyaaguna.éit, Wulilaayi Aan, and Spoon Lake 3. The depth of the house (1.1 m) suggests that it was a winter dwelling, supported by the presence of storage caches. Unlike at Spoon Lake 3, there is no evidence of winter and summer residence at the same location, perhaps a reflection of the expanding area of open fiord exposed by glacial retreat and increasing separation between villages and summer subsistence camps.

FIGURE 104. Stone tools from the Spoon Lake 3 site: (A) cobble spall notched for hafting as a semilunar knife, with the sharp working edge at bottom; (B) hammer notched for hafting, with visible battering marks; (C) whetstone; (D) slightly concave dish or paint stone; (E) double-ended chisel/groove-cutting tool); and (F) retouched cobble spall knife. Scans © Smithsonian Institution.

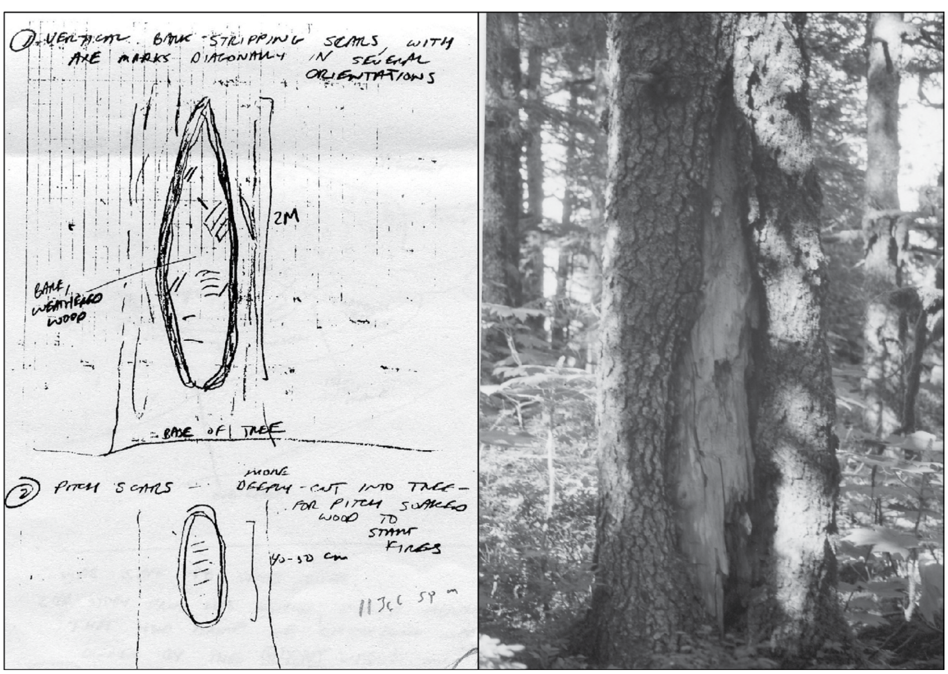

FIGURE 105. Bark stripping scars on spruce trees near the Spoon Lake 2 (YAK-075) site; photograph and field notes from the 1996 Smithsonian survey. © Smithsonian Institution.

FIGURE 106. The forest clearing at Spoon Lake 2 (YAK-075) in 1996; David Ramos (left) and Aron Crowell (right). Photo © Smithsonian Institution.

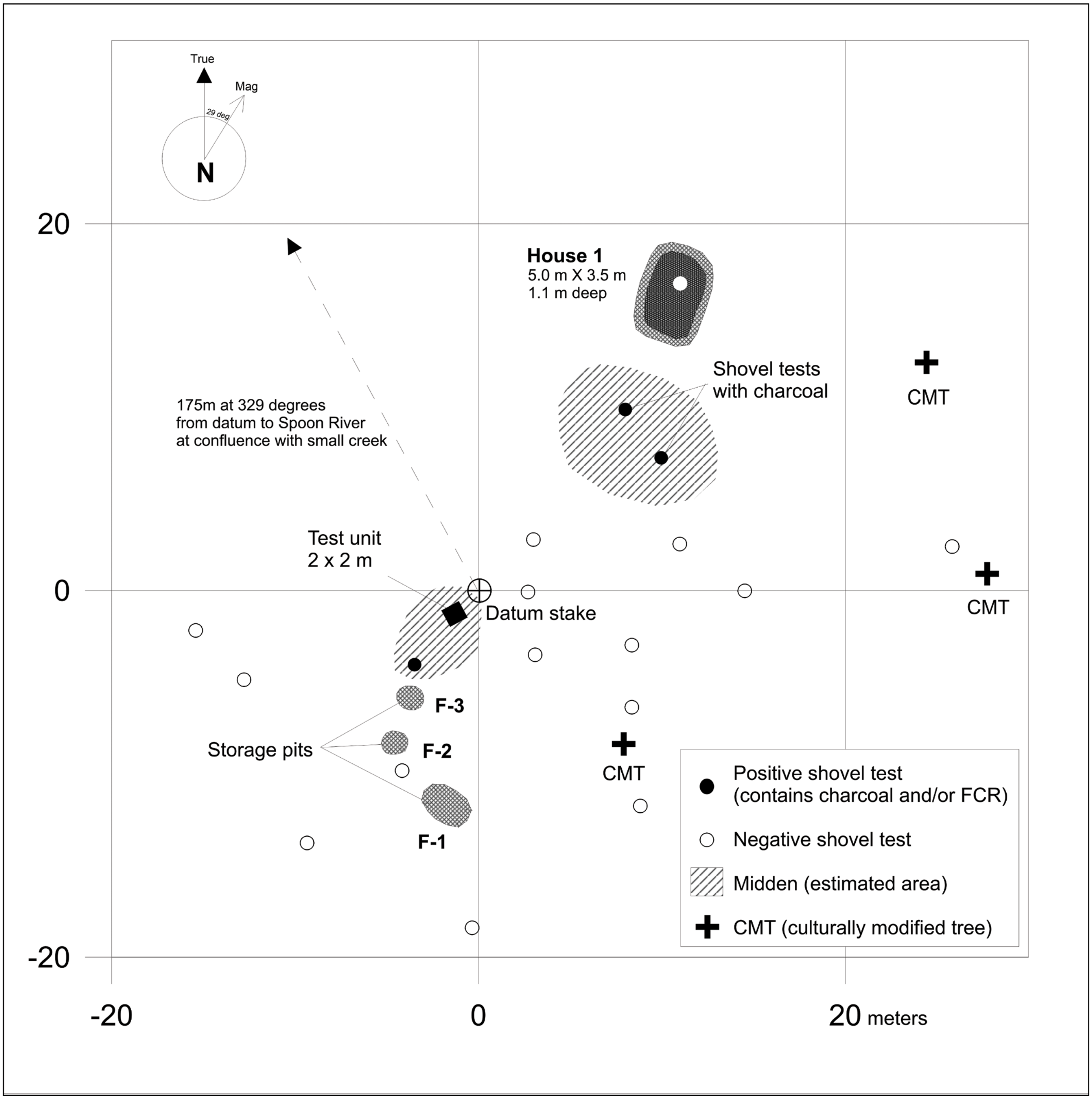

FIGURE 107. Tape and compass sketch map of the Spoon Lake 2 site showing a single house pit (House 1), cache pit features (F), charcoal midden areas, culturally modified trees, and location of the 1996 test unit. Axis units are 1.0 m. © Smithsonian Institution.

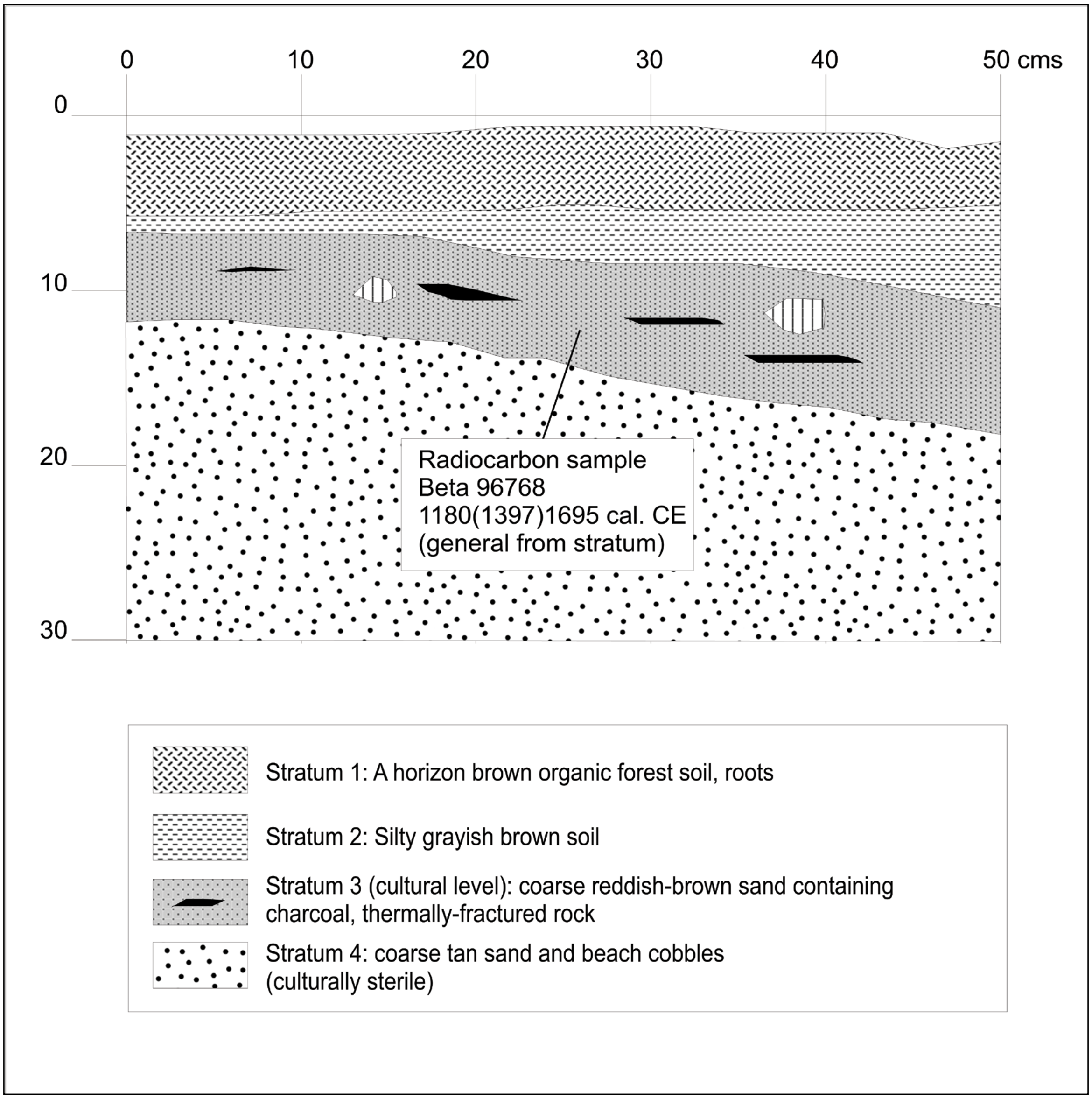

FIGURE 108. Stratigraphy of the 1996 test unit at Spoon Lake 2 (drawn at 50 cm wide, 30 cm deep; the unit was expanded to 2 × 2 m). © Smithsonian Institution.

5

The Ahtna Period, 1500–1700 CE

ORAL TRADITIONS

An epic *shkalneek*, or oral historical tradition, describes a migration by members of a Lower Ahtna Raven clan, the Gineix̲ K̲wáan, from their village at Chitina on the Copper River to Yakutat fiord, occasioned by a schism over chiefly succession and the inheritance of a treasured *at.óow* feast bowl (Deur et al. 2015:30–40; Crowell 2022). John Swanton first transcribed the tale in 1904, as told by Yakutat elder K'áadasteen in Sitka (Swanton 1909:347–368); Maggie Harry narrated it to John Harrington at Yakutat in 1939 (Harrington 1940); and Frederica de Laguna recorded a dozen versions told by Yakutat elders in 1949–1954 (De Laguna 1972:231–242).

The 500-year-old origin story of the Kwáashk'i K̲wáan—a new name assumed by the Gineix̲ K̲wáan after they came to Yakutat—has been carried forward to the present and was shared by Kwáashk'i K̲wáan elders for the Smithsonian Yakutat project (E. Abraham, 16 June 2012, IN-13A; L. Farkas, 17 June 2012, IN-13B). It is commemorated by Ahtna songs composed during the journey and still performed at Yakutat (De Laguna 1972:23–240, 1155–1157, 1226–1227) and in a Kwáashk'i K̲wáan crest depicting the spirit of Mount St. Elias, whose peak guided the migrants through the St. Elias Mountains.

The small band of Gineix̲ K̲wáan migrants trekked on foot up the Chitina River valley and across the Bagley Icefield toward Mount St. Elias, enduring the intense cold and danger of the glacial terrain (Figure 109). They were starving but caught Arctic ground squirrels to eat, followed by the appearance of fog in which some of the group lost their way. The survivors' first sight of the ocean from the flank of Mount St. Elias was a joyous portent that they would be saved, and the people danced and sang as they descended to Icy Bay (Swanton 1909:347–368). The 300 km route of the migration is shown in Figure 110.

At Icy Bay, the Gineix̲ K̲wáan built Teey Aani ("yellow cedar bark town"), named for bark used to cover the houses (Thornton 2012:17). The clan grew concerned that they would become a "lost tribe" because they were Ravens and had no Eagle partners to marry; however, members of an Eyak Eagle clan, the G̲alyáx̲ Kaagwaantaan, came to Icy Bay by boat from the mouth of the Copper River, leading to intermarriage between the two groups (De Laguna 1972:231–233).

The Icy Bay community sent exploratory parties by canoe to Yakutat fiord, where they contacted Eyaks of the Koskedi and Ł'ux̱ˑedi clans, most likely residents of

FIGURE 109. The Ahtna Gineix Kwáan migration across the glaciers toward Mount St. Elias. The band was initially about 40 strong, but part of the group became separated and was lost. The Ahtna are shown wearing fur clothing and traveling on snowshoes with pack dogs. Illustration by Emily Kearney-Williams. © Smithsonian Institution.

Diyaaguna.éit, Wulilaayi Aan, and other towns on the Yakutat foreland (chapter 4, this volume). The entire Gineix Kwáan–Galyáx Kaagwaantaan group then departed Teey Aani and migrated to the east side of Yakutat fiord, either by canoe (Swanton 1909:347–368) or by crossing on foot over the Malaspina–Hubbard glacier, which at that time extended from near Point Manby to the opposite shore between Knight Island and Point Latouche (De Laguna 1972:231–242; chapter 1, this volume).

The Gineix Kwáan observed that recently deglaciated Ganawás (Knight Island) was treeless and that wild strawberry plants grew there. Local residents of the Koskedi, Ł'ux̌edi, and Hmyedi clans were hostile to the newcomers, resenting incursion on their lands. When they discovered a Gineix Kwáan man fishing at the stream called Kwáashk' (Eyak, "humpback [pink] salmon"; today called Humpy or Humpback Creek), they broke his salmon harpoon, and when the daughter of a Galyáx Kaagwaantaan clan leader picked strawberries on Ganawás, they cut the gathering basket from her back. To settle these disputes, the Gineix Kwáan traded with the Yakutat Eyak for territorial rights to Yakutat fiord, offering one or several highly valuable *tináa* (engraved ceremonial shields made of native copper) that they brought from their homeland on the Copper River. The Eyak people said, "There is more copper in that canoe than this little creek [Kwáashk'] is worth, so we're going to give you all of Tłaxátà [Yakutat fiord]" (L. Farkas, 17 June 2012, IN-13B). According to some accounts, sea otter furs were also offered as part of the settlement. In commemoration of their new territory, the Gineix Kwáan adopted the name Kwáashk'i Kwáan, meaning the "people of Kwáashk'" (Swanton 1909:347–368; De Laguna 1972:231–242).

A salient theme of the migration story is adaptation to Yakutat's unfamiliar coastal habitat. The acquisition of Kwáashk' stream may be seen as a critical first step for a hunting and salmon fishing people of interior Alaska, providing a secure foothold in the new environment through application of transferable ecological knowledge. A group originally named for the Gineix (Big

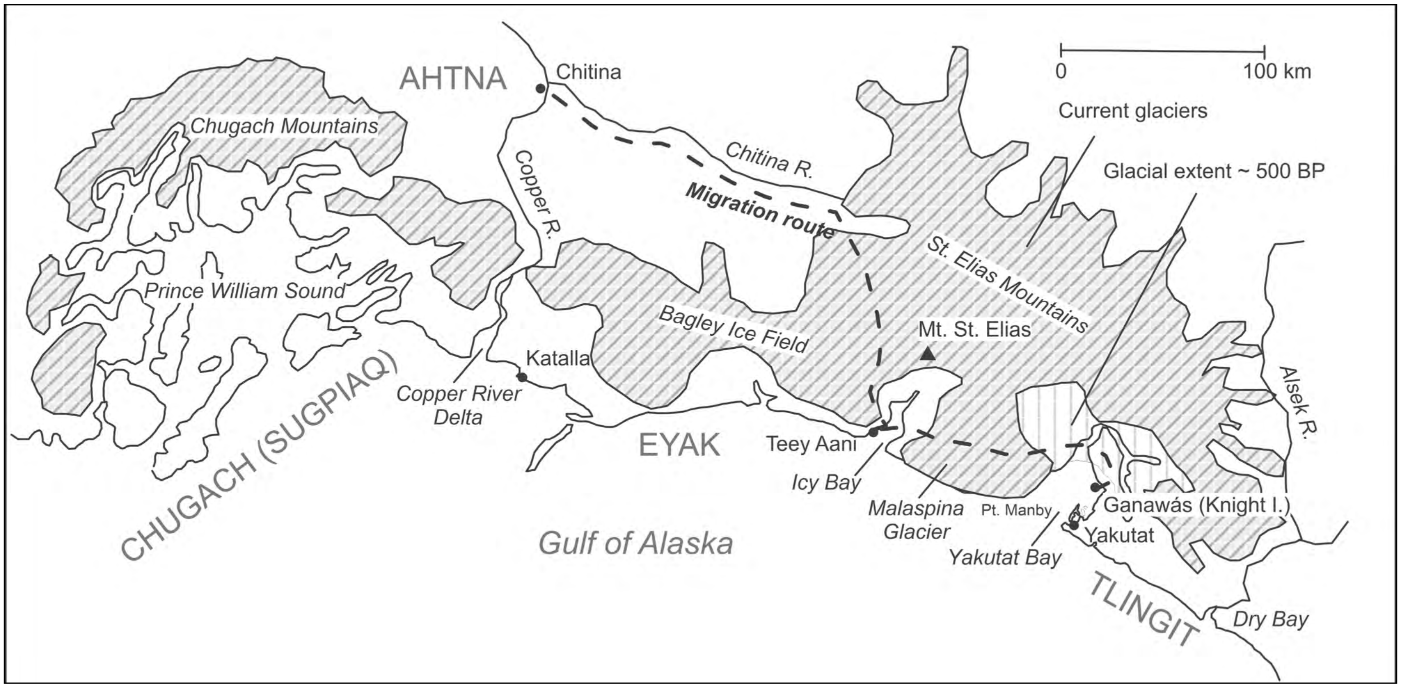

FIGURE 110. The Gineix Kwáan migration route as described in oral tradition. The group followed the Chitina River valley to its head, crossed over Bagley Ice Field, passed Mount St. Elias, and descended to the coast at Icy Bay where they built Teey Aani. They later crossed Malaspina Glacier on foot or traveled by boat to Yakutat Bay, where they settled on Ganawás (Knight Island). The Yakutat glaciers are shown in their 1450 CE positions. © Smithsonian Institution.

Bremner) River, which joins the Copper River below Chitina, adopted as their new name the Eyak word for a salmon stream in Yakutat fiord, thus relocating essential aspects of their identity and economy. Oral tradition also emphasizes the availability at Yakutat of terrestrial animals that were important in the former Ahtna way of life. In K'áadasteen's account, a mountain spirit bestows extraordinary powers on the youngest of six Kwáashk'i Kwáan brothers, enabling him to become a superb hunter of brown bears, black bears, and mountain goats. The brothers also go to the "seals' home" at the glacier to hunt them from a canoe, signifying exploitation of the marine environment enabled by knowledge and technology adopted from the Eyak (Swanton 1909:347–368).

Kwáashk'i Kwáan elder Elaine Abraham said that ecological knowledge was provided to her people by the reigning spirits of the fiord:

> When they came down there it was a foreign country. They didn't know what to eat; they didn't know how to live. And the spirits of that place adopted the humans. . . . They showed them how to hunt seal, and they became friends of the spirit of the glacier. That is why they have a special connection with the glaciers and the mountains in all that area. (E. Abraham, 11 June 2011, IN-2)

PLACE NAMES AND SETTLEMENTS

The Russian cartographer Teben'kov reported in the mid-nineteenth century that all places between Prince William Sound and Yakutat Bay had multiple names in the Sugpiat, Eyak, Tlingit, and Ahtna languages (Davidson 1901; De Laguna 1972:109). However, only a few Athabascan (possibly Ahtna) toponyms have been preserved for locations near Yakutat, and none pertain to the fiord itself (Thornton 2012).

After acquiring their lands in the fiord, the Kwáashk'i Kwáan and Galyáx Kaagwaantaan built the village of Tlákw.aan (Tlingit, "old town") on the south shore of Ganawás (Knight Island). This took place sometime in the decades just before or after 1500 CE, based on radiocarbon dates from the Tlákw.aan archaeological site, which was investigated by the Smithsonian project in 2014. Ganawás (from Eyak *galawas*, "water extends in an indefinite shape") may have been the original name of the village, signifying glacial retreat and the enlarging body of open water, but the name later came to mean all of Knight Island (E. Abraham, 16 June 2012, IN-13A; Thornton 2012:21). Tlákw.aan and other settlements founded or occupied by the Ahtna following their migration are shown in Figure 7.

North Knight Island Village (YAK-205), a village or seasonal camp with three small house pits, was established on the northeastern tip of Knight Island, called Ganawás Shadaa ("around the head of Ganawás") at about the same time as Tlákw.aan. The residents may have been Eyak, Kwáashk'i K̲wáan, or possibly Sugpiat hunters from Prince William Sound. The site was investigated in 2014 and is discussed below.

Noowk' (Tlingit, "little fort"; YAK-009), located on an islet in Knight Island Passage, consists of a 35 × 70 m habitation area enclosed by rock walls that were the foundation of a log palisade (De Laguna et al. 1964:22). According to oral tradition, Noowk' was a place of refuge for the residents of nearby Tlákw.aan during "Aleut" (Chugach Sugpiat) raids (De Laguna 1972:66). The fort has not been dated and was only briefly visited in 2014.

Territory ceded to the Kwáashk'i K̲wáan by the Eyak included the Yakutat foreland as far east as the village of Naasoodat on the Lost River (E. Abraham, 4 August 2013, IN-29). However, Naasoodat itself is said to have remained in Eyak hands until Russian colonization in 1795, when the Kwáashk'i K̲wáan adopted it as their "capital" (De Laguna 1972:75). At some point after the migration to Yakutat, the Kwáashk'i K̲wáan moved into previously Eyak settlements west of Naasoodat including Áa Ká (Aka Lake Village) and Gooch Shakee Aan (Tlingit, "village on top of the hill"; De Laguna 1972:75–76; Figure 7). They may have established sealing camps in Disenchantment Bay during the sixteenth century, but any archaeological evidence would have been erased by the readvance of Little Ice Age of Hubbard Glacier in 1600–1700 CE.

TLÁKW.AAN: FOUNDING TOWN OF THE AHTNA

Oral Traditions

Tlákw.aan, a Tlingit name, has been translated as "old town" (De Laguna et al. 1964; Thornton 2012:21) or "renowned town" (Swanton 1909:397). Kwáashk'i Kwáan community scholars Lena Farkas and Elaine Abraham said it can also mean "always their land" or "always their village" (E. Abraham and L. Farkas, 16 June 2012, IN-13A).

Other Tlingit names signify the large size and importance of the settlement. Yéil Áa Daak Wudzigidi Yé ("place where Raven fell down") comes from a legend that "because of all the smoke they had coming from all of their houses, Raven could not fly over the village without dropping from smoke" (De Laguna 1972:247–248; E. Abraham, 16 June 2012, IN-13A; Thornton 2012:21). This story is illustrated in Figure 111, which depicts Raven's flight and an aerial view of the village as reconstructed from archaeological data. Another name is K'ootsinadi.aan ("shaken town") because "when our people walked in the morning, they'd go 'Hoo! hoo!' and they'd stomp; that whole place would shake because there's so many of them" (E. Abraham, 16 June 2012, IN-13A). Some of the original houses at Tlákw.aan were still remembered by name at the time of Frederica de Laguna's research in the mid-twentieth century, including the Kwáashk'i K̲wáan's Noow Hít ("fort house") and the G̲alyáx̲ Kaagwaantaan's Xóots Hít ("bear house"), although it was not possible to match these remembered houses to specific ruins at the archeological site (De Laguna 1972:245–247).

Another strand of oral tradition concerns Tlingit occupation at Tlákw.aan. Several Yakutat elders told De Laguna that it was Xatgawet, a rich and famous eighteenth century Tlingit Teik̲weidí leader, who established the village and named it after Tlákw.aan (Klukwan) on the Chilkat River in Southeast Alaska "to pretend it was a high-class people's place" (De Laguna 1972:65–66, 245–247). This version of Tlákw.aan history contradicts the story of its founding by the Gineix̲ K̲wáan and is inconsistent with sixteenth century archaeological dates from the site. If, as appears likely, the Teik̲weidí or other Tlingit clans came to live at Tlákw.aan after migrating to Yakutat fiord in the early eighteenth century, they were there for only a few decades before Russian contact in the 1780s. In 1791, the Malaspina expedition observed Tlingit grave houses and memorial poles on the south shore of the "Isle of Pines" (Knight Island) near the former location of Tlákw.aan, but signs of active habitation were absent (De Laguna 1972:66). In Figure 111 these structures are depicted across the creek from the village, but this location is conjectural.

Research History

Frederica de Laguna and archaeologist Francis Riddell excavated Tlákw.aan in 1949 and 1951–1952, with results that were published by the Smithsonian's Bureau of American Ethnology (De Laguna et al. 1964). The site was selected as an Alaska Native historical place (AA-10532) by Sealaska Corporation under Section 14(h)(1) of the Alaska Native Claims Settlement Act and certified eligible by the U.S. Bureau of Indian Affairs in 1983 (Sealaska Corporation 1975). Archaeological surveys to support the selection were undertaken by the Cooperative Park Studies Unit, University of Alaska Fairbanks in 1980 (Cooperative Park Studies Unit 1980).

In 2014 the Smithsonian received permission from Sealaska Corporation and the Yakutat Tlingit Tribe to conduct supplemental investigations at Tlákw.aan. Fieldwork authorized by the agreement was limited to surface mapping of the village and excavation of a 1 × 4 m test trench in the shell and bone-rich midden adjacent to De Laguna's House 1. Objectives of the excavation included reinterpretation of the cultural sequence and stratigraphy; AMS radiocarbon dating to improve on unreliable dates reported in 1964; and recovery of a well preserved archaeofaunal sample to investigate the inhabitants' utilization of the fiord ecosystem.

Fieldwork was completed during a brief period of access (4–17 July 2014) with the help of students participating in a Smithsonian-led University of Alaska Anchorage archaeological field school. At the conclusion of fieldwork, the project hosted a community visit to the site led by Victoria Demmert (president, Yakutat Tlingit Tribe), Cathy Bremner (Yakutat Tlingit Tribe Council), and Cyndy Bremner (mayor, Yakutat City and Borough), accompanied by Fred Beemis, Jeremiah James, Chuck Smythe (Sealaska Heritage Institute), and other Yakutat visitors and family members (Figure 10).

FIGURE 111. Raven's flight over Tlákw.aan, the first village built by the Gineix̲ K̲wáan after migrating to Yakutat Bay. The village is depicted on the basis of archaeological evidence as it would have appeared in the mid-sixteenth century. In one myth, Raven tried to fly over the settlement but was overcome by smoke from its many hearth fires, an incident commemorated by the name Yéil Áa Daak Wudzigidi Yé ("place where Raven fell down"). The large wooden plank buildings are lineage houses; the smaller structures are food storage caches and other outbuildings. The scene depicts young spruce trees growing on a recently deglaciated landscape. Illustration by Emily Kearney-Williams. ©Smithsonian Institution.

Site Description

Knight Island is located in a highly productive marine habitat where the waters are enriched by glacial effluent (chapter 1, this volume). Marine invertebrates abound in the intertidal zone; pink salmon can be harvested at Kwáashk' (Humpback Creek); Pacific herring spawn at Eleanor Cove; and halibut, rockfish, Pacific cod, and lingcod inhabit the surrounding waters. Harbor seals, harbor porpoises, and sea otters feed in the area throughout the year, and terrestrial game, including black bears, brown bears, and mountain goats, can be taken in the foothills of mountains on the adjacent mainland. The harbor seal rookery at Hubbard Glacier was formerly closer to Knight Island than it is today and constituted a major resource for the people of Tlákw.aan.

The YAK-007 archaeological site (Figure 112) occupies a clearing measuring roughly 200 × 100 m, located close to the beach on the south shore of Knight Island and bordered by mature spruce–hemlock forest with trees up to 1.5 m in girth. Younger trees have encroached on the clearing over the last century amid rye grass, nettles, wild celery, and salmonberry. Two northeast-trending beach ridges extend across the site, possibly marking old shorelines that have shifted inland due to postglacial isostatic rebound. Relative sea level change at YAK-007 during the 1899 earthquakes was negligible (Tarr and Martin 1912).

Riddell and De Laguna recorded seven rectangular house pits (Houses 1–7) that are visible on the surface of the site (De Laguna et al. 1964:43–76: map 6). The two largest were House 1 and House 7, both over 15 m long, while the others were 6–9 m long. Midden areas (Mounds A–D) contained charcoal-stained sand, fire-cracked rock, animal bones, marine shell, and artifacts. Several shallow, round pits were mapped adjacent to the houses (De Laguna et al. 1964: map 6; Figure 112).

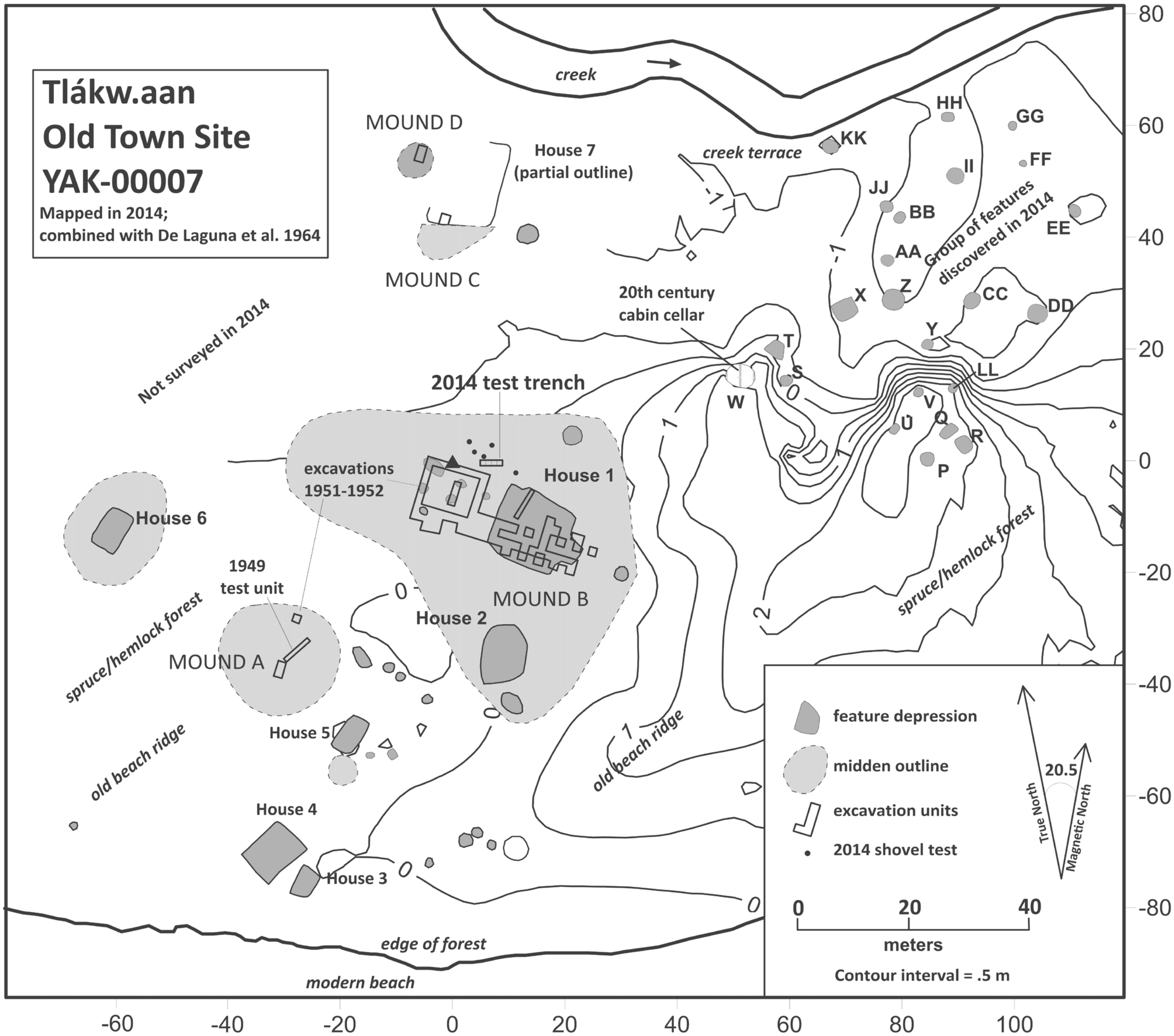

FIGURE 112. The archaeological site of Tlákw.aan (YAK-007), resurveyed and redrawn from De Laguna et al. 1964 (map 6), with the addition of pit features discovered north of the main village area in 2014 (Features P–KK). Houses and midden areas are shown as reported by De Laguna. The 2014 test trench was located just north of De Laguna's excavations at House 1 and Mound B.

Extensive excavations during 1949–1952, totaling about 200 m^2, centered on Mound B and included House 1; House 9, a more recent plank structure built inside the House 1 pit; House 8, a burned building buried at the bottom of the midden; and a plank-lined "storage house" or cache (De Laguna et al. 1964:43–76). Other subsurface pits, hearths, postholes, and caches were uncovered within the complex stratigraphy of the mound. Additional test units and trenches were placed in Mound A and House 7.

De Laguna interpreted all the houses at YAK-007 as Tlingit in design, apparently because of their large size, subterranean floors, and lack of basal wall frames, which she considered to be diagnostic of Eyak construction (De Laguna et al. 1964:43–76; Crowell 2022). Nonetheless, all had Eyak or Ahtna features. House 8, built early in the history of the site, had vertical wall planks emplaced inside a simple pit, similar to Houses 4, 8, and 14 at Diyaaguna.éit (Figure 113). House 1, the largest structure, had a side bench along its north wall and a double-beam gabled roof typical of historic Tlingit houses but lacked a stepped pit foundation and central hearth. House 7 had a deeply excavated floor but no side benches. These architectural characteristics are consistent with limited Tlingit cultural influence and a late, relatively brief period of Tlingit occupation.

In 2014, 22 additional cultural depressions were discovered to the northeast of the main house group, several located along the crest of the eastern beach ridge and others on lower ground near the creek (Figure 112, Features P through KK). For unknown reasons there is no mention of these easily visible pits in De Laguna's 1964 report. They are circular to rectangular, 2–4 m long, and 0.3–0.9 m deep. While some could be the remains of small houses, most were probably semisubterranean storage caches. It was not possible to test or date these features under conditions of the 2014 research permit, although they appear to be precontact in age. When these features are considered, the site layout of Tlákw.aan rather closely resembles that of Diyaaguna.éit, each village including a central group of lineage houses and an adjoining but separate area with numerous caches (Figure 83).

An anomalous deep pit at Tlákw.aan (Feature W) contained twentieth century debris and building materials and was identified by Raymond Sensmeier as the cellar of a cabin where he and his family lived during 1945–1951 (personal communication to Aron Crowell, 12 March 2017). A standing cabin was mapped at this location in 1952 (De Laguna et al. 1964: map 6).

An approximation of the late population of Tlákw.aan may be derived from the size and number of dwellings. The largest traditional houses in the Tlingit region typically measured 15 × 18 m and sheltered 40 to 50 people (De Laguna 1972:294–299, 1990:207–208; Emmons 1991:59–68), which suggests an average of about 6 m^2 of interior space per person. Extrapolating from the total floor area of the surface houses at Tlákw.aan (707 m^2), and assuming that all were simultaneously occupied, the resident population would have been about 120 persons.

2014 Test Trench

A site datum stake was placed 9 m west and 3 m north of House 1 in Mound B. Grid north was set at 29°, the bearing of magnetic north in 1949, to align the trench excavation with the published site map (De Laguna et al. 1964: map 6). The trench was laid out as a line of four 1 × 1 m squares extending 4–8 m east of datum (Figure 114). Owing to limited time and the high density of faunal material encountered (over 10,000 pieces), excavation of the northern half of the trench was limited to 45 cm below surface while the southern half was taken down an additional 20 cm to the bottom of the midden. Three-dimensional coordinates of artifacts, bones, and bone/shell clusters were measured with the laser total station; locations were hand plotted on level sheets; and cultural strata were divided into 10 cm levels for recording purposes. For

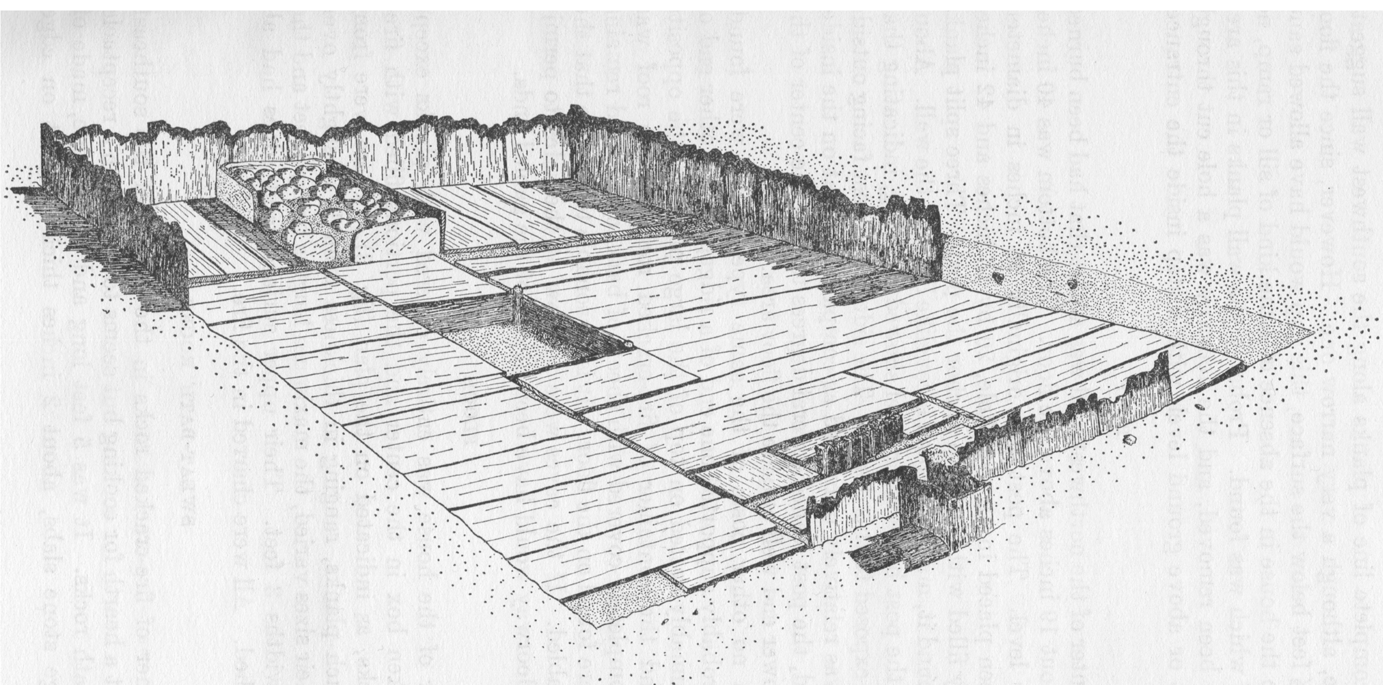

FIGURE 113. The floor of House 8 at Tlákw.aan, reproduced from De Laguna et al. 1964. The vertical plank walls extended to the base of the foundation pit, and there were no side platforms. The box containing stones was probably a steam-bathing feature.

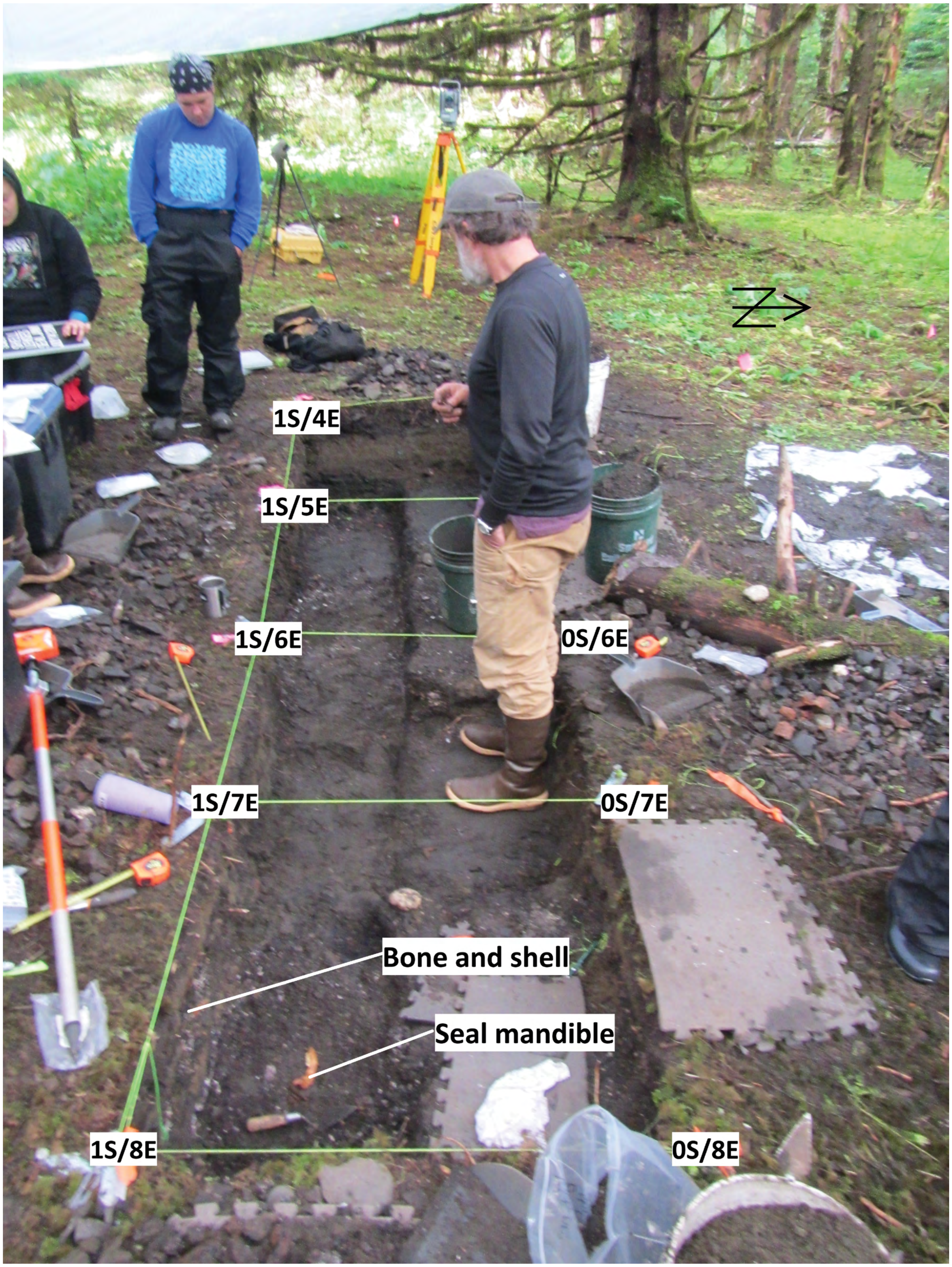

FIGURE 114. The partially excavated 2014 test trench at Tlákw.aan, view to the west. Aron Crowell (center) and Emalie Thern (standing, left). Photo ©Smithsonian Institution.

example, stratum 4, level 1 (4.1) designates the upper 10 cm of stratum 4; stratum 4, level 2 (4.2) is 11–20 cm below the top of the layer.

As shown in a profile of the south wall of the trench (Figure 115), the midden was 60–65 cm deep with stratigraphy similar to that reported by De Laguna (De Laguna et al. 1964:36–41). Stratum 1, appearing just below the surface moss, was very dark brown (10 YR 2/2) humus accumulated from vegetal growth over the two and a half centuries since the site was last inhabited. Stratum 2 was B-horizon very dark gray (5 YR 3/1) fine sand containing charcoal fragments and stains, fire-cracked greywacke cobbles (a by-product of steam bathing), pieces of heat-altered granite and sandstone, and minor amounts of mammal bone and fragmented shell. De Laguna reported that this "black rocky midden" layer covered most areas of the site that she investigated. Below this was stratum 3 (De Laguna's "tan sandy midden"), a fairly uniform layer of fine C-horizon dark yellowish-brown sand (10 YR 4/4) containing small amounts of fire-cracked rock, charcoal, fragments of calcined bone, and poorly preserved pieces and smears of mammal bone. Strata 2 and 3 together represent the final period of occupation at Tlákw.aan, designated by De Laguna as Old Town III (De Laguna et al. 1964:85–86).

Stratum 4 at the base of the midden was composed of dark yellowish-brown sand (10 YR 4/4) interlayered with "black" (7.5 YR 2.5/1) charcoal-stained sand, fire-cracked rock, fish bone, mammal bone (including articulated limbs and spinal segments), greasy organic stains, and nearly pure lenses of whole and broken invertebrate shell including littleneck clam, mussel, sea urchin, and gastropods. Bone preservation was excellent, especially in close association with shell. Stratum 4 at Mound B was equivalent to De Laguna's "brown sandy midden" and "shell midden" layers, representing the Old Town II Period. Mound B appears to have built up through the discard of hearth waste, fire-cracked rock, and food remains from House 1 and House 9, in some instances observed as "basket dumps" consisting of lenses of material 50–60 cm in diameter and 10–15 cm thick.

Artifacts found during the 2014 trench excavation (n = 15) included a barbed bone arrow point (Figure 116), a bird bone awl, the base of a harpoon head for sea mammal hunting, a barb from a halibut hook, six beaver or porcupine teeth probably used as carving tools, a decorative native copper cone, a pecked and ground stone chisel, two cobble spall scrapers, and a sharpened bone sliver that may have served as an arrow point or fish-hook barb. All were found in stratum 4 except the halibut hook barb, which came from stratum 3. These tool types are discussed below in reference to De Laguna's much larger collection, now housed at the University of Pennsylvania Museum. No glass, metal, ceramic, or other postcontact trade items were recovered,

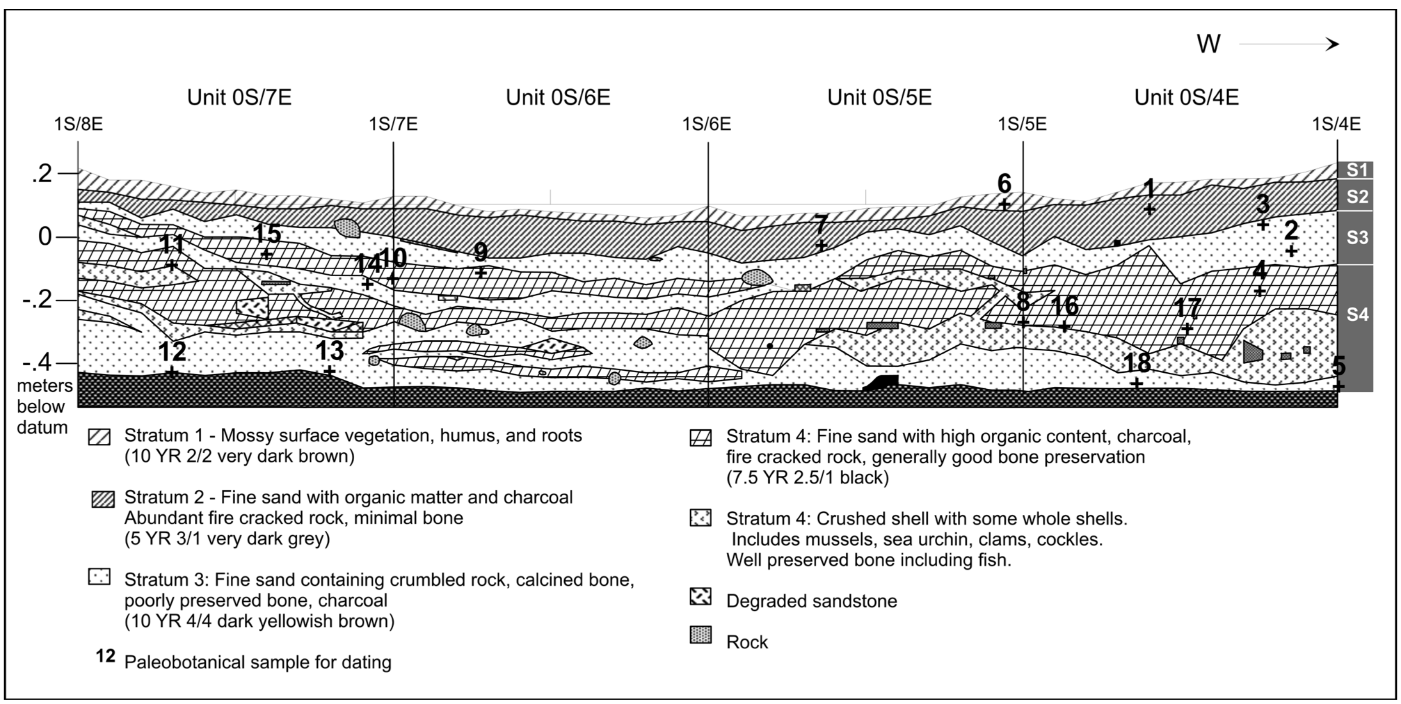

FIGURE 115. Stratigraphy of the south wall of the 2014 test trench at Tlákw.aan showing locations of charcoal samples submitted for palaeobotanical and radiocarbon analysis (sample 1 = PRI-15-039-1 in Table 8, 3 = PRI-15-039-3, etc.). Munsell color descriptors are given for each stratum. Unit corner designations may be compared to Figure 114. © Smithsonian Institution.

FIGURE 116. Barbed arrow point (YAK-007: 0060) in situ in the 2014 trench, stratum 4. Photo © Smithsonian Institution.

consistent with oral knowledge and the previous archaeological determination that the site was abandoned before Western contact (De Laguna 1972:247). A few unworked slate fragments (*n* = 5) were found but no chert debitage.

Radiocarbon Dating

Two radiocarbon dates were reported from De Laguna's investigations at the site, 136 +/- 78 RCYBP ("radiocarbon years before present," meaning before 1950) and 328 +/- 78 RCYBP, both on unidentified wood charcoal (De Laguna et al. 1964:206). These standard radiometric dates, both with large error ranges, were among the earliest ^{14}C lab determinations ever made and differ substantially from each other even though both were from the bottom level of Mound B. Given the difficulty of adjusting for the potential "old wood" problem—that is, samples from older and younger growth rings on long-lived trees producing very different dates—De Laguna believed that initial occupation of the site could have been as early as the mid-sixteenth century or as late as the early eighteenth century.

In 2014, 17 samples of charcoal, wood, bark, and conifer needles were collected from strata 2, 3, and 4 of the test trench (for sample locations, see Figure 115) and submitted for species identification and AMS dating (Table 8). All samples were identified as *Picea* (spruce) except one fragment of *Populus* (balsam poplar; Kováčik and Cummings 2015).

Accelerated mass spectrometer dates were run on nine of the samples and fell into two groups, with the seven oldest ranging from 1454 (1509) 1631 cal. CE to 1490 (1563) 1641 cal.

TABLE 8. Tlákw.aan (YAK-007) and North Knight Island Village (YAK-205) radiocarbon dates and palaeobotanical identifications. S = stratum, SF = subsurface feature.

Sample number	Context	Botanical ID	AMS ^{14}C date	2-sigma calibrated date (95.4%)	Median	δ^{13}C (0/00)
			TLÁKW.AAN (YAK-007)			
PRI-15-039-3	Trench, S3	*Picea* charcoal	145 ± 24	1670–1950 CE	1814 CE	–24.75
PRI-15-039-2	Trench, S3	Conifer needle, charred	234 ± 26	1530–1950 CE	1667 CE	–25.92
PRI-15-039-1	Trench, S2	*Picea* charcoal	351 ± 24	1461–1635 CE	1561 CE	–28.14
PRI-15-039-9	Trench, S4	*Populus* charcoal	357 ± 24	1458–1634 CE	1555 CE	–26.48
PRI-15-039-10	Trench, S4	*Picea* charcoal	324 ± 24	1490–1641 CE	1563 CE	–26.35
PRI-15-039-14	Trench, S4	*Picea* charcoal	310 ± 24	1497–1647 CE	1561 CE	–25.6
PRI-15-039-4	Trench, S4	*Picea* charcoal	366 ± 24	1456–1632 CE	1519 CE	–26.35
PRI-15-039-8	Trench, S4	*Picea* charcoal	371 ± 23	1454–1631 CE	1509 CE	–25.63
PRI-15-039-5	Trench, S4	*Picea* charcoal	366 ± 24	1456–1632 CE	1519 CE	–24.23
			NORTH KNIGHT ISLAND VILLAGE (YAK-205)			
PRI-5591-7	House 1, hearth SF-2	*Picea* charcoal	384 ± 22	1448–1623 CE	1489 CE	–26.6

CE (Table 8). Six of these older AMS dates were from stratum 4 and one from stratum 2 (PRI-15-039-1), the latter a stratigraphic reversal most likely due to digging during the later years of occupation that brought stratum 4 material up to the surface. The seven dates intersect a plateau in the dendrocalibration curve and thus have bimodal calendrical distributions (Figure 117). The probability ranges that start in the late 1400s are probably too early for spruce trees to have grown on the recently deglaciated landscape, so peaks in the late 1500s to early 1600s should be more accurate. The span of deposition for stratum 4 is therefore estimated as about 1550–1630 CE.

The stratum 3 dates are 1530 (1667) 1950 cal. CE (PRI-039-2) on conifer (probably spruce) needles and 1670 (1814) 1950 cal. CE (PRI-039-3) on spruce charcoal (Table 8). The conifer needle sample (PRI-15-039-2) is more reliable because needles stop growing and absorbing atmospheric carbon after 5–7 years, avoiding the old wood problem, but the calibration is ambiguous, with distinct peaks in both the late 1600s and late 1700s. The earlier range is more likely, allowing overlying stratum 2 to be deposited before Russian contact in the 1780s. The date range for stratum 3 is therefore estimated as 1630–1670 CE and stratum 2 as 1670–1780 CE.

Other parts of the Tlákw.aan site may be older than the area sampled by the 2014 trench, given that all but one of the palaeobotanical samples were spruce, a tree characteristic of mature forests rather than early postglacial landscapes. Oral tradition describes Knight Island as recently freed of ice, barren of trees, and covered with strawberry plants when the Gineix Kwáan arrived, a successional stage that would most likely have obtained in the mid to late 1400s (Barclay et al. 2001). De Laguna conjectured (without supporting radiocarbon evidence) that House 7, Mound C, and Mound D were older than Mound B and included them in her Old Town I Period (De Laguna et al. 1964:85). It is therefore possible that further investigation of those areas would yield older dates and palaeobotanical specimens from early succession trees such as willow and alder. On balance, it is estimated that people lived at Tlákw.aan for a minimum of two centuries, from circa 1550–1780 CE, but possibly for more than three centuries, circa 1450–1780 CE.

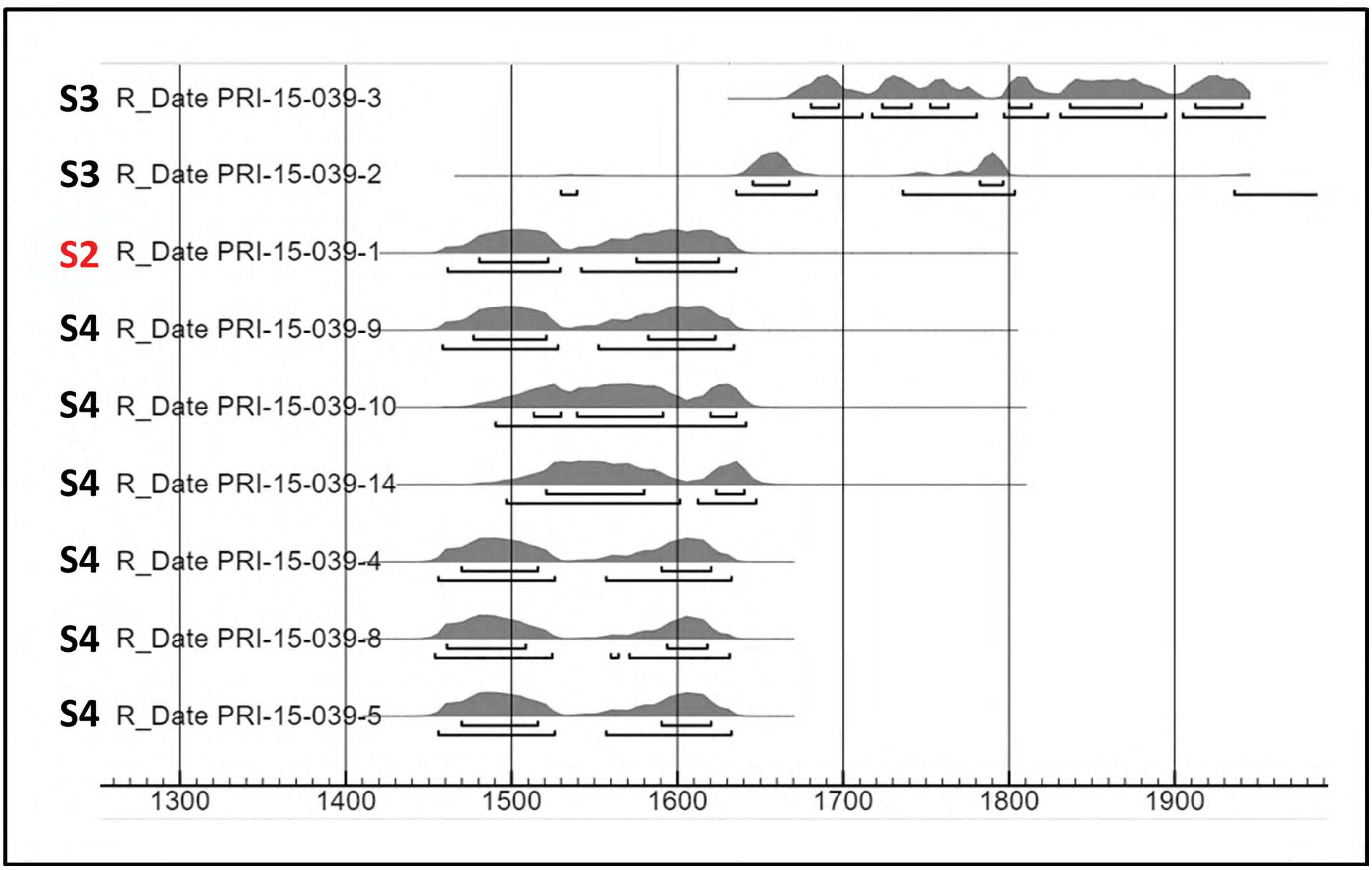

FIGURE 117. Multiplot of accelerated mass spectrometer radiocarbon dates from the Tlákw.aan 2014 test trench showing probability distributions at one and two standard deviations (bars). The bottom axis represents calendar years in the common era. S = stratum. © Smithsonian Institution.

Artifacts

The 1949–1952 Tlákw.aan artifact collection (*n* = 987) was examined and photographed at the University of Pennsylvania Museum in 2014 (De Laguna et al. 1964:92–186). It includes the following items.

Copper Arrow Points

Copper arrow points from Tlákw.aan (*n* = 5) have leaf-shaped blades, sloping shoulders, and narrow, pointed tangs (Figure 118A–C). They are identical to leaf-shaped points from Ahtna sites in the Copper River basin, including GUL-077, with dates from 925 to 1485 cal. CE (Workman 1977; Hanson 2008: fig. 9) and the early nineteenth century Dakah De'Nin's Village (Shinkwin 1979: fig. 10). Trace element analyses of two of the Tlákw.aan points (Veakis 1979; Cooper et al. 2008) indicated that the metal probably came from a Chitina River source.

Ground Slate Endblades

Large ground slate endblades for lances (*n* = 3; Figure 118D) and smaller slate blades for arrows (*n* = 6; Figure 118E) are uncommon at Tlákw.aan in comparison to late prehistoric Eyak (Davis 1996:466-471, figs. 95–96) and Sugpiat sites (De Laguna 1956, 1975; Clark 1974a, 1974b; Knecht 1995; Crowell and Mann 1998). None have basal barbs like the endblades found at Diyaaguna.éit, and Wulilaayi Aan (Figure 85; see chapter 4, this volume). Workman (1977) noted that the Ahtna traditionally used copper instead of stone or bone for many types of tools.

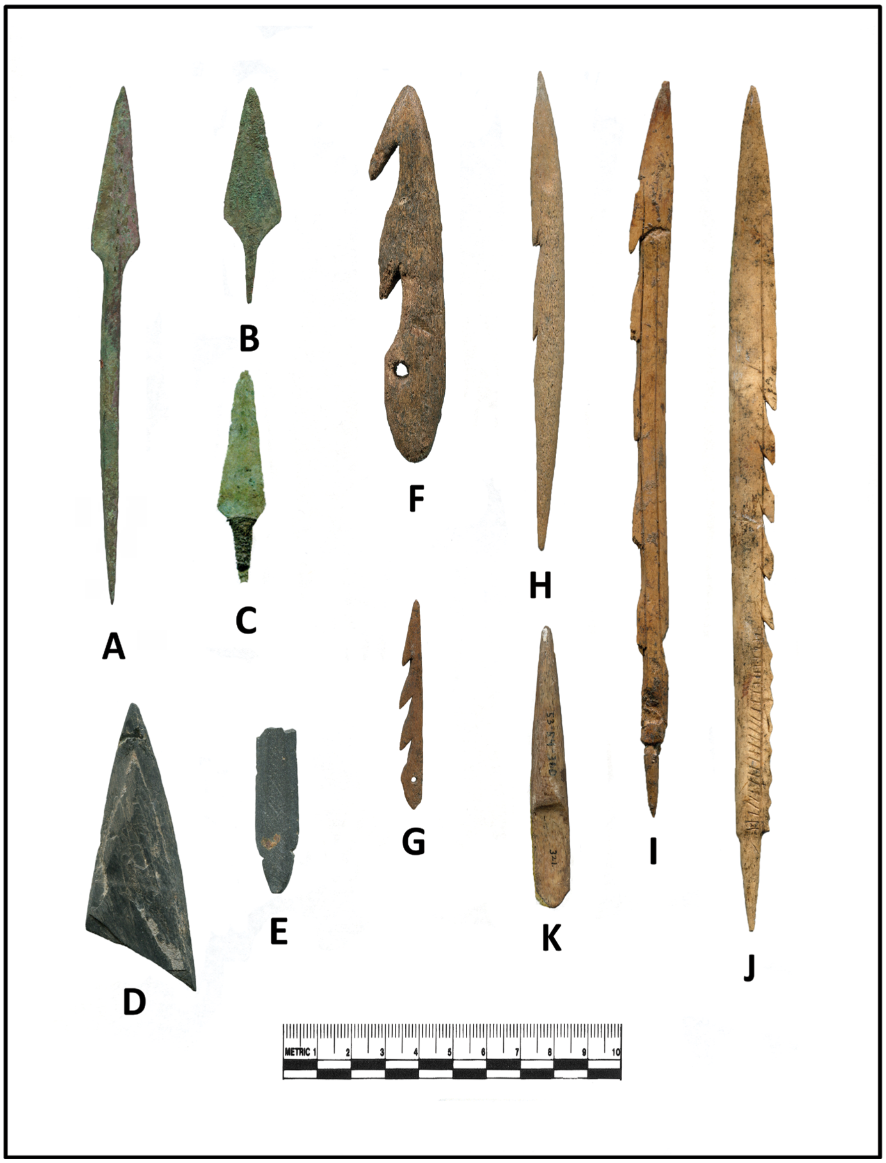

FIGURE 118. Projectile points and harpoon heads from Tlákw.aan (YAK-007): (A–C) copper arrow points with leaf-shaped blades; (D) ground slate lance point; (E) ground slate arrow point; (F) barbed bone harpoon point for seals; (G) barbed bone harpoon-arrow point for sea otters; (H–J) barbed bone arrow points for land game; and (K) bone barb for a halibut hook. Artifacts are from the 1949–1952 excavations at Tlákw.aan (De Laguna et al. 1964). Collection access courtesy of the University of Pennsylvania Museum; artifact scans ©Smithsonian Institution.

Bone Arrow Points

Unilaterally barbed arrow points with conical tangs made of bone or antler (*n* = 19; Figures 116 and 118H–J; De Laguna et al. 1964: fig. 17) are an Ahtna type (VanStone 1955; Shinkwin 1979: fig. 13, 14; Hanson 2008: fig. 16) but also widespread during the last 1,000 years among other Alaskan Athabascan and Inuit groups.

Bone Harpoon Points

Unilaterally barbed bone harpoon heads with tapered tangs and line holes, used for taking seals, porpoises, sea lions, and salmon (*n* = 12, Figure 118F), reflect the maritime focus of the Tlákw.aan subsistence economy and were used by all southern Alaskan coastal groups including the Tlingit (De Laguna 1960), Eyak (Birket-Smith and De Laguna 1938), and Sugpiat (De Laguna 1956) but not by the Ahtna in their original inland territory.

Barbed Harpoon-Arrow Heads

Small, barbed bone heads for harpoon arrows used to hunt sea otters (*n* = 9; Figure 118G) match ethnographic examples known from the northern Tlingit and Sugpiat areas (Figure 49; chapter 2, this volume). They were used for surround hunting of otters from kayaks or canoes (De Laguna 1972:378–381; Emmons 1991:122–127).

Halibut Hook Barbs

Pointed bone pieces with one flattened side (*n* = 5, Figure 118K) were misidentified by De Laguna as gaff hook points but actually were barbs for halibut hooks (De Laguna 1972:388–391; Emmons 1991:117–119).

Adzes, Chisels, and Carving Knives

Splitting adzes (*n* = 14, Figure 119A–B) made of pecked and ground greenstone or schist with hafting knobs or grooves were broadly distributed after 1000 CE across southeastern and southern Alaska as far west as Kodiak Island, although not reported for the Copper River Ahtna. Other Tlákw.aan woodworking tools include stone planing adzes (*n* = 13, Figure 119C), stone chisels (*n* = 76, Fig. 119D–E), and beaver or porcupine teeth (*n* = 13, Fig. 119G–H) used as carving knives. These types have been found at Ahtna sites (Rainey 1939; Workman 1977; Shinkwin 1979), Eyak sites on the Yakutat foreland (Davis 1996), and at Sugpiat sites in Prince William Sound (De Laguna 1956). A double-ended stone chisel was found at the Spoon Lake 3 site (chapter 4, this volume).

Cobble Spall Scrapers

Cobble spall knives or scrapers (*n* = 6, Figure 119J) used for preparing skins are a common artifact type in the Ahtna region (Workman 1977; Shinkwin 1979:61–62; Ketz 1983:174–175, 187–188; Hanson 2008:122–123) and occur in other Athabascan, Eyak, and Sugpiat areas. Comparable examples were found at the Spoon Lake 3 site (chapter 4, this volume).

Stone Scrapers

The Tlákw.aan assemblage included paddle-shaped scrapers made of flaked slate or schist (*n* = 5, Figure 119F) as well as semilunar slate scrapers (*n* = 7, Figure 119I), both comparable to Chugach Sugpiat types (De Laguna 1956:131–135) used for preparation of hides.

Copper Knives

The most distinctively Ahtna tools from Tlákw.aan are semilunar knives with wooden handles and crescentic copper blades (*n* = 9, Figure 120A–B) used for slicing salmon and other fish, a type that is duplicated at the GUL-077 site in the Copper River basin (Hanson 2008: fig. 11). There was also a unique Tlákw.aan copper semilunar knife with a grass-wrapped tang (Figure 120C).

Stone Lamps

Pecked stone oil lamps (*n* = 51, Figure 121A–C) hollowed from limestone, basalt, and other rocks are abundant in the Tlákw.aan collection. Stone lamps for burning sea mammal oil are a coastal trait unknown in Ahtna territory and they are rare in Tlingit collections, although a few were found at the Daax Haat Kanadaa site near Angoon (De Laguna 1960). They were universally used by other Alaskan coastal peoples including the Eyak (Davis 1996:490–496), Chugach Sugpiat (De Laguna 1956:143–146), and Kodiak Island Sugpiat (Clark 1984).

Copper Jewelry and Ornaments

Tlákw.aan jewelry and ornaments made of native copper included bracelets (*n* = 6, Figure 122A), rings (*n* = 4, Figure 122B), coiled wire beads (*n* = 2, Figure 122C), cone ornaments for clothing (*n* = 4, Figure 122D), and pins (*n* = 4, Figure 122E). The rings and cones have close analogs among precontact Ahtna copper artifacts from GUL-077 on the Copper River (Hanson 2008: figs. 12, 13). The Eyak and Sugpiat also wore copper decorative items, and examples include a bracelet from Kachemak Bay (De Laguna 1975: plate 49-10) and the copper bracelets and rings found in precontact levels at Diyaaguna.éit (Davis 1996:416–422).

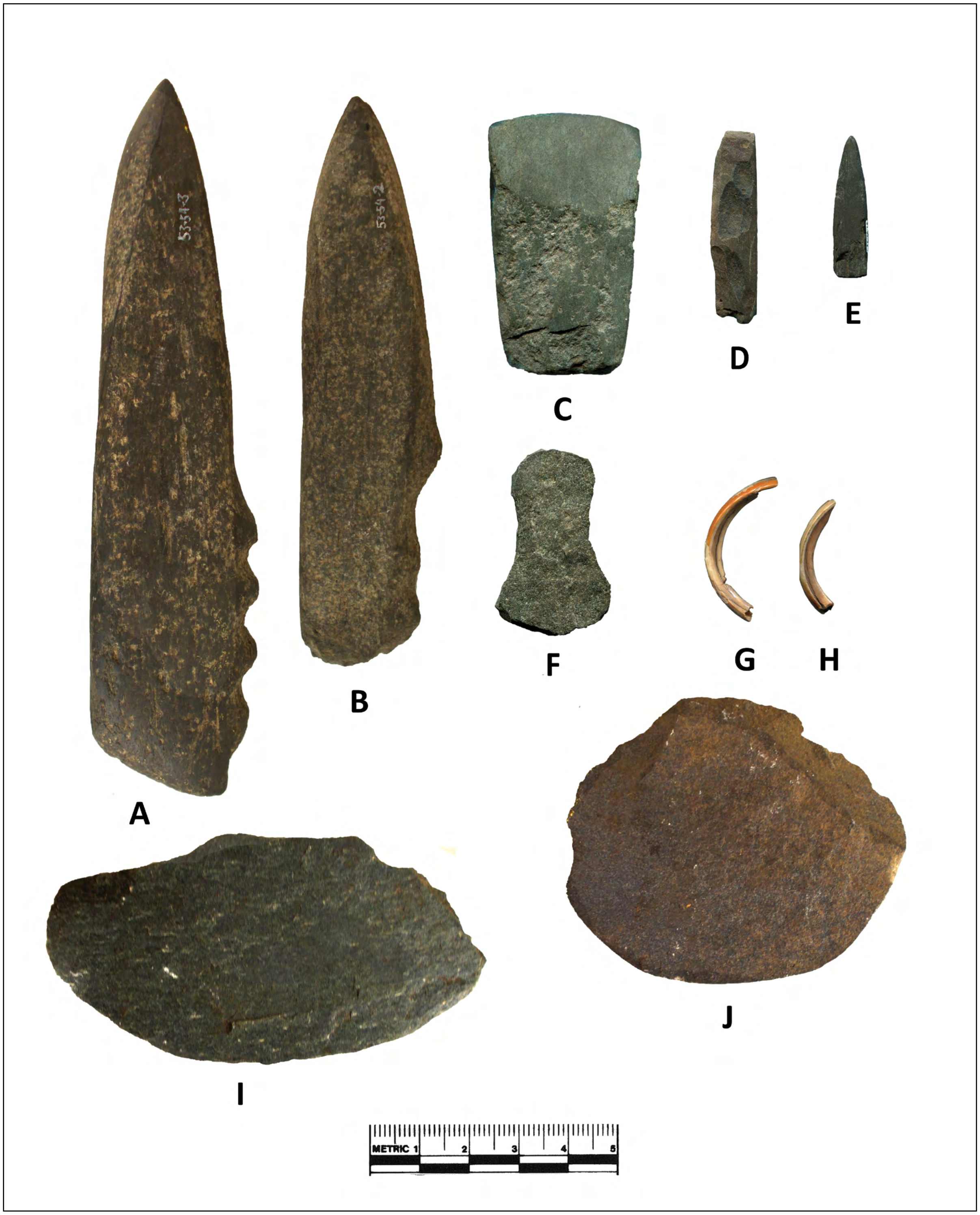

FIGURE 119. Wood and skin-working tools from Tlákw.aan (YAK-007): (A–B) pecked stone splitting adzes; (C) greenstone planing adze; (D–E) ground slate chisels; (F) paddle-shaped schist scraper; (G–H) beaver or porcupine teeth used as carving tools; (I) ground stone semilunar knife or scraper; and (J) cobble spall knife or scraper. Collection access courtesy of the University of Pennsylvania Museum; artifact scans © Smithsonian Institution.

FIGURE 120. Native copper knives from Tlákw.aan (YAK-007): (A) semilunar knife with wooden handle; (B) crescentic blade for large semilunar knife; and (C) curved knife with grass-wrapped tang. Collection access courtesy of the University of Pennsylvania Museum; artifact scans © Smithsonian Institution.

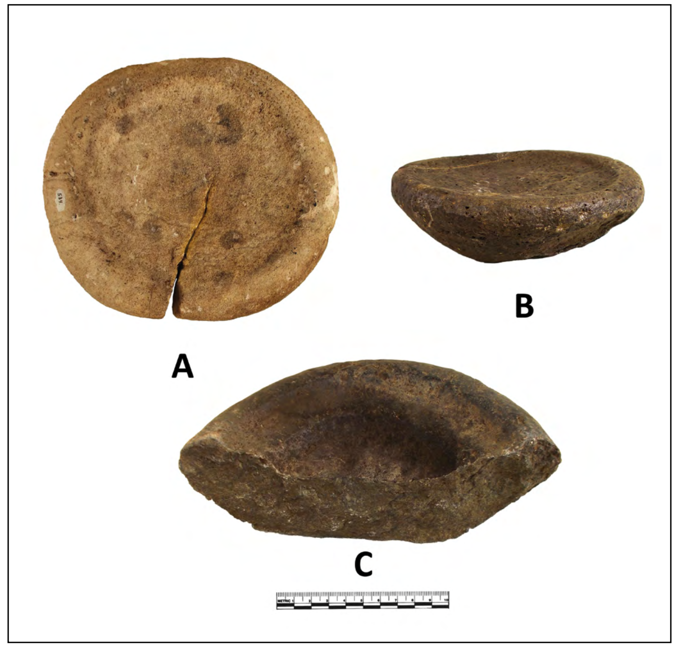

FIGURE 121. Stone oil lamps from Tlákw.aan (YAK-007). Collection access courtesy of the University of Pennsylvania Museum; artifact scans © Smithsonian Institution.

Coal Beads

Coal beads (*n* = 36, Figure 122F–H) may have been made from anthracite coal collected at seams along Esker Creek on the west side of Yakutat Bay, and the presence of unfinished beads and coal fragments indicate on-site manufacture. Holes through the beads are straight sided (Figure 122G), indicating possession of metal drill bits probably made from shipwreck iron. Coal beads were common in Prince William Sound, Cook Inlet, and elsewhere on Alaska's southern coast.

Artifact Discussion

Artifacts from the site are a combination of Ahtna imple -ments reflecting the immigrants' former way of life in the Alaskan interior, such as copper arrow points and barbed bone arrow points for hunting land animals, and Gulf of Alaska maritime technologies including sea mammal harpoons and lances, harpoon arrows, halibut hooks, and oil lamps that were presumably adopted from the Eyak. A broad spectrum of subsistence activities is suggested by the artifact assemblage and borne out by the faunal analysis.

Copper items in the assemblage confirm oral traditions about the Ahtna migration and link the Ahtna residents of Tlákw.aan to their Copper River homeland, including leaf-shaped arrow points that have exact counterparts at similar-aged sites in that region; metallurgical analysis also supports this geographical connection. Copper-bladed knives and jewelry provide further supporting evidence, although these types were also possessed by Eyak people of the Copper River Delta and eastern Gulf of Alaska coast. Copper artifacts occur in all levels of the Tlákw.aan site, suggesting ongoing trade with the Copper River basin long after the original migration, consistent with an oral tradition that the Kwáashk'i K̲wáan used to travel every year to the mouth of the Copper River to meet with their Ahtna relatives (De Laguna 1972:222). Sarah William's statement that the ancestral Kwáashk'i K̲wáan "used copper for everything" (De Laguna 1972:237) highlights the metal's cultural and historical significance.

Faunal Remains

Excavations at Tlákw.aan during 1949–1952 recovered skeletal remains of harbor seal (*Phoca vitulina*, number of identified faunal specimens [NISP] = 779) as well as harbor porpoise (*Phocoena phocoena*, NISP = 128), mountain goat (*Oreamnos americanus*, NISP = 32), and sea otter (*Enhydra lutris*, NISP = 11; Freed and Lane 1964). Most faunal specimens excavated during 1949–1952 were identified in the field and discarded so are not available for further study.

FIGURE 122. Ornaments and jewelry from Tlákw.aan (YAK-007): (A) copper bracelet; (B) copper ring; (C) coiled copper wire bead; (D) copper cone; (E) copper pin; and (F–H) coal beads. Collection access courtesy of the University of Pennsylvania Museum; artifact scans ©Smithsonian Institution.

Principal objectives for the analysis of fauna from the 2014 test trench (10,638 specimens) were (1) taxonomic identifications of all species to assess ecosystem utilization; (2) age assessment of harbor seal skeletal elements to evaluate whether Tlákw.aan residents were hunting at the glacial ice floe rookery; and (3) examination of stratigraphic-temporal trends in mammalian taxa (Etnier 2017).

Taxonomic Identifications

Taxonomic identifications (Table 9) were made through comparisons with reference skeletal material at Western Washington University. There were 510 invertebrate specimens of which 356 were identifiable, dominated by littleneck clams (*Leukoma staminea*) and mussels (*Mytilus* spp.). Other taxa included marine and terrestrial gastropods, scallops, and urchins.

The fish assemblage was strongly focused on salmon (Salmonidae), which constituted 3,440 of 6,669 of specimens examined (52%). The only other identified species were dogfish (*Squalus suckleyi*, NISP = 9) and Pacific cod (*Gadus macrocephalus*, NISP = 2), with the remainder of fish specimens (*n* = 3,218) unidentified. The possibility that tiny herring bones were missed by excavators was checked by microscopic examination of a 5 kg bulk soil sample from stratum 4.4, where fish remains were abundant and well preserved. No evidence of herring or other small species was found in this sample (Madonna Moss, University of Oregon, personal communication to A. Crowell, 4 October 2018).

None of the 22 bird elements (mostly long bone fragments) in the sample were identifiable.

Mammals comprised 3,255 specimens with diverse taxonomic representation. Consistent with the results of previous work (Freed and Lane 1964), harbor seal was the dominant taxon (NISP = 1,044), representing 32% of all specimens identified at least to "mammal" and 89% of all specimens identified to a more specific taxon. These are broadly similar to Freed and Lane's results, in which harbor seal represented 81% of identified mammals. Harbor porpoise (*Phocoena phocoena* and family Phocoenidae) was the second most abundant mammal in the sample, also as previously reported, and sea otter (NISP = 1) and sea lion (NISP = 1) were present.

Specimens of northern fur seal (*Callorhinus ursinus*) are of particular interest because these animals are now rarely seen in Yakutat fiord. Although represented by a relatively small sample (NISP = 9), eight of the bones were from young-of-the-year animals (YOYs). Three of the YOYs were complete enough to obtain a metric estimate of age at death based on regressions presented in Etnier (2002). These were 3.4 months, 5.2 months, and 6.2 months. These age estimates are consistent with the harvest of YOYs migrating past Yakutat from distant breeding grounds to the north, including the Pribilof Islands and possibly the eastern Aleutian Islands (Etnier 2002, 2011, 2020; Crockford 2012).

Several rodent specimens (NISP = 12) were recovered, nine of which were isolated incisors. These may represent a mix of beaver (*Castor canadensis*), porcupine (*Erethizon dorsatum*), and one or two other taxa, possibly muskrat (*Ondatra zibethicus*) or marmot (*Marmota* sp.). Except for porcupine, all were also reported in Freed and Lane (1964). Incisors were used as carving tools and hafted in a wooden or antler socket.

Freed and Lane (1964) reported mountain goat (*Oreamnos americanus*) and black bear (*Ursus americanus*), but no remains of either species were identified in the 2014 sample. Black-tailed deer (*Odocoileus hemionus*, NISP = 4) was found in prehistoric levels of the 2014 trench (stratum 3 and 4), although this species has previously been considered to be a mid-twentieth century arrival in the area (Sill et al. 2017:8).

TABLE 9. Number of identified faunal specimens (NISP) by taxon from the 2014 test trench at Tlákw.aan (YAK-007). A dash (—) indicates no specimen.

	Stratum level								
Taxa and totals	**4.5**	**4.4**	**4.3**	**4.2**	**4.1**	**3.1**	**2.1**	**Not known**	**Total**
				INVERTEBRATES					
Tube worm	—	—	—	—	—	1	—	—	1
Urchin	—	—	1	—	—	—	—	—	1
Barnacle	—	—	—	9	17	2	—	—	28
Limpet	—	—	—	2	6	—	—	—	8
Littorina sp.	—	1	—	14	5	2	—	—	22
Nucella sp.	—	—	—	—	1	—	—	—	1
Terrestrial snail	—	—	—	1	—	—	—	—	1
Mytilus sp.	—	6	3	4	99	24	—	1	137
Leukoma staminea	—	3	—	17	128	4	1	—	153
Saxidomus gigantea	—	—	—	—	2	—	—	—	2
Scallop	—	—	—	1	1	—	—	—	2
Unidentified bivalve	—	—	—	79	52	9	—	5	145
Unidentified invertebrate	—	1	—	—	8	—	—	—	9
Invertebrates subtotal	**0**	**11**	**4**	**127**	**319**	**42**	**1**	**6**	**510**
				FISH					
Dogfish	—	3	5	1	—	—	—	—	9
Salmon	—	656	1,250	512	517	496	5	4	3,440
Cod	—	—	—	—	—	1	1	—	2
Unidentified fish	0	259	471	906	1,441	128	12	1	3,218
Fish subtotal	**0**	**918**	**1,726**	**1,419**	**1,958**	**625**	**18**	**5**	**6,669**
				BIRDS					
Unidentified bird	—	7	3	5	4	3	—	—	22
Birds subtotal	**0**	**7**	**3**	**5**	**4**	**3**	**0**	**0**	**22**
				MAMMALS					
Beaver	—	—	—	1	—	—	—	—	1
Probable porcupine	—	—	—	—	1	—	—	—	1
Beaver/porcupine	—	1	4	2	—	—	—	—	7
Rodent	—	—	1	1	1	—	—	—	3
Black-tailed deer	—	—	—	3	—	1	—	—	4
Cervidae	—	—	—	1	—	1	—	—	2
Artiodactyla	—	—	6	2	—	—	1	—	9
Probable Artiodactyla	—	1	1	2	—	—	—	—	4
Dog	—	—	1	—	—	—	—	—	1
Sea otter	—	—	—	—	—	1	—	—	1
Bear	—	—	—	2	—	—	—	—	2
Probable Bear	—	—	—	—	—	—	—	1	1
Unidentified carnivore	—	—	4	—	—	—	1	—	5
Harbor seal	—	77	165	220	199	208	9	35	913
Probable harbor seal	—	8	18	35	29	38	2	1	131
Fur seal	—	4	2	2	1	—	—	—	9

TABLE 9. (*Continued*)

	Stratum level								
Taxa and totals	**4.5**	**4.4**	**4.3**	**4.2**	**4.1**	**3.1**	**2.1**	**Not known**	**Total**
				MAMMALS (*Continued*)					
Probable fur seal	—	—	—	—	1	1	—	—	2
Sea lion	—	—	—	1	—	—	—	—	1
Unidentified pinniped	—	1	—	2	1	7	—	—	11
Harbor porpoise	—	1	—	2	5	—	—	—	8
Probable harbor porpoise	—	—	—	2	1	—	—	1	4
Phocoenidae	1	2	8	18	14	6	—	2	51
Probable Phocoenidae	—	—	—	3	—	—	—	—	3
Probable Cetacea	—	1	—	—	—	—	—	—	1
Unidentified mammal	3	124	253	437	461	578	146	79	2,080
Mammals subtotal	**4**	**220**	**463**	**736**	**714**	**841**	**159**	**119**	**3,255**
				UNIDENTIFIED VERTEBRATES					
Unidentified vertebrates subtotal	0	100	15	11	36	20	0	0	182
Grand total	**4**	**1,256**	**2,211**	**2,298**	**3,031**	**1,531**	**178**	**130**	**10,638**

Temporal Trends in Mammals

Harbor seals constitute the bulk of the YAK-007 mammalian assemblage throughout the temporal sequence (Figure 123), making up 29%–40% of all mammal bones in all but stratum 2.1, where bone preservation was generally poor. The percentage of harbor seals appears to decrease through time, but this is largely, if not completely, a function of variable preservation and identification rates. The temporal trends in identification rates for mammals, defined as the number of specimens identified to taxa more specific than "mammal" divided by the total number of mammalian specimens examined, mirror the percentage of harbor seals almost perfectly, peaking in stratum 4.3 and showing a steady decrease after that. The overall hunting effort for harbor seals thus appears to have been consistent through time. The vertical distribution of harbor seal bones illustrates the high density of their occurrence, particularly in stratum 4 (Figure 124).

Age Composition of Harbor Seals

At the beginning and end of occupation at Tlákw.aan the glacial front was as close as the Blizhni Point moraine (16 km away), although during an intervening period in the late sixteenth century it withdrew past Point Latouche into Disenchantment Bay (chapter 1, this volume). The proximity of the glacier during much of the settlement's history suggests that harbor seal hunting at the ice floe rookery might have been undertaken from the village itself rather than from sealing camps located farther up the fiord, as in later times. The presence of numerous harbor seal pups as well as adults in the Tlákw.aan faunal assemblage supports this hypothesis and provides information on ancestral seal hunting for comparison with oral accounts.

Parturition of pups at the modern ice floe rookery in Disenchantment Bay begins by early May, with peak numbers observed on the floes ice in mid to late June (Jansen et al. 2014). Pups are weaned and independent of their mothers by 4–6 weeks (Pitcher and Calkins 1979; Hoover-Miller 1994) and decrease greatly at the rookery by mid-July (Jansen et al. 2014). Traditional sealing in the late nineteenth–early twentieth century began in early June, when most pups had been born but were still nursing, and continued through July, with large numbers of adults (mostly females) and pups being taken during this period (Crowell 2016). Kwáashk'I Kwáan clan leaders generally forbade hunting in the rookery until newborn pups were seen on the ice, although they occasionally allowed the earlier taking of pregnant females to obtain the white lanugo fur of fetal animals, used for regalia (G. Ramos Sr., 18 June 2012, IN-15).

To analyze the age profile of harbor seal remains from Tlákw.aan, complete bones from the 2014 archaeological sample were measured using landmarks presented in Etnier (2002) and Ericson and Storå (1999; see also Storå 2000). Twenty-three different skeletal elements were measured for a total of 26 indices. These measurements—typically length in millimeters—were compared with growth curves generated from 41 known-age reference skeletons collected in collaboration with the Whatcom Marine

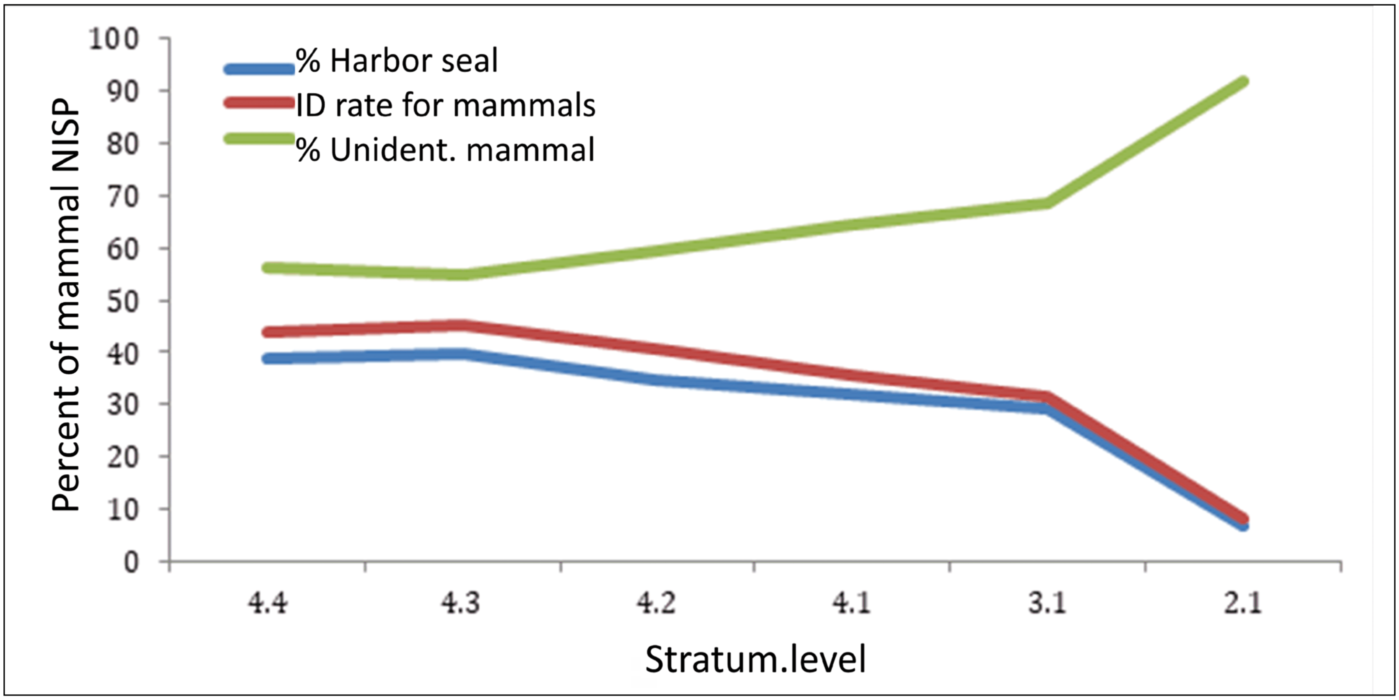

FIGURE 123. Temporal trends from oldest (4.4) to youngest (2.1) strata in the Tlákw.aan 2014 test trench, showing harbor seal remains as a percentage of all mammals; identification rates of all mammal bones; and unidentified mammal as a percentage of all mammals. Created by Michael Etnier. © Smithsonian Institution.

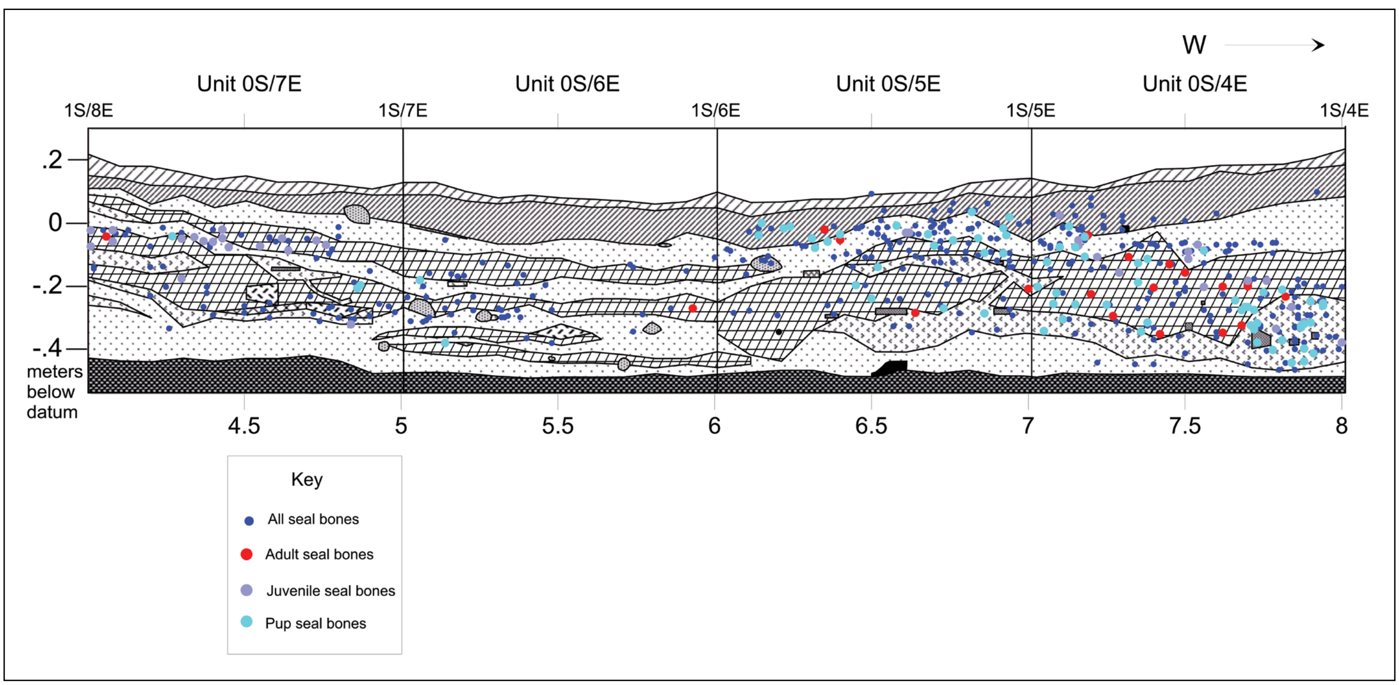

FIGURE 124. Vertical plot of harbor seal bones in the Tlákw.aan 2014 test trench.

Mammal Stranding Network and the Central Puget Sound Marine Mammal Stranding Network, with authorization from the National Oceanic and Atmospheric Administration. Date of collection or stranding was assumed to correspond to date of death of the individual.

In the absence of additional information on date of birth from necropsy of the animals (such as presence of the umbilicus, which persists up to five days postpartum, or presence of milk in the stomach), an average of 9 August was used to define birth date. For YOYs, the difference between date of death and date of birth equaled the age at death. For YOYs stranded on or prior to 9 August, an age at death of zero (i.e., newborn pup) was used. For individuals greater than one year in age, broad categories of subadult and adult were assigned based on fusion state of the epiphyses (growth plates). The reference sample included 32 YOYs (0–6 months) as well as 3 subadults and 6 adults.

To create growth curves, measurements for the 32 reference YOYs were plotted against age in tenths of a year. The graph for midline femur length (Figure 125) shows a typical degree of metric separation between newborns, transitional, and weaned animals. Next, the average measurement for all fully fused adults in the reference sample (2–6 specimens, depending on the skeletal element) was plotted (the horizontal dashed line in Figure 125). Finally, measurements for the YAK-007 specimens were plotted with an arbitrary age value of 0.1 years, roughly corresponding to the age of weaning (4–6 weeks). Based on where the YAK-007 specimens plotted relative to the known-age specimens, and whether or not they represented fully fused individuals, they were categorized as newborn pups, transitional (between nursing and weaned), weaned pups, subadults, or adults (Figure 126). Data and growth curves for all skeletal elements are presented in Etnier (2017: appendix 1).

Subjective estimates were made for Tlákw.aan specimens that could not easily be measured. Subjectively assigned categories were newborn, YOY, juvenile, and adult, based on degree of osteological development, fusion state of the epiphyses, and size relative to known-age reference skeletons. Age estimates were made for, in total, 173 Tlákw.aan harbor seal specimens ("ageable NISP" per Lyman 1987), with 145 metrically determined (Table 10) and 28 subjectively determined (Table 11).

For a combined analysis, subjectively assigned newborns were added to metrically determined newborns; subjective YOYs were added to metric weaned pups; subjective juveniles were added to metric subadults; and subjective adults were added to metric adults. The outcome is that newborn pups make up 16% (28/173) of the total; transitional pups 16% (27/173); weaned

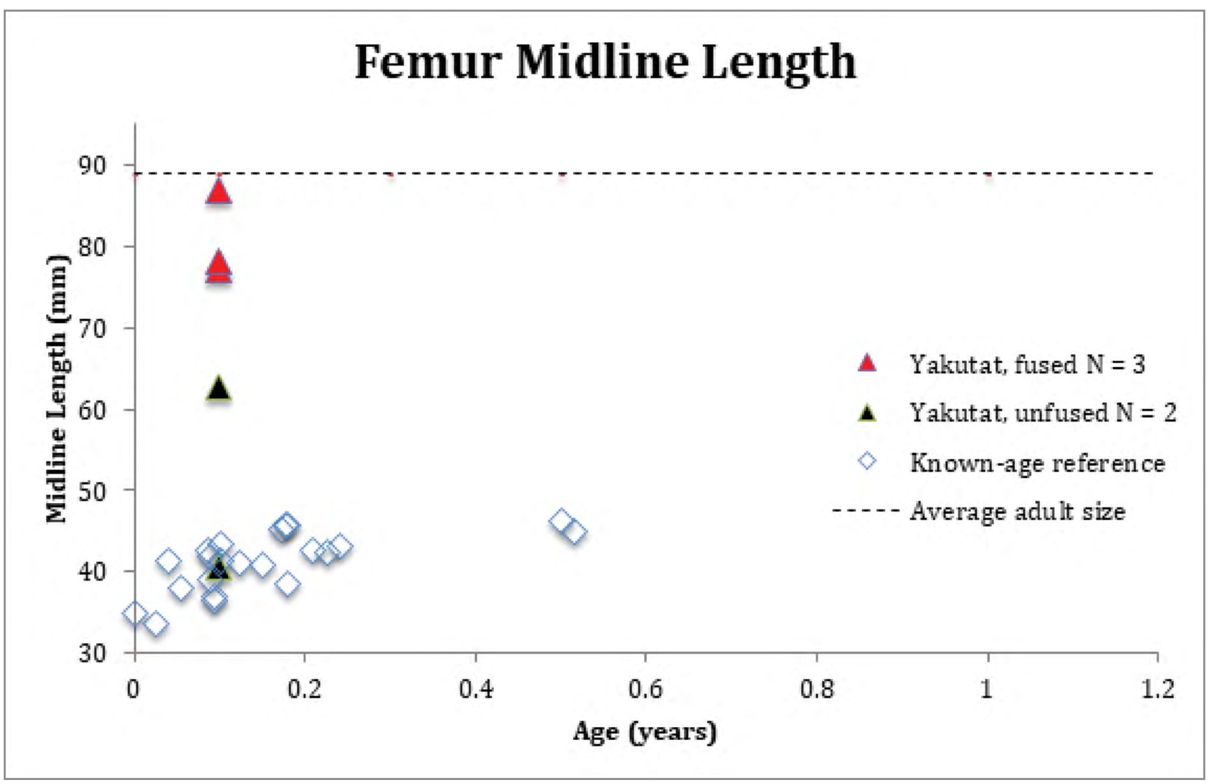

FIGURE 125. Length-at-age data for femurs from known-age harbor seals, with measurements from unfused and fused specimens from YAK-007 arbitrarily plotted at age = 0.1 years. Created by Michael Etnier. © Smithsonian Institution.

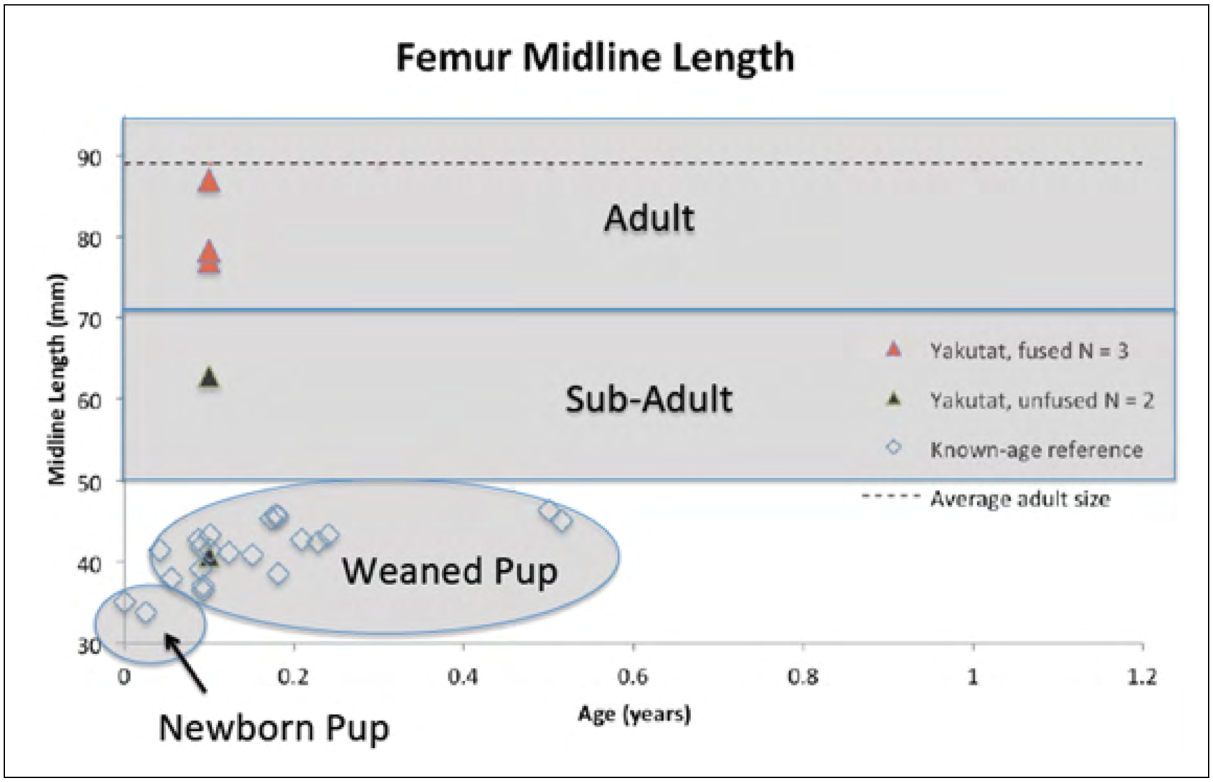

FIGURE 126. Shaded areas indicate zones used for estimating age-at-death for harbor seal specimens from YAK-007. Data points are plotted as in Figure 125. Created by Michael Etnier. © Smithsonian Institution.

pups 16% (27/173); subadults 30% (52/173); and adults 23% (39/173). The combined proportion of newborn and transitional pups (32%) is an unmistakable signal of ice floe rookery hunting at the glacial front during May–July, since animals of that age (up to six weeks) would have been available only at that location. It may be surmised that hunters accessed the rookery by canoe from Tlákw.aan, rather than from a separate sealing camp, and that they brought back whole animals of all ages to the village for butchering, evidenced by diverse representation of cranial and postcranial elements.

A higher success rate or general cultural preference for taking pups (newborn, transitional, and weaned) is also indicated, since these age categories make up 48% of the archaeological sample compared with 10% of the overall seal population as observed at the modern rookery, even during the pup peak in late June (Jansen et al. 2014). Moreover, since subadult and adult seals could have been hunted throughout the year near Knight Island and other parts of Yakutat fiord, their modest proportional representation at Tlákw.aan is even more striking. These data may be compared with the Early Contact Village Site in Aialik Bay on the Kenai Peninsula (Crowell et al. 2008). Harbor seal bones at that site included 24% adults versus 76% pups and subadults, nearly identical to Tlákw.aan and indicative of a similar focus on hunting at the ice floe rookery near Aialik Glacier.

Temporal trends may also be considered. When the age data are subdivided by stratigraphic designation, the proportion of subadults decreases through time (Figure 127). As subadults decrease, the combined proportion of newborn, transitional, and weaned pups increases from 26% in stratum 4.3 to 54% in stratum 3.1, suggesting an increase in the intensity of ice floe sealing hunting as the glacial edge moved closer to the site during the late Little Ice Age readvance, reaching Blizhni Point by circa 1700 CE. Thus, while the overall importance of harbor seals in the diet seems to have remained constant over time, the age profile of harvested animals shifted toward younger animals.

Discussion of Faunal Remains

Faunal remains from Tlákw.aan, supplemented by artifact data, indicate broad spectrum utilization of a glacial fiord catchment. Marine and terrestrial animals were taken during all phases of the seasonal round, from spring (harbor seal, sea otter, halibut, cod, shellfish) through summer (salmon, harbor seal, other sea mammals) and fall (mountain goat, bears, deer, beaver, porcupine).

TABLE 10. Summary of metrically determined harbor seal age estimates, by skeletal element and specific measurement. “Pup” refers to individuals inferred to be unweaned newborns approximately one month or younger; “trans.” refers to individuals that are transitional and could not be distinguished between newborn pups versus weaned young-of-the-year. “Weaned” refers to individuals inferred to be weaned, older than approximately six weeks. Sample from the 2014 Tlákw.aan test trench.

Element and total	Measurement	Pup	Trans.	Weaned	Subadult	Adult	Total
Mandible	Short length	2	0	0	1	0	3
Bulla	Length	4	9	0	1	1	15
Pelvis	Acetabulum height	2	0	1	0	5	8
Femur	Length	0	1	0	1	3	5
Fibula	Length	0	2	0	0	0	2
Astragalus	Length	1	0	0	3	0	4
Calcaneus	Length	0	0	0	2	0	2
1st metatarsal	Length	1	1	1	6	1	10
2nd metatarsal	Length	0	1	0	2	3	6
3rd metatarsal	Length	0	1	0	3	1	5
4th metatarsal	Length	1	0	0	1	0	2
5th metatarsal	Length	0	2	0	0	1	3
1st phalanx (rear)	Length	0	0	0	5	1	6
Scapula	Glenoid height	2	0	1	1	6	10
Humerus	Length	4	0	1	0	1	6
Humerus	Head width	1	3	0	1	0	5
Humerus	Distal thickness	2	4	0	1	1	8
Radius	Length	0	1	0	0	0	1
Radius	Proximal height	0	1	2	0	6	9
Ulna	Length	0	0	0	2	0	2
1st metacarpal	Length	1	0	1	5	0	7
2nd metacarpal	Length	1	0	0	4	1	6
3rd metacarpal	Length	0	0	1	6	1	8
4th metacarpal	Length	0	0	0	3	0	3
5th metacarpal	Length	0	0	1	2	0	3
1st phalanx (front)	Length	5	1	0	0	0	6
Total		**27**	**27**	**9**	**50**	**32**	**145**

Lineage houses and caches provided infrastructure for the socioeconomic pattern of cooperative resource harvesting during the warmer months and storage of processed foods (dried or smoked fish and meat, sea mammal oil, plant foods) for winter consumption when the entire population was present at the village. Mound B and other middens represent the end point of this consumption cycle when food remains were disposed by households.

Although deglaciation may have occurred less than a century before Tlákw.aan was initially occupied, faunal data from 2014 trench in Mound B appear to represent a more mature postglacial marine ecosystem that developed later in the history of the site (c.f. discussion of palaeobotanical specimens and radiocarbon dating, above). Clams, mussels, and other invertebrates indicate relatively clear water and the absence of ice scour, signals that the glacier had moved far enough away for productive intertidal zones to develop. The abundance of salmonid remains suggests that these fish were locally available at Kwáashk’ (Humpback Creek) and other locations. The run of salmon in that stream, which connects to Lake Redfield, may have been established soon after the glacier withdrew—Eyak use prior to the Gineix Kwáan is attested in oral tradition—but would have grown as the watershed became more biologically productive. While other types of fish are poorly represented in the 2014 Tlákw.aan faunal sample, artifacts from the site include bone barbs from halibut hooks and composite bone hooks used for mid-sized species such

TABLE 11. Summary of subjectively determined age estimates (YOY = young of year), by skeletal element and specific measurement. Sample from the 2014 Tlákw.aan test trench.

Element and total	Measurement	Pup	YOY	Juvenile	Adult	Total
Femur	Fusion	0	2	0	2	4
Tibia	Development	1	1	0	0	2
Fibula	Fusion	0	1	1	0	2
Mandible	Development	0	3	0	0	3
Tooth	Development	0	1	0	1	2
Scapula	Fusion	0	0	0	2	2
Humerus	Fusion	0	3	0	1	4
Radius	Fusion	0	2	1	1	4
Ulna	Development	0	1	0	0	1
Pelvis	Fusion	0	1	0	0	1
Sternabra	Development	0	3	0	0	3
Total		1	18	2	7	28

as Pacific cod. Modern Yakutat residents report catching halibut, herring, sablefish, rockfish, and lingcod in the Knight Island area (Sill et al. 2017).

Harbor seals were the primary sea mammal in the Tlákw.aan diet and were targeted at the ice floe rookery and in local waters around the islands of eastern Yakutat Bay. Harbor porpoises, fur seals, and the occasional sea lion were also drawn to the abundance of forage fishes in the Knight Island area and contributed to the human food supply. Barbed harpoon heads, scrapers for preparing hides, and stone lamps for burning sea mammal oil attest to ancestral use of these animals. Sea otters feed on urchins and bivalves found on local reefs, and their consumption at Tlákw.aan is documented by bones and the barbed points of harpoon arrows.

The paucity of avian remains is not surprising since few edible seabirds are available in Yakutat fiord, although the eggs of glaucous-winged gulls and Arctic terns are an important traditional food. Migratory waterfowl (sandhill crane, mallard duck, Canada goose, and others) that are targeted by contemporary hunters are mostly taken on the Yakutat foreland (Sill et al. 2017).

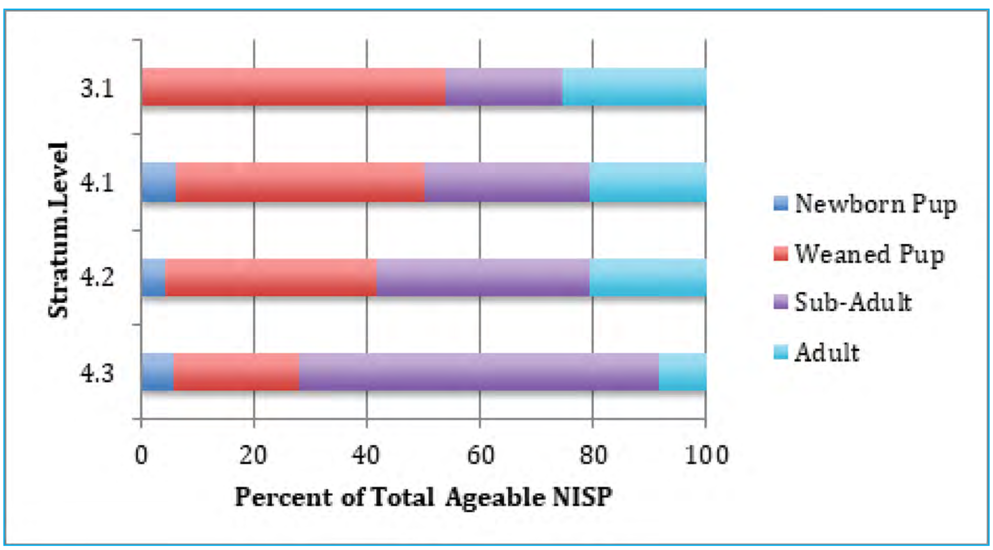

FIGURE 127. Temporal trends in the relative abundance of different age classes of harbor seals at YAK-007. Strata 4.4 and 2.1 were omitted due to small sample sizes. NISP = number of identified faunal specimens. Created by Michael Etnier. © Smithsonian Institution.

Compared with modern subsistence (chapter 2, this volume), the diet at Tlákw.aan had a significantly greater emphasis on marine resources, seen especially in the quantity and variety of sea mammals harvested and in the greater diversity of intertidal invertebrates. The analysis underlines the utility of integrating archaeofaunal, ecological, and cultural data to interpret human interaction with marine ecosystems in the North Pacific over time (Braje and Rick 2011; Rick et al. 2011).

Site Summary

The archaeology of Tlákw.aan—including the extent of the site, number of structures, architecture, radiocarbon age, artifact assemblage, and faunal remains—is consistent with oral narratives that describe the Gineix̱ K̲wáan migration from the Copper River area and the clan's cofounding with the G̲alyáx̱ Kaagwaantaan of a large village on Knight Island, with residence there until shortly before Western contact (Crowell 2022). Archaeological data confirm that the migration occurred, provide a chronological framework for the event and its aftermath, and demonstrate the cultural transformation of an inland riverine people to hunters and fishers on the Gulf of Alaska coast. Maritime adaptation, an explicit theme of the migration narrative itself, is verified by the tangible evidence of animal bones and implements used for hunting, fishing, skin processing, and food preparation.

NORTH KNIGHT ISLAND VILLAGE

Oral Tradition

The northern tip of Knight Island is Ganawás Shadaa (Tlingit, "around the head of Ganawás"; Thornton 2012:21). The north point, which is on U.S. Forest Service land in Tongass National Forest, is a low, forested promontory with views to the south down the length of Knight Island Passage and north toward the head of the fiord. Low-surf beaches on both sides are suitable for boat landings and Néix̱ Hit Tá creek, on the mainland just across Knight Island Passage, is a close and convenient source of fresh water. Present-day Yakutat residents occasionally use the point as a camping place when hunting for harbor seals, sea otters, and black bears or trolling for Chinooksalmon in the area (Devlin Anderstrom, personal communication to Aron Crowell, 19 June 2014).

Indigenous use of this location is demonstrated by the North Knight Island Village archaeological site (YAK-205), discovered in 2012 by the Smithsonian Yakutat project and investigated in 2014 (see Figure 7 for location). Radiocarbon dating indicates that the settlement was established 400–500 years ago, about the same time as Tlákw.aan, but there is no direct reference to it in oral tradition. The founders might have been Kwáashk'i K̲wáan, although the Eyak Hmyedi are said to have lived on Knight Island before they arrived (De Laguna 1972:231–233). The Chugach Sugpiat (called Aleuts by some Yakutat elders) are also associated in oral tradition with Knight Island and the adjacent mainland, as both inhabitants and enemy raiders (De Laguna 1972:257). However, other Yakutat community members use Aleut as a synonym for Eyak, adding further uncertainty to the settlement history (De Laguna 1972:61, 213). Yakutat elder George Ramos Sr. suggested that the residents of North Knight Island Village might have been either Eyak or Tlingit and that they used the high ground behind the village as a vantage point to watch for Chugach attacks (Judith Ramos, personal communication to Aron Crowell, 6 July 2014).

Site Description

The point at the north end of Knight Island is covered by mature spruce forest, with terrain that rises gradually from its eastern tip to the base of a steep, 12 m high bluff (Figure 128). A sandy, level terrace skirts the base of the bluff at an elevation of 7.6 m above sea level, as measured from mean lower low water (MLLW). At the north end of the terrace, in a grassy clearing with few trees, there are three circular house depressions (H-1, H-2, and H-3), each 3.0–3.2 m in diameter and 0.6 m deep, and a probable cache pit (Feature 1, 1.1 m wide and 0.2 m deep). Two additional houses (H-4 and H-5), which are similar in diameter but slightly shallower (0.3–0.4 m) than those on the terrace, are located downslope in alder brush at 6.5 m above MLLW.

The difference in elevation between the two groups of houses appears to correlate with age and declining relative sea level (RSL). The houses on the terrace are four centuries old or more, based on an AMS radiocarbon date from House 1 (see below), and were built soon after withdrawal of glacial ice from Knight Island; at that time, the sea presumably reached the base of the terrace. The shoreline would have receded as the island rose due to isostatic rebound, and construction of Houses 4 and 5 took place when RSL had dropped about 1 m. Artifact evidence from the midden deposits around Houses 4 and 5 suggests occupation during the late nineteenth century. Today the shoreline (measured at the edge of the cut bank at the top of the beach) is 5.5 m above MLLW, suggesting a cumulative drop in RSL over the last five centuries of about 2 m. Vertical movement of northern Knight Island during the 1899 earthquakes was negligible (Tarr and Martin 1912: plate 14) and is not a factor in this reconstruction.

Investigations in 2014

Smithsonian investigations (19 June–3 July 2014) were conducted with the assistance of University of Alaska Anchorage students joined by Yakutat high school students Kayla Drumm, Hayley Lekanof, and Devlin Anderstrom, supervised by Maka Monture for Sealaska Heritage Institute (Figure 129). Work at the site included visual survey and shovel testing to determine its extent; mapping of terrain and cultural features; and 13 m^2 of test excavations at four locations (Figure 128).

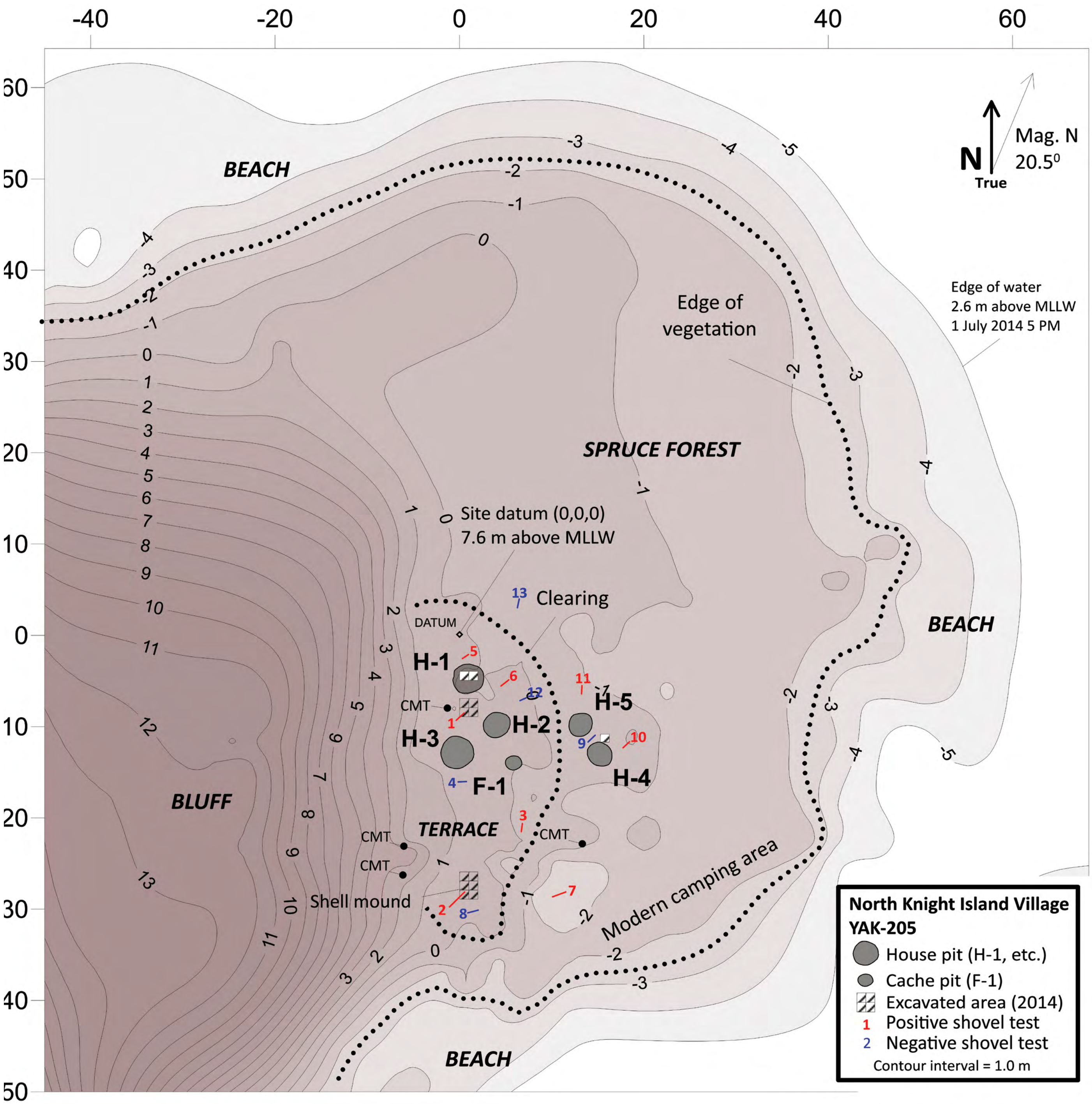

FIGURE 128. The North Knight Island Village site (YAK-205) showing its location on a terrace at the base of a 12 m bluff. Cultural features including house and cache pits are shown, as well as areas tested and excavated in 2014. The contour interval is 1.0 m; axis units are 1.0 m. © Smithsonian Institution.

FIGURE 129. Yakutat High School and University of Alaska students excavating at the North Knight Island Village site. From left to right, Devlin Anderstrom, Lorena Medina-Dirksen, Haley Lekanof, Kayla Drumm, Darian LaTocha, and Hillary Hogue. Photo © Smithsonian Institution.

Noncultural stratigraphy on the point consists of upper A-horizon humus over dark grayish-brown sand (Munsell 10 YR 4/2) with minimal development of B and C horizons. Beach cobbles underlie the sand at 50–70 cm below surface. Shovel tests ST-1, ST-5, and ST-6 were positive for cultural traces (charcoal, fire-cracked rock, bone, chert flakes) at the north end of the terrace near Houses 1, 2, and 3, while ST-2 at the south end revealed a pile of clam shells. A thin midden with charcoal and fire-cracked rock was found around Houses 4 and 5. No cultural indications were found on top of the bluff or other areas of the point except for modern fire rings, cut stumps, and camping debris along the south beach.

Four spruce trees with partially healed bark-stripping scars (culturally modified trees) were recorded on the point and the hillside. Two showed cut marks apparently made by a steel axe or knife. It is likely that subsistence harvesting of spruce bark took place at the site during the mid to late twentieth century.

House 1

House 1 is the northernmost of the three house pits on the terrace (Figure 130). Coring of a mature spruce tree (1.9 m girth) rooted on its west wall provided a count of 168 annual rings. With the addition of 15 years for growth of the tree to the height where the core was taken (1.4 m), the estimated age of the tree in 2014 was 183 years, meaning that it germinated in about 1831 CE. The tree started growing at an unknown time after the dwelling was abandoned, so this date is a minimum limit for the age of the house. Coring of a second spruce tree growing on the wall of House 2 (Figure 130) gave a slightly younger age of 127 years, or 1887 CE.

A 1 × 2 m area was excavated in the northern half of House 1, where a cobble-enclosed hearth (SF-2) was uncovered (Figure 131). Stratigraphy across the excavated area included a 13 cm layer of dark brown (Munsell 10 YR 2/2) humus (stratum 1) over a 20 cm cultural layer consisting of mottled dark grayish-brown

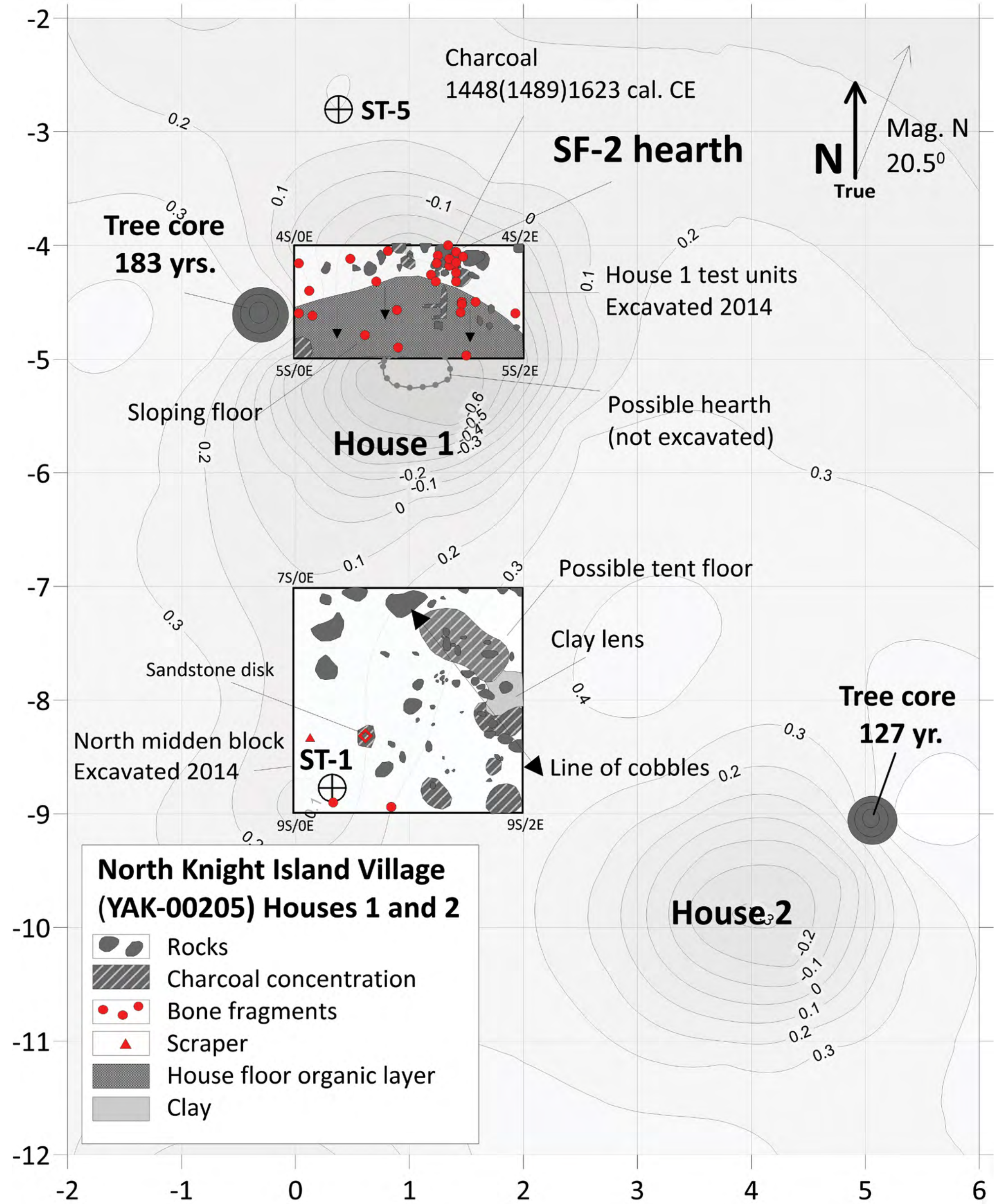

FIGURE 130. Results of excavations at House 1 and the north midden block at North Knight Island Village (YAK-205). Shovel test = ST; axis units are 1.0 m. © Smithsonian Institution.

(Munsell 10 YR 4/2) fine sand mixed with pieces of charcoal, fire-cracked greywacke rock, quartzite beach pebbles, and fragments of animal bone (stratum 2). Bone fragments were concentrated around the hearth but occurred throughout the unit (Figure 130). No artifacts or debitage were found.

The floor of the house, which was covered in the southern half of the excavation by a 1–2 cm layer of charcoal-stained organic material (possibly decomposed grass), sloped down steeply from the hearth at −0.60 m elevation to the center of the house at −1.05 m. A second hearth may be present in the middle of the house, but only the edge was exposed. The full depth of the structure from upper rim (+0.10 m) to bottom center (−1.05 m) was 1.15 m.

Spruce (*Picea* sp.) charcoal from hearth SF-2 yielded an AMS date of 1448 (1489) 1623 cal. CE (PRI-5591-7; Kováčik 2017; Table 8). This result is similar to dates from the lowest cultural stratum at the Tlákw.aan site and indicates that the two sites were established at about the same time.

FIGURE 131. Subsurface hearth feature SF-2 in House 1 at North Knight Island Village. Photo © Smithsonian Institution.

North Terrace Midden

A 2 × 2 m square area was excavated between Houses 1 and 2 (Figure 130). Stratigraphy consisted of 10–12 cm of dark brown (Munsell 10 YR 2/2) humus and grass roots (stratum 1) overlying 50 cm of dark grayish-brown sand (Munsell 10 YR 4/2) containing scattered fragments and thin lenses of charcoal, small pieces of fire-cracked greywacke, and a few bone fragments (stratum 2).

In the eastern half of the excavation a NW–SE alignment of greywacke cobbles may mark the edge of a tent, similar to lines of hold-down rocks found at tent locations at the YAK-012 historic sealing camp site (chapter 6, this volume). Charcoal concentrations extended to the line of rocks as if contained within a structure. A 10 cm thick lump of solid gray clay, function unknown, was found within the charcoal. Artifacts from the north terrace midden excavation included a cobble spall; a small white sandstone disk abrader nested in a pocket of charcoal; small flakes of green chert debitage; and several fragments of unmodified slate.

South Terrace Midden

A 2 × 3 m block was excavated at the south end of the terrace (Figure 132), where 10 cm of turf and humus (stratum 1) overlay 20–25 cm of grayish-brown sand lightly mixed with charcoal, shell, and bone (stratum 2). Subsurface feature SF-1, a hearth in the northwest corner of the excavation, was marked on the surface by a shallow depression. The hearth was lined by large beach cobbles, with dense charcoal between and above the stones. A machine-cut iron nail with rectangular cross section was found inside the hearth pit, a type that suggests a nineteenth century date prior to 1890 (Adams 2002).

Subsurface Feature SF-3 was a 10–15 cm thick pile of several hundred bivalve shells (littleneck clam, *Leukoma* sp.), primarily unbroken halves, lying just under the turf (Figure 133). A few snail and whelk shells and chiton plates were mixed with the clams, and charcoal was present in and around the pile. The shell dump may be the same age as the SF-1 hearth but is possibly more recent because it was very close to the surface, just under the modern turf. Midden deposits in the excavated area (stratum 2) produced four cobble spalls, suggesting meat or skin processing. Identifiable bones from the unit included harbor seal. These findings indicate that the south end of the terrace has seen historic and recent use in connection with subsistence activities, including intertidal gathering and seal hunting.

House 4 and House 5

A 1 × 1 m square midden test pit was excavated between Houses 4 and 5, revealing 20–30 cm of dense charcoal and fire-cracked rock just under the modern turf. No artifacts or bone were recovered. The below-terrace elevation and metal artifacts from nearby shovel test ST-11 (a wire nail and fragments of a steel can) suggests that this part of the site was used in the late nineteenth or early twentieth century.

Artifacts

Cobble Spalls

Cobble spalls (n = 5) are expedient utility tools used for scraping skins and cutting meat and fish (De Laguna 1956, 1960;

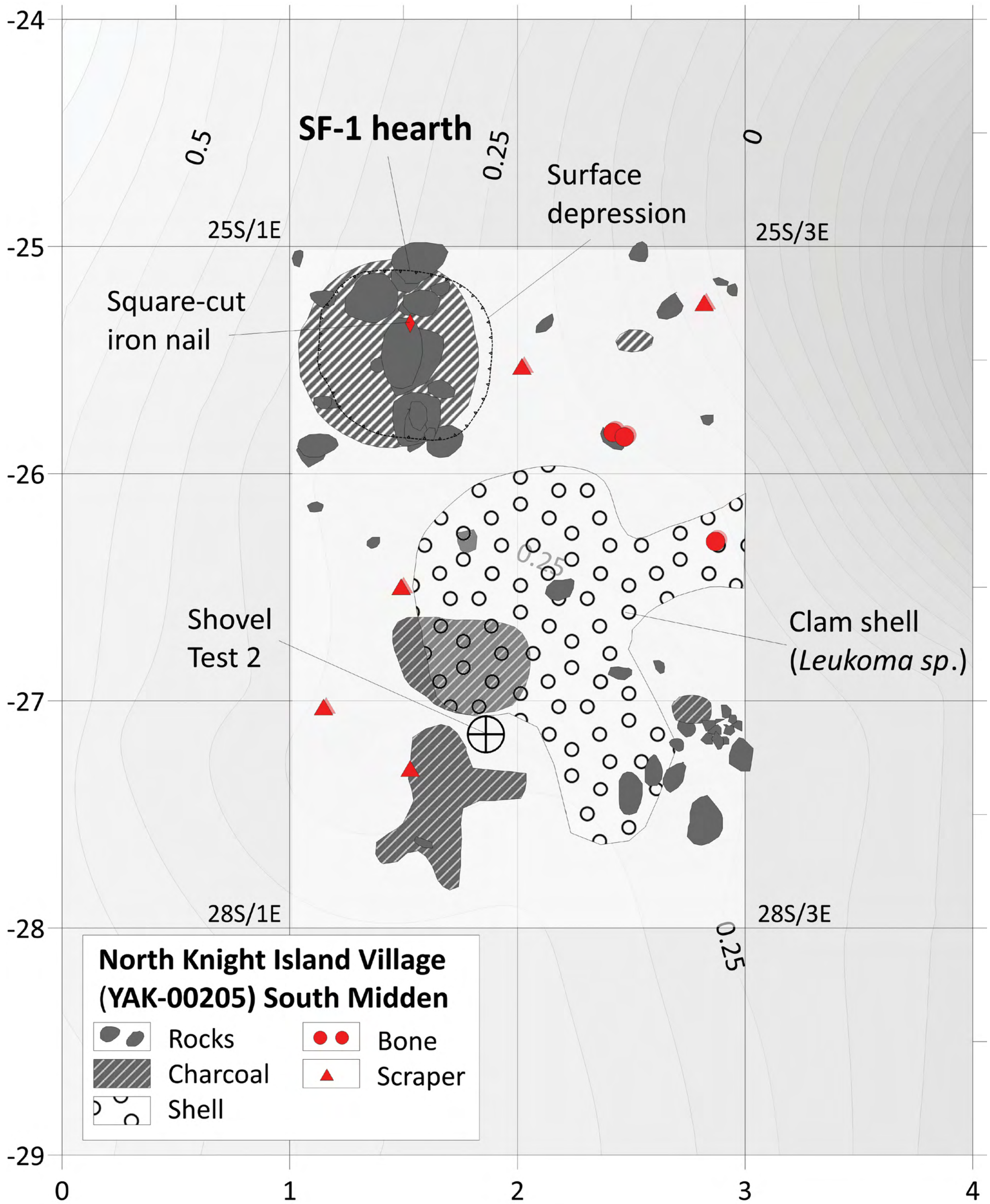

FIGURE 132. Results of excavation at the south midden block at North Knight Island Village, including hearth feature SF-1 and mound of littleneck clam (*Leukoma sp.*) shells. Axis units are 1.0 m. © Smithsonian Institution.

FIGURE 133. Littleneck clam (*Leukoma sp.*) shell mound (SF-3) in the south midden block at North Knight Island Village, lying just below the ground surface. Photo ©Smithsonian Institution.

Heizer 1956; De Laguna et al. 1964; Shinkwin 1979; Davis 1989; Matson and Coupland 1995). One was found in House 1 and the others in the south terrace midden excavation. The tools are 4.4–9.9 cm long and made of granite and basalt.

Abraders

Two abraders were recovered, one disk shaped (5.5 cm in diameter) and the other elongated (8.4 × 3.5 cm). Both were made of fine-grained white sandstone, probably obtained from an intertidal outcrop on the north side of the point where waves have sculpted large boulders of this material.

Iron Nails

The proximal end of a machine-cut iron nail with longitudinal grain and rectangular cross section (0.5 × 0.2 cm) was found in hearth SF-1 at the south end of the terrace. Machine-cut iron nails with square or rectangular cross sections began replacing hand-wrought nails in the United States during the early part of the nineteenth century and were largely superseded by round wire nails made of soft steel after the mid-1880s (Adams 2002). The bent midsection of a steel wire nail (0.4 cm diameter) was found in ST-11 near House 5. These artifacts date the more recent occupation at YAK-205 to the late nineteenth or early twentieth century, although a larger artifact sample would be needed to refine this estimate.

Tinned Steel Can

Two rusted fragments of thin (1–2 mm), flat metal—apparently pieces of a tinned steel can—were found in ST-11. Tinned cans were manufactured as early as the 1820s and were common in the United States by the beginning of the twentieth century.

Faunal Remains

Faunal specimens found in excavations and shovel tests are presented in Table 12. With few exceptions bone was present in the form of small, often calcined fragments that were not identifiable beyond class. The only identified vertebrate species was harbor seal (*Phoca vitulina*, NISP = 22). Seal elements included cranium, mandible, vertebrae, tibia, femur, sternum, metapodial, phalanx, cuboid, and cuneiform, which represent all quarters of the body and suggest that whole animals were being processed and consumed on site. Mollusk remains included large numbers of *Leukoma* sp. (littleneck clams) found in the shell pile (SF-3) at the south end of the terrace, along with lesser numbers of marine snails, mussels, chitons, urchins, and limpets, an assemblage indicating multispecies intertidal harvesting on beaches near the site. Fragments of unidentified land snail shells were also found in the south midden.

Site Discussion

Hearth features and compacted floor deposits containing charcoal and animal bones in House 1 confirm that it was a dwelling rather than a large storage pit, and this interpretation can reasonably be projected to the other four depressions of similar size (H-2, H-3, H-4, and H-5). Only the smallest pit, Feature F-1, is likely to have been a food cache.

The radiocarbon date from House 1 and the small collection of artifacts (cobble spalls, sandstone abraders) found on the terrace support the hypothesis that this upper part of the site, including Houses 1, 2, and 3, was initially used in the sixteenth or early seventeenth century. Two near-surface features at the south end—pit hearth SF-1 and shell pile SF-3—are more recent, both probably dating to the late nineteenth century. Below the terrace, Houses 4 and 5 and surrounding thin midden deposits are of similar, if not more recent, vintage.

The cultural affiliation of the site remains conjectural. The artifacts found in 2014 are not culturally diagnostic, but the architecture of the houses may be considered. All are circular and approximately 3 m in diameter, contrasting in size and form to the larger and typically rectangular houses of the Eyak, Ahtna, and Tlingit. They most closely resemble Sugpiat summer dwellings of the Kenai Peninsula and Prince William Sound, which were of similar size and depth, usually circular, and roofed with bark or planks, whereas winter houses from that region were more deeply excavated with entrance tunnels and sod-covered roofs (De Laguna 1956; Crowell and Mann 1998; Crowell et al. 2008; Maio et al. 2019).

The older house group at North Knight Island Village including Houses 1, 2, and 3 might therefore have been a Sugpiat summer site, consistent with the oral tradition that "Aleuts" camped on the island but never built a permanent winter village there (De Laguna 1972:257). Seal hunting appears to have been the primary subsistence focus. The paucity of artifacts, thin house floor deposits, and light concentrations of charcoal and other cultural materials in the sandy midden on the terrace indicate a relatively ephemeral occupation, perhaps only one or two seasons. A similar interpretation might be applied to Houses 4 and 5, although this would imply Sugpiat use of Yakutat Bay in the late nineteenth or early twentieth century, which is not supported by oral or historical information.

TABLE 12. Faunal identifications (NISP) for North Knight Island Village (YAK-205). Shovel test = ST.

Taxon	House 1	North Midden	South Midden	ST-1	ST-2	ST-10	Total
Phoca vitulina	8	5	7	2			22
Unidentified mammal	53	87	32	1		22	195
Unidentified bird	6						6
Unidentified vertebrate	221	77					298
Unidentified marine shell	2		5		7		14
Leukoma (littleneck clam)			556		219		775
Littorina sp.			1				1
Mytilus sp.			5				5
Neptunea sp.			1				1
Barnacle			2				2
Chiton			32				32
Limpet			2				2
Urchin			10				10
Land snail			108		4		112
Totals	**290**	**169**	**761**	**3**	**230**	**22**	**1,475**

6 The Tlingit Period, 1700–1900 CE

The Tlingit Period was initiated by a third wave of Indigenous migration to Yakutat fiord, this time by Tlingit clans moving up from the south during the early eighteenth century. The arrival of the Tlingit spawned conflict with Eyak and Ahtna populations that already resided in the Yakutat area, but intermarriage and social integration followed in time. The late eighteenth and early nineteenth centuries brought extensive contact with Russian and American sea otter traders, followed in 1867 by U.S. colonial rule and the commercial fur and fishing industries (chapter 2, this volume). Knowledge of the Tlingit Period derives from oral tradition (Swanton 1909; Harrington 1940; De Laguna 1972; Thornton 2012), archaeology (De Laguna et al. 1964; Davis 1996), and accounts by Western traders and explorers (e.g., Dixon 1968; Olson 2002).

ORAL TRADITIONS

In Hoonah oral tradition, Kaakeix'wtí from Xakwnoowú near Cross Sound was the first person to venture north to Dry Bay, where he taught Tlingit methods of hunting, fishing, and trapping to the Tutchone Athabascan residents (Swanton 1909:326–346). Subsequently, Southeast Alaska Tlingit clans, including the Teik̲weidí (Eagle moiety, from northern Prince of Wales Island), L'uknax̲.ádi (Raven moiety, from Sitka), Kaagwaantaan (Eagle moiety, from Cross Sound and Icy Strait), and Shank̲ukeidí (Wolf/Eagle moiety from Chilkat and Kake), migrated north by canoe along the Gulf of Alaska coast to Dry Bay, or traveled there overland by descending the Alsek River (Swanton 1909; De Laguna 1972:81–82, 223–229). These movements, estimated to have taken place in the early 1700s, were partly impelled by Haida expansion into former Tlingit territories in the northern Alexander Archipelago (De Laguna 1990).

The Little Ice Age glacial advance at Glacier Bay (1700–1770 CE) may also have triggered Tlingit emigration to the north. The rapidly expanding Muir Glacier overran Tlingit villages in the bay and depressed the surrounding land over a wide area, causing up to 4 m of relative sea level rise in Cross Sound, Icy Strait, Lynn Canal, and Chatham Inlet (Dauenhauer and Dauenhauer 1987; Larsen et al. 2005; Mann and Streveler 2008; Connor et al. 2009; Crowell and Howell 2013; Crowell et al. 2013a). This event may be the origin of northern Tlingit accounts of the "Great Flood" brought about by Yéil (Raven), in which people are driven from their coastal villages and seek shelter on the mountaintops (Swanton 1909:16–17, 120–121). The actual rise in relative sea level, while far less than portrayed in oral tradition, would have been enough to flood shoreline villages and alter coastal habitat, potentially leading to population dispersal from the region (Crowell et al. 2013a).

The migrating Tlingit clans first settled with the Tutchone Athabascan residents of Dry Bay, who belonged to the L'uknax̱.ádi Raven clan. Long-standing relationships already existed with this group through intermarriage and trade along the Alsek River, and most Dry Bay Tlingit are said to have spoken Tutchone as a second language (De Laguna 1972:81–82). The Tlingit L'uknax̱.ádi came to be the dominant clan at Dry Bay, establishing their main settlement at Gus'eix̱ (Thornton 2012:10–12).

From Dry Bay the Teiḵweidí moved farther north to the Yakutat foreland, where the Drum House branch of the clan acquired territory on the Ahrnklin, Dangerous, and Italo Rivers and established Ahrnklin village (Swanton 1909:365–368; De Laguna 1972:80; Figure 35). The Bear House branch of the Teiḵweidí settled on the Lost and Situk Rivers, where they took Diyaaguna.éit from the Eyak in battle and made it their leading village. The Bear House Teiḵweidí also occupied Wulilaayi Aan and Nets'eł hwuw.aan, while other foreland settlements, including Naasoodat, Aka Lake, and Goosh Shakee Aan remained under Laax̱aayík Teiḵweidí (Eyak) or Kwáashk'i Ḵwáan (Ahtna) control (De Laguna 1972:73–76). The Teiḵweidí are also said to have settled with Ahtna and Eyak residents at Tlákw.aan on Knight Island (chapter 5, this volume).

DOCUMENTARY HISTORY

Direct Western contact in Yakutat fiord began with the arrival of British sea otter trader George Dixon, who anchored in Monti Bay (Port Mulgrave) in May 1787. Observations by Dixon and others who followed provide information on Tlingit subsistence and settlement patterns in the late eighteenth century. Dixon reported a total of 70–80 people at Ankau Creek and in the Khantaak Island group, living in temporary summer shelters made of planks (Dixon 1968; De Laguna 1972:126). In the following year, Russian fur traders Izmailov and Bocharov observed that "the greater part of the inhabitants had quitted their winter huts, and for the purpose of procuring provisions, were gone out in canoes and boats" while their permanent villages were said to be along "various rivers," referring to winter villages on the Yakutat foreland (De Laguna 1972:132–138; Shelikhov 1981:93–99).

In June 1794, Alejandro Malaspina explored the eastern shore of the fiord from Monti Bay to Disenchantment Bay, where his progress was stopped by thick ice floes from Hubbard Glacier (Olson 2002). Tlákw.aan village on Knight Island was not seen and was presumably no longer inhabited. Malaspina observed no living settlements along his route except Laax̱aa Tá, a camp with summer huts just south of Point Latouche (discussed below). In Disenchantment Bay the expedition landed at Indian Camp Creek, the future site of Ḵeik'uliyáa sealing camp, but there were no indications of Indigenous habitation. Thus, in the late eighteenth century the entire Yakutat population, including Eyak, Ahtna, and Tlingit clans, resided in winter villages on the Yakutat foreland, with residents dispersing to subsistence camps in the fiord during the spring and summer months. Spring hunting at the Disenchantment Bay harbor seal rookery appears to have been conducted from Laax̱aa Tá, rather than from Knight Island as during the Ahtna Period. Large amounts of floating ice choked Disenchantment Bay, as reported by Malaspina, apparently blocking reliable access by canoe (De Laguna 1972:76).

Russia's Shelikhov–Golikov Company established a fortified outpost and agricultural settlement on the Yakutat foreland in 1795 (Novo Rossiysk, "New Russia"), but it was destroyed by the Laax̱aayík Teiḵweidí in 1805 (De Laguna 1972:173–176). After looting the Russian fort, the Laax̱aayík Teiḵweidí built their own fortified settlement, Ch'áak'Noow ("eagle fort") on the Situk River for defense against the L'uknax̱.ádi Tlingit (De Laguna 1972:79; Thornton 2012:22; Figure 7).

The Alaskan smallpox epidemic in 1837–1840 killed more than 400 Yakutat residents and led to the abandonment of most settlements on the foreland and the consolidation of survivors at Khantaak Island (De Laguna 1972:177). The post-1867 American period saw the move from Khantaak to the town of Yakutat in 1889; extensive trade by the Alaska Commercial Company (ACC); intensive market sealing for the ACC involving an annual move by most Yakutat residents to spring sealing camps in Disenchantment Bay (Crowell 2016); and construction of a salmon cannery at Yakutat in 1903. Two Teiḵweidí settlements date to the post-1867 period (Figure 7): Situk Village on the west bank of the Situk River (1875–1916) and Bear Paw House on the Lost River (1919–ca. 1945; De Laguna et al. 1964:27).

SETTLEMENTS AND PLACE NAMES

Tlingit Period settlements, archaeological sites, and selected place names are shown in Figure 7, indicating occupation and use of most parts of the Yakutat foreland and fiord during this period. Archaeological sites discussed below include the upper layers at Diyaaguna.éit (YAK-019) and Wulilaayi Aan (YAK-020) on the Yakutat foreland, excavated by Stanley Davis (1996), and four sites in the fiord that were reported by De Laguna (De Laguna et al. 1964:20–23) and reinvestigated by the Smithsonian in 2014. These are Laax̱aa Tá (YAK-011), an eighteenth century camp near the entrance to Disenchantment Bay; Néix̱ Hit Tá (YAK-010), a nineteenth century camp on the mainland opposite Knight Island; Ḵeik'uliyáa (YAK-012), a large sealing camp in Disenchantment Bay, used during the late nineteenth and early twentieth centuries; and Woogaani Yé (YAK-202), a twentieth century Disenchantment Bay sealing camp that was also the site of a battle in about 1805 between the Laax̱aayík Teiḵweidí and L'uknax̱.ádi.

De Laguna discovered additional precontact middens at Canoe Pass (YAK-004) and Dolgoi ("Doggie") Island (YAK-005), neither investigated during the Smithsonian project (De Laguna et al. 1964:21). Extensive efforts were made in 2014 to find a Laax̱aayík Teiḵweidí camp at Bancas Point (Gil' Shakee.aan, "village on top of the cliff"), which is known only from oral tradition (Thornton 2012), but the search was unsuccessful (Table 1, Figure 7).

DIYAAGUNA.ÉIT DURING THE TLINGIT PERIOD

Following Tlingit migration to the Yakutat foreland, Diyaaguna.éit became the main village of the Bear House Teikweidí. It is recalled in oral tradition as a fortified settlement with eight lineage houses, enclosed by a palisade (De Laguna 1972:76–77). The smallpox epidemic of 1837–1840 killed most of the site's residents, and the survivors moved to the Situk River and Khantaak Island.

Tlingit occupation at Diyaaguna.éit during the eighteenth and early nineteenth centuries was principally at Locality B (Figure 83), where ten Tlingit-style lineage houses (H-3, H-5, H-6, H-7, H-11, H-12, H-13, H-22, H-23, and H-24) were constructed along the bank of Tawah Creek (Davis 1996:303–305). The house pits exhibit classic Tlingit construction with tiers of side platforms surrounding a deep central depression and hearth. House 3 was identified by Yakutat elders as the probable remains of Bear House (or Bear Paw House), where Teikweidí chief Daqusetc resided (De Laguna 1972:77; Davis 1996:267–274). Smaller structural depressions at Locality B were interpreted as bath houses, a menstrual hut, food storage pits, and cremation pits, the latter likely associated with deaths from the smallpox epidemic and abandonment of the site in about 1840.

The upper soil layers and house floors at Diyaaguna.éit contained stone and bone artifacts from the Tlingit occupation, but these were indistinguishable from underlying Eyak material. However, interaction with foreign trading ships and the Novo Rossiysk fort in the late eighteenth century brought about a marked transformation in the material culture of Diyaaguna.éit residents. Eurasian trade artifacts dominate in the Tlingit Period deposits including, European and Chinese glass beads (drawn and wound styles); Chinese coins used by the Russians in Northwest Coast trade; hand-painted and transfer-printed pearlware, whiteware, earthenware, and porcelain ceramics; bottles and window glass; iron and copper tools including axes, adzes, chisels, knives, nails, kettles, hooks, rods, and needles; metal jewelry and ornaments such as rings, bracelets, spiral earrings, cones, buckles, and buttons; gun parts; and lead musket balls (Davis 1996:339–438). The artifact assemblage is comparable other pre-1840 Russian colonial sites in southern Alaska (Crowell 1997, 2011b; Crowell et al. 2008). No archaeofaunal data specific to the Tlingit occupation are available.

WULILAAYI AAN DURING THE TLINGIT PERIOD

Wulilaayi Aan was originally a Ł'uxedi Eyak village, as discussed above (chapter 4, this volume). The Eyak were displaced by the emigrating Tlingit in the eighteenth century, but the Bear House Teikweidí chief Daqusetc, who lived at nearby Diyaaguna.éit, is said to have given the site to his Kwáashk'i Kwáan brother-in-law (De Laguna 1972:77).

Archaeological evidence of residence during the Tlingit Period at Wulilaayi Aan, most likely by the Kwáashk'i Kwáan, came primarily from House 2 and House 3. House 2 was relatively small (3.5 × 4.0 m) with an Eyak-style central pit and side benches. The uppermost of three occupation floors produced a mix of stone tools and Russian imports, including glass beads, iron nails, an iron axe, a copper hook and knife, glass fragments, and two Russian coins (Davis 1996:223–226). House 3 was of similar size and architecture, with imported Russian artifacts found in all three floor levels, including iron nails and fragments and utilized window glass fragments (Davis 1996:226–229). Food storage pits, hearths, cremation features, and general midden deposits on the surface of Wulilaayi Aan yielded glass beads and other Russian trade goods, consistent with oral tradition indicating that the site was occupied up until the time of the smallpox epidemic. No archaeofaunal data specific to the Tlingit occupation are available.

NÉIX HIT TÁ: AN EARLY SEALING CAMP

Oral Traditions and History

Oral traditions about this site, situated at the mouth of a small stream on the mainland across from northeastern Knight Island (Figure 134; see Figure 7 for location), refer to multiple occupations and time periods. The Tlingit name of the stream is Néix Hit Tá ("back of marble house"; Thornton 2012:21), perhaps inspired by white granite outcrops in its upper valley.

In enumerating ancestral sealing camps that his uncle Jack Ellis knew from oral tradition, George Ramos Sr. said that Néix Hit Tá was the "original, first one" established as glacial ice withdrew from Yakutat Bay (G. Ramos Sr. 11 June 2011, IN-8, and 18 June 2012, IN-15). The Tlingit place name of the channel between Néix Hit Tá and Knight Island is Tsaa Yoowú ("seal stomach"; Thornton 2012:21).

Frederica De Laguna was told of an "Aleut" or "Chugach" camp (De Laguna et al. 1964:22; De Laguna 1972:66) at this location, possibly referring to early use by Sugpiat people from Prince William Sound or to the Russian colonial period, when Sugpiat hunters were brought to Yakutat to harvest sea otters. Later nineteenth and early twentieth century residence at the stream by Yakutat Natives was recalled by L'uknax.ádi Tlingit elder Minnie Johnson of Yakutat (born 1884), who told De Laguna that the settlement was named G^waxgek^w: "The name G^waxgek^w is Aleut for 'mountain stream.' Sea gulls used to lay their eggs there. There was no grass. Quite a few families settled in there. . . . It's right across from Knight Island. A stream comes out. It used to be shacks all the way down there on a sand spit. Now it's all trees"(De Laguna 1972:66).

In the nineteenth century Néix Hit Tá, or G^waxgek^w, was frequented by seal hunters and families as a stopover on the way to and from Disenchantment Bay. Israel Cook Russell, the leader of a National Geographic Society expedition to climb

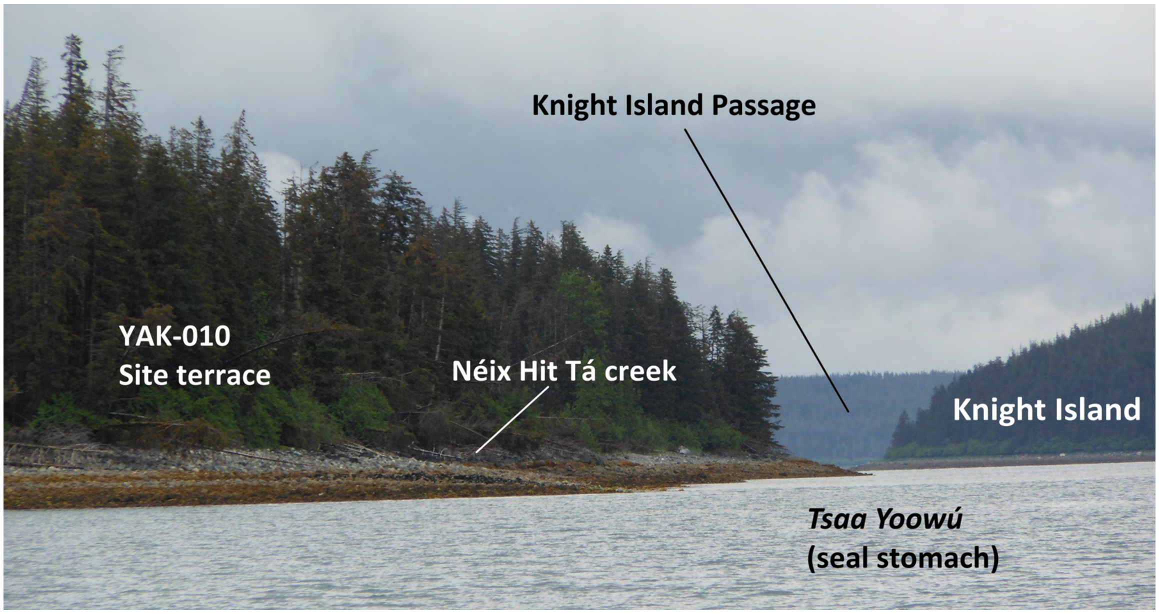

FIGURE 134. View to the south of the entrance to Néix̲ Hit Tá creek and the location of the archaeological site (YAK-010). Photo © Smithsonian Institution.

Mount St. Elias in 1890, camped at the creek overnight where he was joined by one party: "They brought their canoe high on the beach, and made themselves at home about our camp-fire. There were seven or eight well-built young men in the party, all armed with guns" (De Laguna 1972:202). George Ramos Sr. remembered seeing evidence of this settlement on the south bank of the stream when he was young—probably in the late 1940s—but no one lived there at that time (G. Ramos Sr., 18 June 2012, IN-15).

Site Description

Both sides of the stream mouth were searched in 2011 and 2012, and the south bank was followed inland for about 200 m (Figure 135). A forested terrace borders both sides of the stream, about 3.5 m above high tide level at the entrance and rising gradually upstream. This area was tectonically uplifted about 1.5 m during the 1899 earthquake (Tarr and Martin 1912: plate 14). The terrace has been eroded along its seaward edge by waves, and the creek is bordered by banks of eroding glacial sand and pebbles. The terrace is covered with spruce trees averaging about 1.5 m in girth and a century in age, consistent with forest growth since the beginning of the twentieth century. Hemlock trees are present, with an understory of berry bushes and devil's club. A blowdown of trees on the north bank made examination of the ground surface impossible in some areas.

Visual inspection, shovel testing, and metal detection revealed thin (5–10 cm) nineteenth–early twentieth century cultural deposits on the north bank terrace. Charcoal fragments and an impact-deformed musket ball were found in the roots of a fallen spruce at the top edge of the bank on the north side of the stream, and fragments from two late nineteenth century glass bottles were found on the erosion face nearby. A 1 × 1 m square test unit at the edge of the bank near the bottle fragments uncovered five wire nails and a concentration of charcoal. Traces of shell or bone were noted in the roots of several blown-down trees on the south bank, indicating that cultural deposits extend to that side. Nine bark-stripped trees, some with multiple scars, were noted during a brief survey of the southern bank.

Discussion

Preliminary results indicate that the late nineteenth–early twentieth century camp recalled by Minnie Johnson is represented by cultural deposits on the north and south banks of the stream. Remains of this encampment were evidently still visible when George Ramos Sr. visited the location in the 1940s. The main part of the historic camp, located on a low-lying spit near the stream according to Johnson, may have been washed away by the tide.

The stripped spruce trees near the stream are evidence of harvesting bark, which provided food in spring and was used to cover traditional shelters used at seal camp. The age of the stripping scars was not determined, but they are partially healed and could date to the middle or late twentieth century.

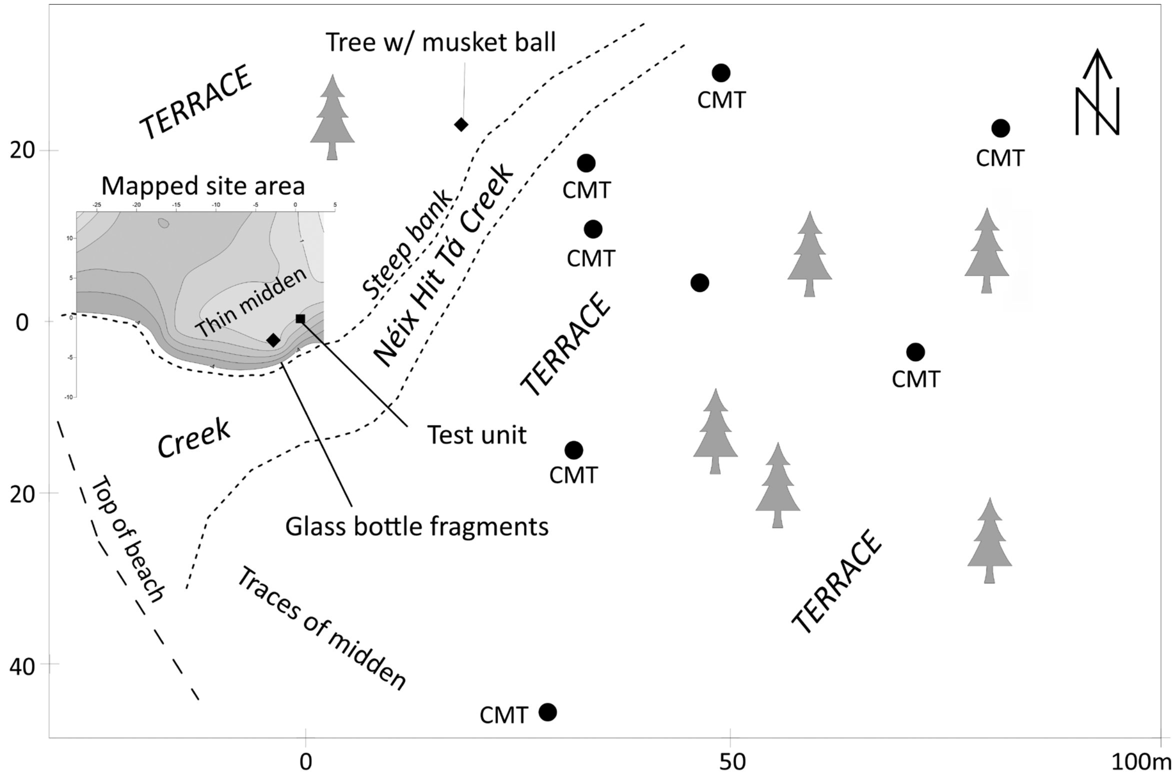

FIGURE 135. Surveyed contour map of the YAK-010 site and schematic of Néix̲ Hit Tá creek from GPS readings, showing locations of culturally modified trees (CMT). Axis units of surveyed area are 1.0 m; contour interval is 1.0 m. © Smithsonian Institution.

No traces of the "first sealing camp" known from oral tradition were discovered at Néix̲ Hit Tá. It may be that older cultural remains were simply overlooked because forest cover and fallen trees hindered archaeological inspection. However, it is also possible that local knowledge about the first sealing camp actually refers to the 500-year-old North Knight Island Village site (YAK-205), located across Tsaa Yoowú channel on Knight Island (chapter 5, this volume). Like Néix̲ Hit Tá, Knight Island is remembered as a place of Aleut (Sugpiat) settlement, substantiated by the circular form of the house pits at YAK-205; archaeofaunal evidence from that site confirms that the occupants were seal hunters. It would not be surprising if these two locations, separated by less than a kilometer, were conflated in centuries-old oral accounts.

LAAX̲AA TÁ: THE "OLD SEALING CAMP"

Oral Traditions and History

De Laguna was told that the north bank of the first stream south of Point Latouche on the east side of Yakutat Bay (Figure 7) was the site of an "old sealing camp" called Laax̲aa Tá (alternatively Tłaxátà), used "before the natives had rifles" when "floating ice in Disenchantment Bay rendered camping dangerous above Pt. Latouche" (De Laguna 1972:67; also reported in Harrington 1940). The camp, which De Laguna did not attempt to relocate, was assigned site number YAK-011. The reported absence of rifles at the time of occupation indicates a date before the 1880s when breech-loading rifles became available to Yakutat residents; alternatively, it might refer to the introduction of earlier firearms, including rifled muskets in about 1840 or smoothbore muskets by 1800 (Crowell 2016). The place name Laax̲aa Tá is from the Eyak word *laax̲aa*, meaning "near the glacier," and the name of the stream—Tł'·tsh·ú·t ("canyon")—is also Eyak (Thornton 2012:20). George Ramos Sr. identified Laax̲aa Tá as the second sealing camp (after Néix̲ Hit Tá) to be used as the retreating glacier moved north away from Knight Island, although he was unsure of the exact location (G. Ramos Sr., 11 June 2011, IN-3, and 18 June 2012, IN-15).

Malaspina's exploration of Yakutat fiord on 1 July 1791 confirmed the presence of a Tlingit camp about two Spanish *millas* (miles) south of Point Latouche, in the vicinity of the first stream (De Laguna 1972:148–149; Olson 2002:362–363). On his chart of Puerto del Desengaño (Disenchantment Bay) and environs (Figure 136), Malaspina marked it as a *rancheria* (small settlement) and sketched five rectangular structures arranged in two rows perpendicular to the shore, as if along a stream (Higueras 1991). Malaspina met a leader of the camp

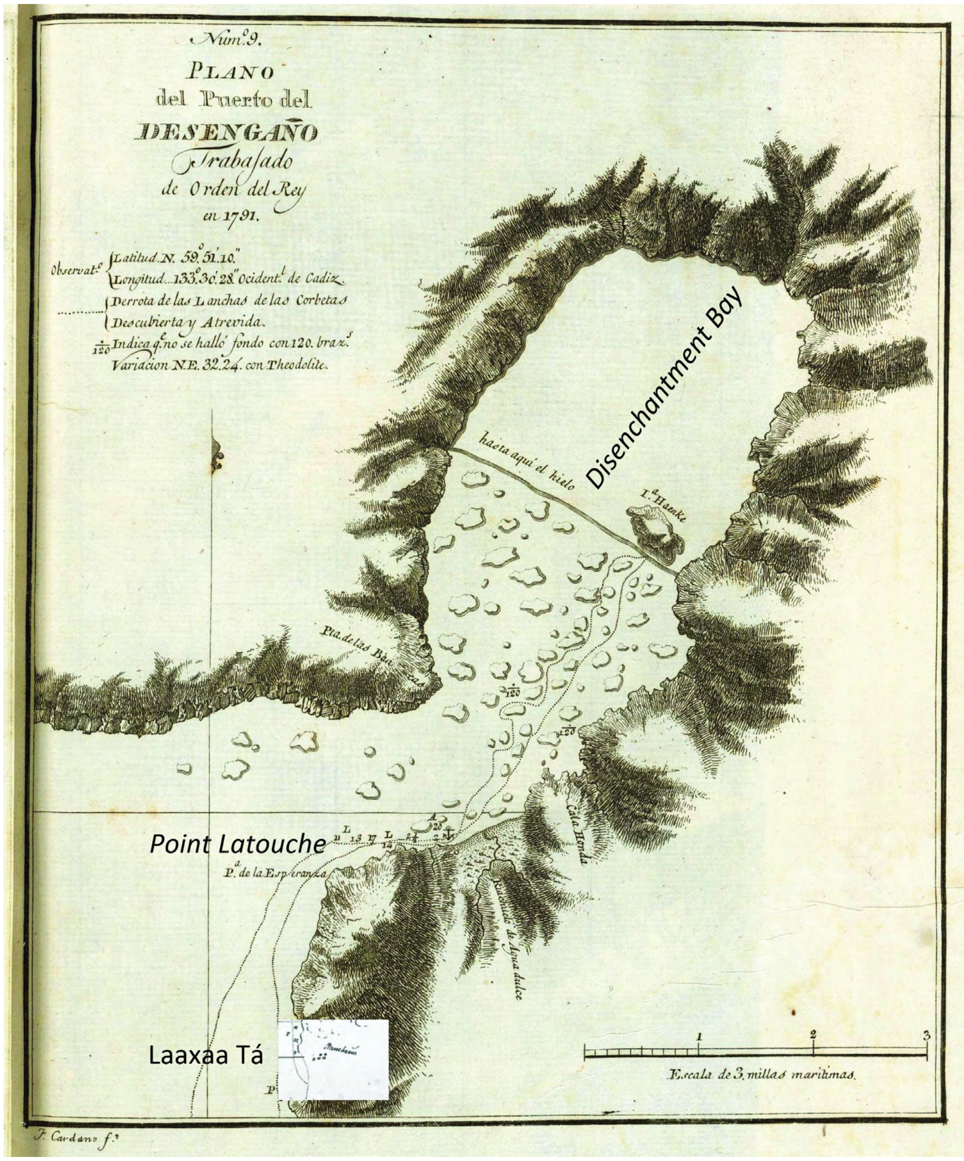

FIGURE 136. This 1791 chart from the Malaspina Expedition, "Plano del Puerto del Desengaño" (Map of the Bay of Disenchantment), indicates a "rancheria" (small settlement) at the location of Laaxaa Tá sealing camp. Loose ice floes are shown in outer Disenchantment Bay up to the edge of a heavy, impenetrable ice pack projecting 3–4 *pies* (feet) above the surface of the water. Engraved from the original by José Maria Cardano; published in *Atlas para el viage de las goletas Sutil y Mexicana al reconocimiento del Estrecho de Juan de Fuca en 1792*, Madrid: Imprenta Real, 1802. Open access, David Rumsey Collection, Cartography Associates, Stanford University. https://www.davidrumsey.com/luna/servlet/view/search?sort=Pub_List_No_InitialSort%2CPub_Date%2CPub_List_No%2CSeries_No&q=plano+del+puerto+del+desengano&search=Go (accessed 17 May 2023).

who came out in a dugout canoe, but there is no indication that he went ashore, and it can be assumed that the dwellings were sketched from a distance. Malaspina wrote, "The little plot of level land where they had built their huts was found to be very protected from the north winds. Its location, facing sufficiently to the south, seemed to make it a preferred site for a settlement. However, although the beach was a good place to anchor, it was exposed to the large waves that pass across here, especially in winter" (Olson 2002:362–363).

As Malaspina's comment suggests, the beach at Laax̲aa Tá is a difficult place to launch and land boats because of nearly constant surf that sweeps over a shallow, boulder-strewn reef. Today it is safely accessible only at high tide under calm conditions, although changes to the shoreline during the earthquake of 1899 might have worsened the situation (Tarr and Martin 1912: plate 14).

Site Description

Reconnaissance surveys around the outlet delta of Tł'·tsh·ú·t stream, including both banks of the two present branches and areas to the north along formerly active channels, were undertaken in 2011 and 2013. A broad, flat terrace along the north bank of the northern contemporary branch, about 4.5 m above the stream, offered the best match to the site location as remembered in oral tradition ("back in the woods" on the north bank) and as mapped by Malaspina (slightly inland, apparently along a stream, and beneath a hill that protected it from north winds). Physical evidence of Laax̲aa Tá camp was discovered on this terrace in 2013, about 60 m from the present shore (Figure 137).

Two circular depressions surrounded by 1 m high wall mounds, each 5 m in diameter, were designated as Structures 1 and 2. These constructions are back-to-back at the terrace edge and have wide openings—probably entryways—through their walls. A 1 × 3 m test trench inside Structure 1 revealed a 10 cm layer of mottled gray and reddish-brown sediments beneath the surface humus (Figure 138). This layer contained ephemeral bone or shell smears and thin lenses of organic woody matter but no charcoal or artifacts. The bottom of the depression was lined with a 4–8 cm layer of dense, claylike gray silt overlying sterile sand. This stratigraphy was unquestionably cultural, bearing no resemblance to natural soil layers on the surrounding terrace, which consist of forest litter and humus overlying glacial sand and gravel. Given the absence of a hearth, and the presence of a clay lining at the bottom of the depression, Structures 1 and 2 are best interpreted as storage caches rather than dwellings, perhaps once covered by plank or bark-covered roofs.

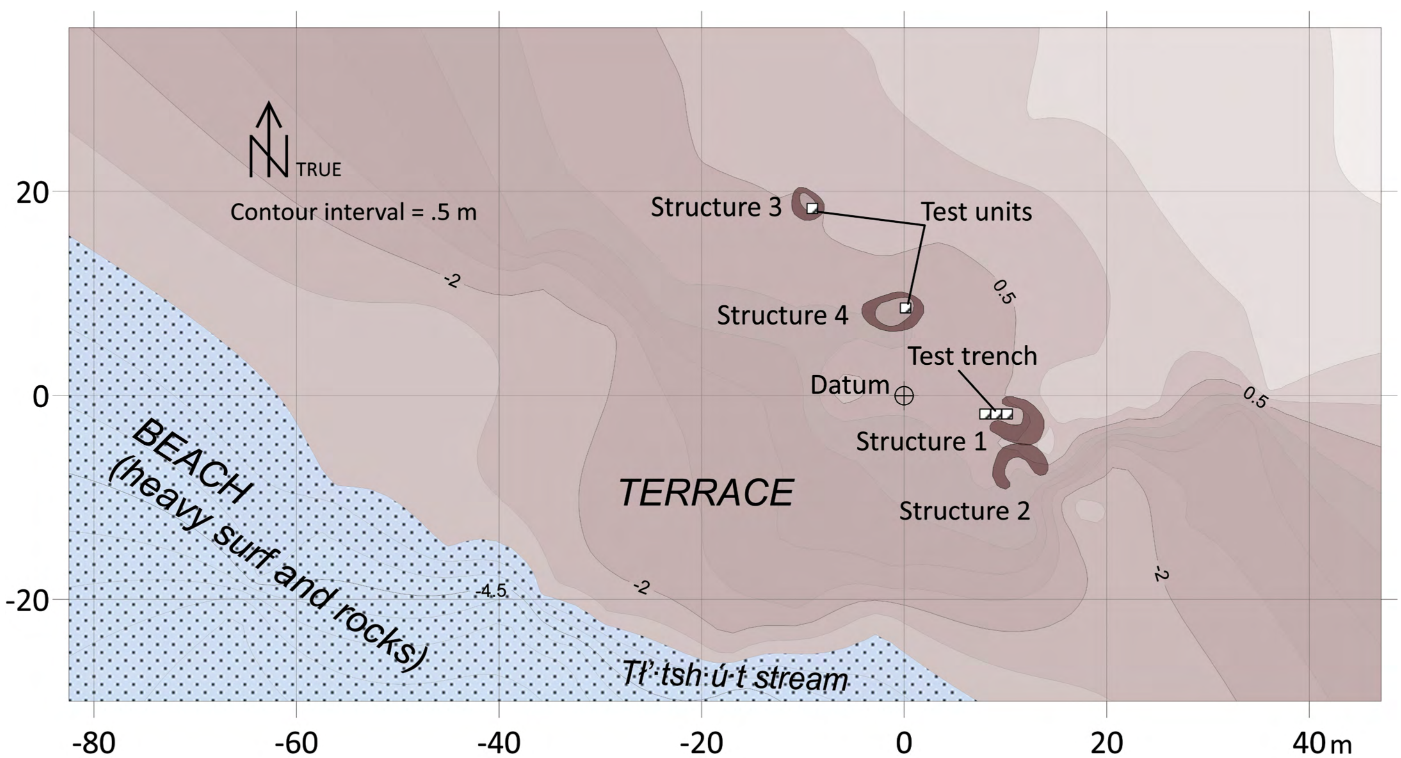

FIGURE 137. Survey map of terrain and cultural features at Laax̲aa Tá camp (YAK-011), Yakutat Bay, 2014. The contour interval is 0.5 m, the axes are in meters. © Smithsonian Institution.

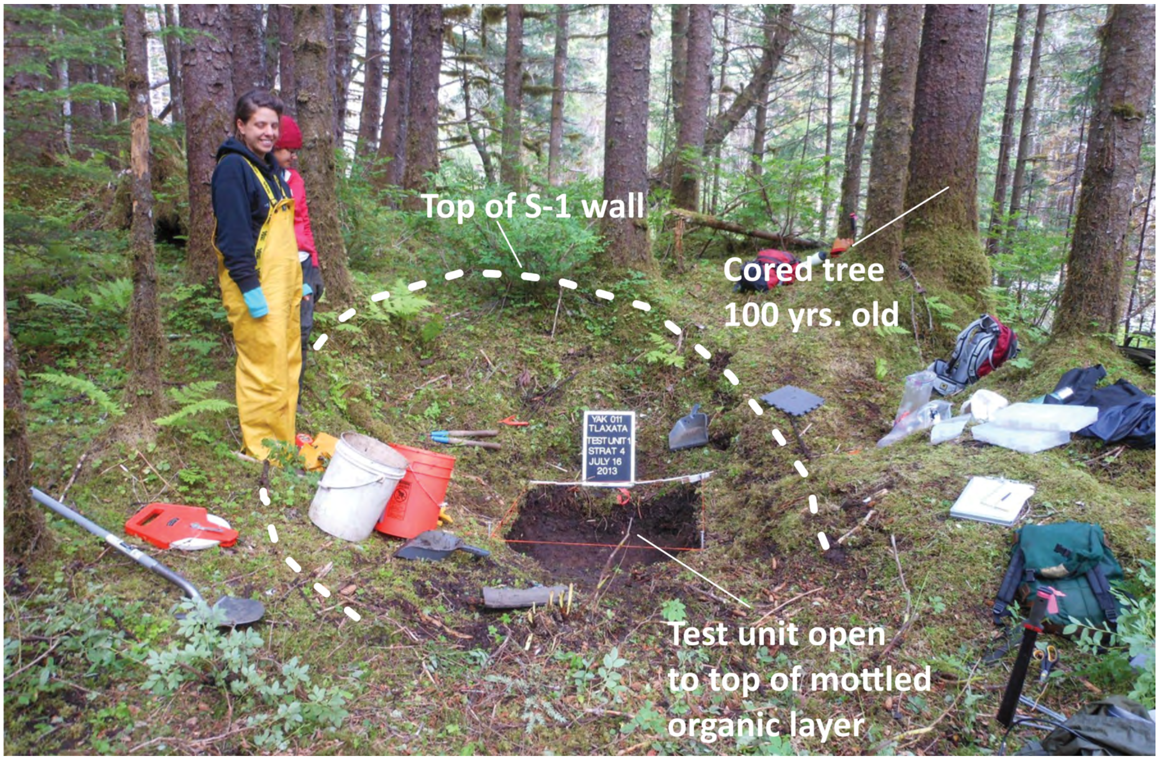

FIGURE 138. Emma Bailey and Fawn Abt at Structure 1, Laax̲aa Tá (YAK-011). The initial 1 m^2 test square has been excavated to the top of the mottled organic layer. View to the southeast. Photo © Smithsonian Institution.

Two shallow, subrectangular depressions without raised wall mounds (Structures 3 and 4) were found on the forest floor (Figure 137) and identified as possible floors of summer plank shelters. Test units measuring 1 × 1 m square were placed in both depressions, but the thin interior deposits contained no identifiable cultural stratigraphy or materials. The ephemeral cultural deposits and scarcity of artifacts at YAK-011 are not unexpected at a seasonally occupied camp that may have been used for only a few years.

A mature spruce tree (1.6 m in girth) growing on the common wall of Structures 1 and 2 (Figure 138) was cored and found to have 85 annual rings, giving a minimum age of 100 years when 15 years are added for growth to coring height (1.2 m). Cores taken from other large trees on the terrace indicated that this is the general age of the forest, which therefore postdates the archaeological site by a century or more. The absence of trees in 1791 would have allowed Malaspina a clear view of the camp from offshore.

Prior to discovery of the site, George Ramos Sr. thought that a sealing camp was unlikely at Tł'·tsh·ú·t stream because of the dangerous landing conditions and suggested that Laax̲aa Tá might have been farther south at Roosevelt Creek (G. Ramos Sr., 18 June 2012, IN-15). Following this suggestion, all stream outlets along Logan Beach from Point Latouche to Knight Island, including Giyaxak (Roosevelt Creek), were checked without result in 2013 and 2014. The remains discovered at Tł'·tsh·ú·t stream are therefore accepted as representing the location of historical Laax̲aa Tá.

Discussion

Despite difficult access, the streamside location and topography of the YAK-011 site match both Yakutat oral knowledge of Laax̲aa Tá sealing camp and Malaspina's 1791 observations of a small settlement south of Point Latouche. Residence at Laax̲aa Tá at that date is consistent with traditional knowledge that the camp was used before firearms became available to the Indigenous population.

Laax̲aa Tá's location relative to the late Little Ice Age harbor seal rookery is also as remembered in oral tradition—near enough to access the seals but safely outside Disenchantment Bay, where the packed glacial floes charted by Malaspina (Figure 136) made it difficult to camp. Residents of Laax̲aa Tá could have hunted by canoe along the outer edge of the pack without getting trapped by ice inside the bay. Although the shift to sealing camps inside Disenchantment Bay took place as early as 1805 at Woogaani Yé (see below), floating ice can even now be a hazard.

KEIK'ULIYÁA: DISENCHANTMENT BAY SEALING CAMP

History and Oral Tradition

After the U.S. acquisition of Alaska from Russia in 1867 the inhabitants of Yakutat fiord intensified their traditional hunt for harbor seals to produce surplus skins and oil for trade with the ACC (Crowell 2016; chapter 3, this volume). Yakutat Bay was the center of the regional sealing industry in Southeast Alaska, about which U.S. census enumerator Ivan Petroff wrote that "the natives on many of the islands make quite a profitable business of killing hair seals [harbor seals] for their hides and the oil rendered from the blubber" (Petroff 1884:90). Disenchantment Bay was, according to John Burroughs in 1899, "perhaps the greatest hair sealing ground on the coast" (Burroughs et al. 1901:161). Underlining its prominence, Tlingit hunting parties traveled from other parts of Southeast Alaska to join in the annual hunt, with permission from Yakutat clan leaders (Figure 139).

The largest of the late nineteenth century Disenchantment Bay sealing camps was Keik'uliyáa (Eyak, untranslated), also known as Shaanáx Kuwóox' (Tlingit, "wide valley"; G. Ramos Sr., 11 June 2011, IN-3, and 13 June 2011, IN-8; Thornton 2012:20-21), located on the broad outwash delta of Indian Camp Creek and Aquadulce Creek just north of Point Latouche (De Laguna 1972:67–68; Figure 140). This was Kwáashk'i Kwáan traditional land, acquired centuries earlier from the Eyak (chapter 4, this volume). The camp was used annually in May–July as a base for hunting harbor seals among the ice floes near Hubbard and Turner Glaciers. In late May most of the Yakutat population would leave Monti Bay for Disenchantment Bay, traveling in large dugout canoes and two-man hunting canoes (Goldschmidt and Haas 1998:47; Johnson 2014:14). Seton Karr reported that Khantaak village at Monti Bay was completely deserted in mid-July 1886 because the inhabitants were sealing at the glacier and that they did not return until early August (Seton Karr 1887:50–51).

The men hunted seals with rifles from dugout canoes, using harpoons to retrieve the animals once they had been shot, while at Keik'uliyáa women skinned, scraped, and tanned the seal hides, dried and smoked the meat, and rendered oil from the blubber (Figure 141). Keik'uliyáa was a "family camp" where men, women, and children lived, distinguished from "men's camps" on Haenke (Egg) Island and other locations within the ice field where male hunters might stay for several days of hunting before returning to the family camp with their catch (E. Abraham, 10 June 2011, IN-1; G. Ramos Sr., 11 June 2011, IN-3).

The Harriman Alaska Expedition, an American scientific voyage (Litwin 2005), visited Keik'uliyáa on 21 June 1899 at the height of the sealing season (Burroughs et al. 1901; De Laguna 1972:66–67). Descriptions by John Burroughs, George Bird Grinnell, and C. Hart Merriam, paintings by Frederick Dellenbaugh, and photographs taken by Edward S. Curtis (Harriman Expedition and Yakutat Collections 1899; C. Hart Merriam Collection of Native American Photographs 1890–1938; De Laguna 1972: plates 72, 74–80), combined with oral traditions and archaeological investigations conducted in 2011 and 2013, indicate that there were three separate living areas, or subcamps, at Keik'uliyáa.

The largest living area, which in 1899 included 18 canvas wall tents and 6 bark-covered smokehouses (Subcamp 1), was at the mouth of Indian Camp Creek (Figure 142); a second, smaller encampment with 8 tents and 1 smokehouse (Subcamp 2) was on a seaside terrace about 300 m east of Aquadulce Creek (Figure 143); and a third encampment with six tents and one smokehouse (Subcamp 3) was located at the mouth of Aquadulce Creek on its west bank (Figure 144). This arrangement (see Figure 140) is consistent with the Tlingit name for the shoreline between Indian Camp Creek and Aquadulce Creek, which is Ayuwaakát Yasatán, meaning "gravel between two camps," that is, between Subcamps 1 and 3 (L. Farkas, 11 June 2011, IN-4; E. Abraham and L. Farkas, 16 June 2012, IN-13A; Thornton 2012:21).

FIGURE 139. Men in sealing canoe offshore from Keik'uliyáa (Shaanáx Kuwóox') sealing camp in Disenchantment Bay, June 1899. Photograph by Edward S. Curtis, Harriman Alaska Expedition. National Museum of the American Indian, Smithsonian Institution P10952.

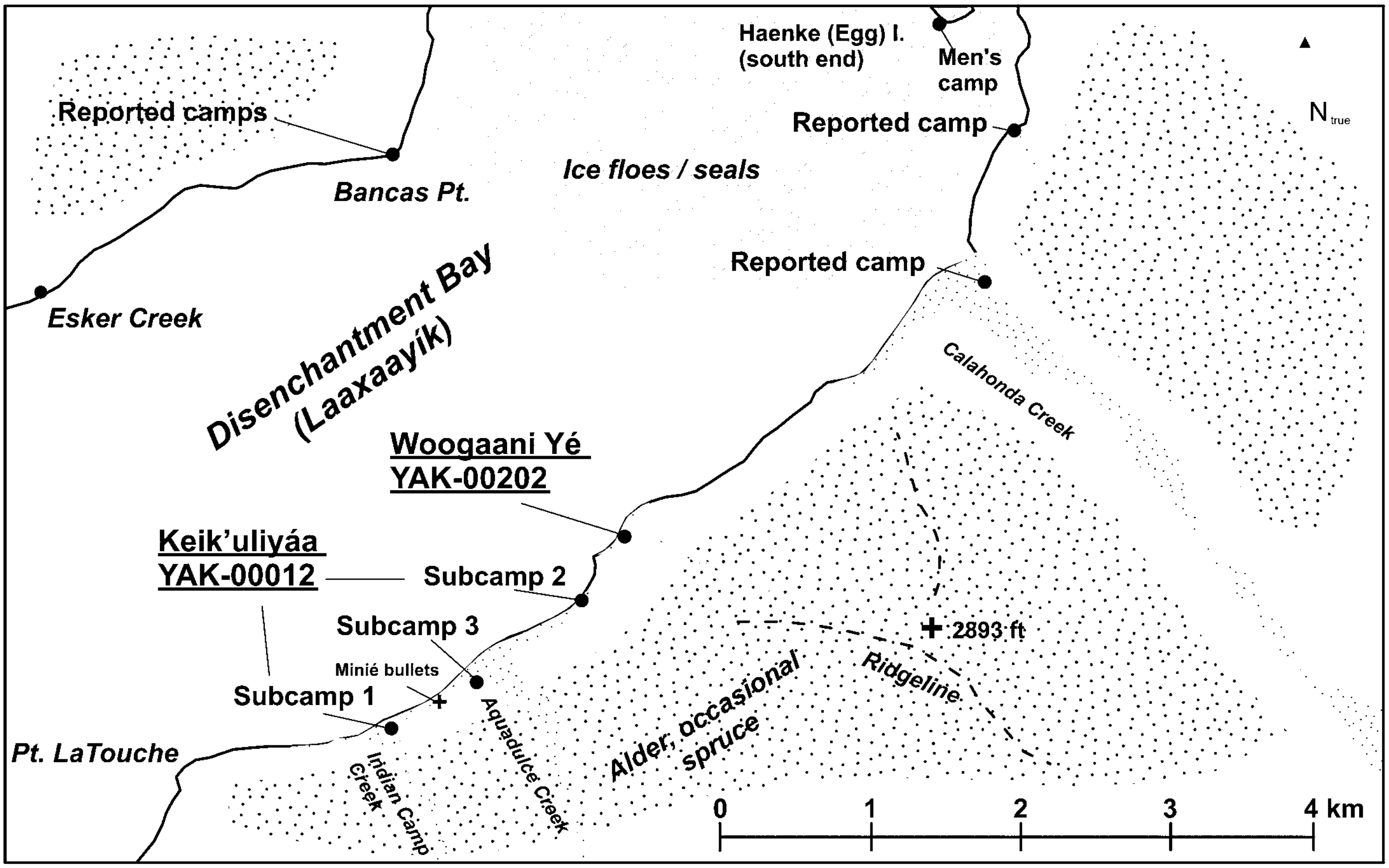

FIGURE 140. Traditional sealing camp locations between Point Latouche and Haenke Island in Disenchantment Bay. © Smithsonian Institution.

Harriman observers estimated that the total population at Keik'uliyáa in 1899 was 300–400 men, women, and children, including Yakutat residents and visiting contingents from Juneau and Sitka, with each group occupying a separate area (Burroughs et. al 1901:161–165). It was customary for Tlingit hunting parties from "Lituya Bay on down," including Hoonah, Sitka, Juneau, and Wrangell, to come regularly to Disenchantment Bay to take advantage of the unequalled sealing, arranging their visits a year or two ahead through negotiations with Kwáashk'i Kwáan leaders (E. Abraham, 27 June 2013, IN-28). Visitors camped separately from the Yakutat community, either on the opposite side of Disenchantment Bay at Esker Stream (G. Ramos Sr., 13 June 2011, IN-8) or in separate subcamps at Keik'uliyáa. It may be inferred that Subcamp 1 was occupied by Yakutat residents in 1899 because it was the only group of tents large enough to accommodate a significant portion of the Yakutat population, which was about 300 in 1890 (Skidmore 1893:53). Subcamps 2 and 3 may have been occupied by the Juneau and Sitka families that year, although which group camped at each location was not recorded. No other sealing camps were being used in 1899, or at least none were seen when the Harriman expedition ship *Elder* explored to the head of Disenchantment Bay and passed into Russell Fiord (Burroughs et al. 1901:55–56). Burroughs described the busy scene at Indian Camp Creek (Keik'uliyáa, Subcamp 1):

> The encampment we visited was upon the beach of a broad gravely delta flanked by high mountains. It was redolent of seal oil. The dead carcasses of the seals lay in rows upon the pebbles in front of the tents and huts [smokehouses]. The women and girls were skinning them and cutting out the blubber and trying it out in pots over smoldering fires, while the crack of the Winchesters of the men could be heard out among the ice. (Burroughs et al. 1901:60)

This description, combined with the sizeable population of the camp, indicates the intensity of the sealing effort. Harriman observers estimated that at least 1,000 scraped sealskins were drying on wooden stretchers in the three subcamps (Burroughs et al. 1901:165), comparable to Seton Karr's report in 1886 that 1,500 seals were killed at Disenchantment Bay in just three days (Seton Karr 1887:71; Figures 142, 143). While a portion of the harvest was intended for home consumption, including

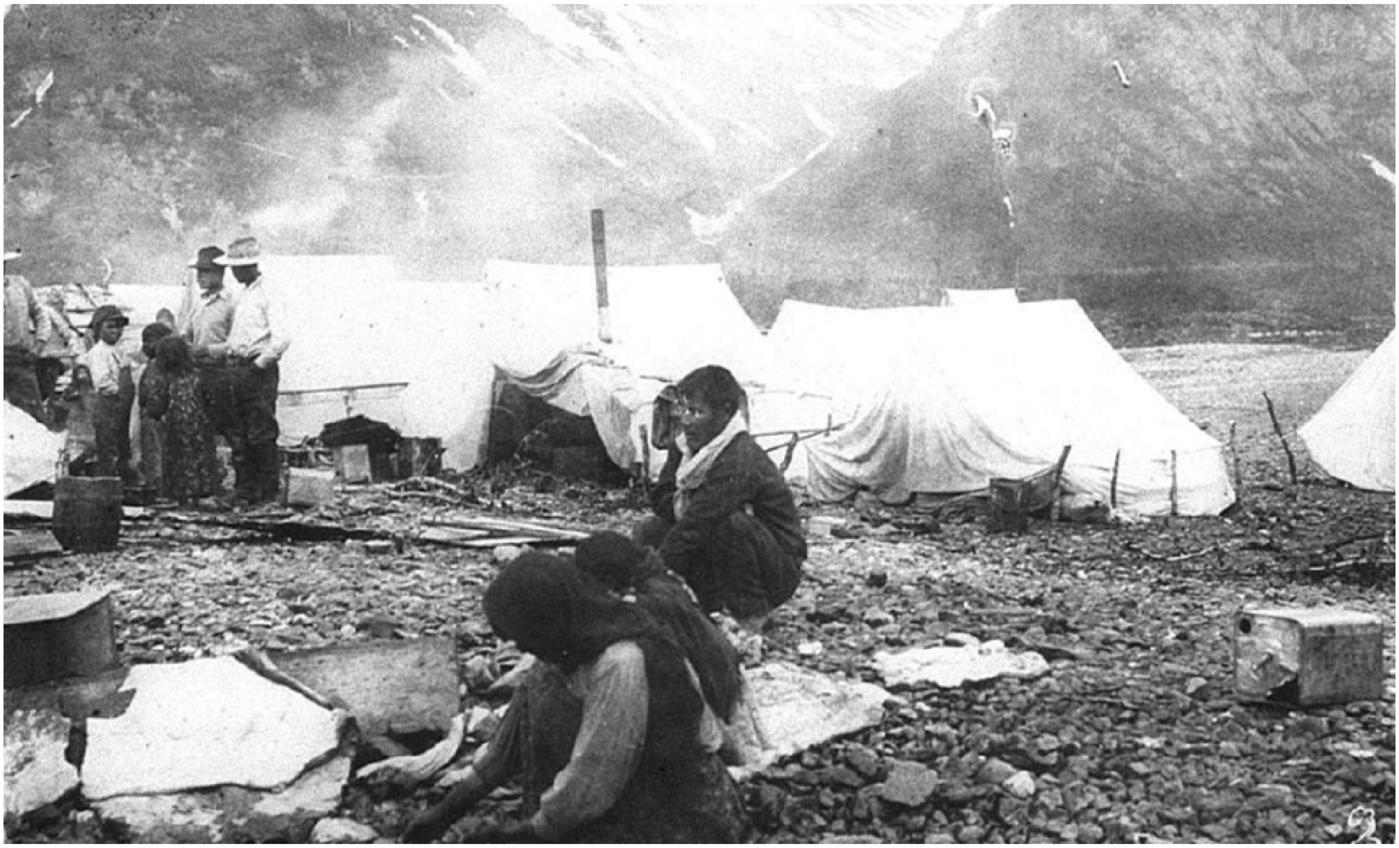

FIGURE 141. Yakutat residents of Keik'uliyáa family sealing camp at Indian Camp Creek, June 1899. Two women in the foreground are working on sealskins that are spread around them on the cobble beach. One of the canvas tents has a chimney for an interior wood stove, probably made from a kerosene can like the one lying on the ground at right. The material culture seen in this image, including Western clothing, tents, barrels, cans, and boxes, is represented by artifacts found at the YAK-012 archaeological site. Photograph by Edward S. Curtis, Harriman Alaska Expedition, July 1899. Bancroft Library, University of California Berkeley, C. Hart Merriam Collection Misc-P13 Vol. 45 No. 6.

all the meat, large quantities of the skins and oil were for trade with the ACC. Yakutat men voyaged in seagoing canoes to the ACC's Nuchek (formerly Konstantinovsk) post in Prince William Sound, bringing sealskins and oil as well as the pelts of sea otters, foxes, ermines, black bears, and martens to exchange for factory-made goods. The Nuchek store stocked wool and cotton clothing, blankets, glass beads, dry goods, canned foods, cookware, hardware, tobacco, firearms, ammunition, and dozens of other types of manufactures (Alaska Commercial Company 1869–1905; Ketz and Arndt 2010). A partial view of the extensive trade for harbor seal products is provided by the store's accounts from 1872 to 1878, which show that during those years it shipped at least 4,000 gallons of seal oil and 2,000 sealskins to the ACC's Kodiak district office, including production from both Yakutat and Prince William Sound (Crowell 2016). The return flow of ACC goods to Yakutat is reflected in the wide variety of trade artifacts found at the Keik'uliyáa archaeological site.

Grinnell (1901) estimated that Keik'uliyáa had been used for "many generations" by 1899. While Malaspina saw no evidence of a camp at this location in 1791, geologist Ralph Tarr was told by a Yakutat resident that a tidal wave generated by a collapsing glacier drowned 100 people at a Disenchantment Bay sealing camp, most likely Keik'uliyáa, in about 1845 (Tarr and Martin 1914:167).

The Fairweather Fault earthquake and aftershocks in September 1899, occurring just four months after the Harriman Alaska Expedition's visit, generated large waves that swept the shoreline and destroyed forests in some parts of the fiord (Tarr and Martin 1912). However, tectonic uplift that accompanied the quake had the fortunate effect of preserving archaeological remains at Keik'uliyáa. Uplift of 3–3.5 m at Subcamp 1 shifted the water's edge seaward so that when Tlingit sealers returned the next season and in later years, they pitched their tents on the new post-earthquake beach rather than at the old site, which was now 20–30 m inland. As a result, tent outlines and other cultural

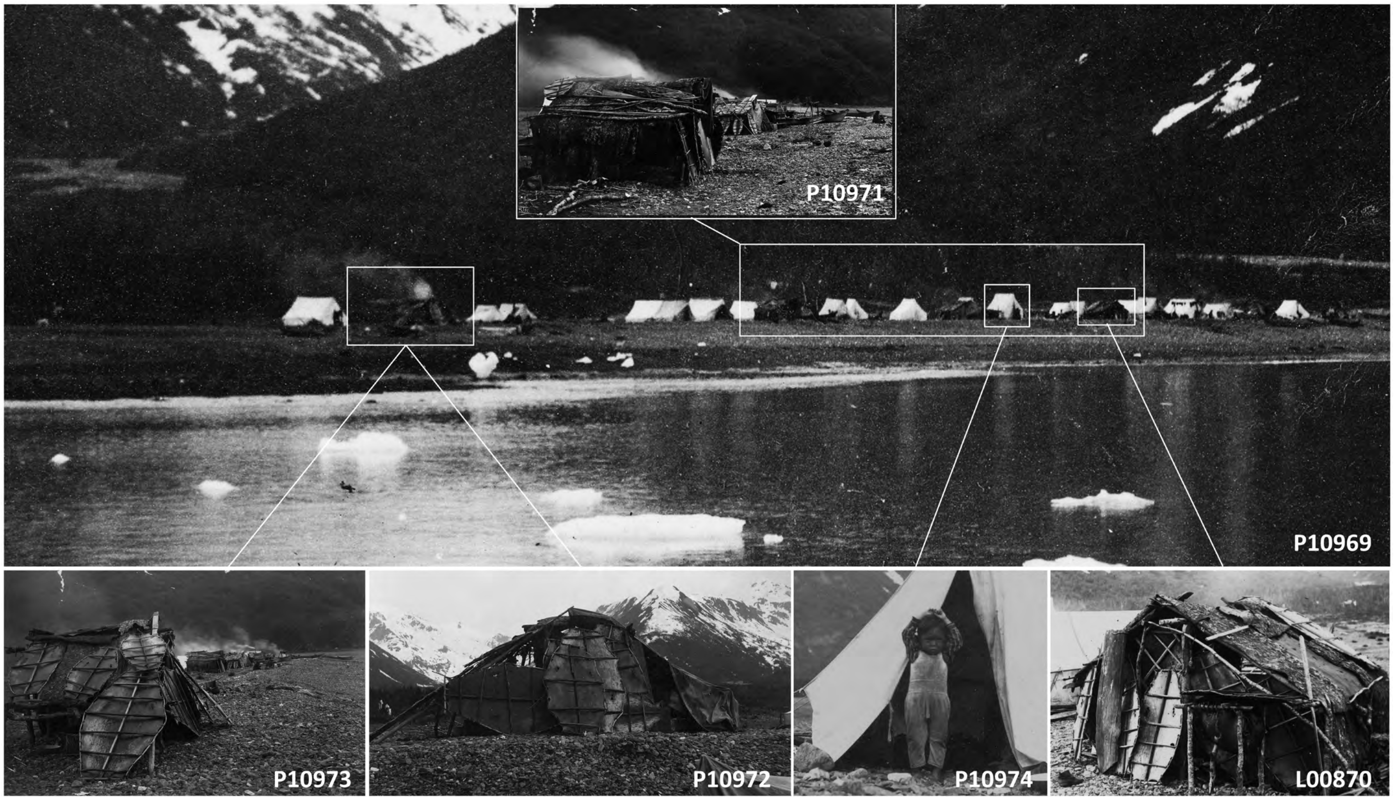

FIGURE 142. Composite image of Keik'uliyáa family sealing camp, Subcamp 1 at Indian Camp Creek, showing 6 bark-covered smokehouses, 18 canvas dwelling tents, and sealskins drying on stretching frames. Photographs by Edward S. Curtis, Harriman Alaska Expedition, July 1899. National Museum of the American Indian, Smithsonian Institution. Photos labeled with NMAI catalog numbers.

remains were preserved just as they were left at the end of the 1899 hunting season, remaining undisturbed on a backshore terrace until rediscovered in 2011. The timing of the Harriman visit was fortuitous, since photographs of the 1899 subcamps can be closely compared with these archaeological features.

Keik'uliyáa was still in use at the time of Tarr and Martin's geological research in 1909–1912, and Subcamp 1 is marked as "Indian Sealing Camp" on their map of Disenchantment Bay (Tarr and Martin 1912: plate 14). However, declining markets for sealskins and oil brought about the end of commercial sealing by about 1915 (chapter 3, this volume), although individual families still carried out subsistence sealing from Keik'uliyáa, Woogaani Yé, Shannáx Kusá (Calahonda Creek), and other Disenchantment Bay locations through the 1970s (E. Abraham and L. Farkas 17 June 2012, IN-13B). Competing seasonal demands from salmon fishing and cannery work contributed to the early twentieth century decline of the once bustling community camps, as did the adoption of outboard motors, which allowed faster travel to Disenchantment Bay from Yakutat village and reduced the need for long-term stays (E. Abraham and L. Farkas 17 June 2012, IN-13B; E. Abraham, 27 June 2013, IN-28).

Elaine Abraham shared oral traditions and personal memories of Disenchantment Bay sealing that were invaluable for archaeological interpretation (E. Abraham, 27 June 2013, IN-28). She recalled that the canvas tents were outfitted with metal heating stoves made from kerosene cans, and chimney pipes for such stoves can be seen in Harriman Expedition photographs (Figure 141). In addition, the door of a cast iron camp stove was found during archaeological investigations at Subcamp 2. Abraham recalled that the bottom edges of tent walls were weighted down with rocks on the inside to keep out wind, rain, and insects, and lines of stones resulting from this practice were discovered at Subcamp 1. Mattresses made of hemlock boughs covered with skins took up much of the space inside the tent, explaining why most artifacts were found at tent entrances and around the edges of the floor. She described how women made and repaired beaded items in camp, resulting in the loss of glass beads that were found by the hundreds at Subcamp 1 (E. Abraham, 27 June 2013, IN-28). The smokehouses at Keik'uliyáa, according to Harry Bremner (Kwáashk'i Kwáan, born 1893), were covered with spruce or hemlock bark that was "folded like an accordion" and packed in the canoes for the trip to Disenchantment

FIGURE 143. Composite image of Keik'uliyáa family sealing camp, Subcamp 2 east of Aquadulce Creek, occupied by visitors from Juneau or Sitka. A bark-covered smokehouse, sealskins on stretchers, canvas dwelling tents, and dugout canoes can be seen. Photographs by Edward S. Curtis, Harriman Alaska Expedition, July 1899. National Museum of the American Indian, Smithsonian Institution. Photos labeled with NMAI catalog numbers.

Bay, where trees and bark were not available; this material can be seen on smokehouses in the Harriman photographs (see Figure 141; Bremner quoted by E. Abraham, 27 June 2013, IN-28).

Designation of the Keik'uliyáa Site

Based on historical information (Burroughs et al. 1901; Goldschmidt and Haas 1998) and oral accounts by Yakutat residents, Frederica de Laguna originally suggested that there were three nineteenth century sealing camps along the southeastern shore of Disenchantment Bay, subsuming all under a single number (12) on her Yakutat site list (De Laguna et al. 1964:22–23, map 3). She subsequently enumerated four camps between Point Latouche and Haenke Island (De Laguna 1972:67–68), and all were assigned the same site number (YAK-012) by the Alaska Heritage Resource Survey. These were (1) Keik'uliyáa; (2) Woogaani Yé; (3) Calahonda Creek; and (4) a small camp at an unnamed creek 2 km south of Heanke Island (Figure 140). De Laguna did not archaeologically verify these reported sites, and their exact locations remained uncertain.

Efforts to locate archaeological traces of Keik'uliyáa were undertaken by the Sealaska Native corporation in 1975 (Sealaska Corporation 1975:782–783) and the U.S. Bureau of Indian Affairs in 1980 (Cooperative Park Studies Unit 1980) and 1989, pursuant to an historical place claim under section 14(h)(1) of the Alaska Native Claims Settlement Act ("Disenchantment Bay Camp," claim AA 10529). These efforts were unsuccessful, in part because displacement of the shoreline away from the old camp during the 1899 earthquake does not appear to have been considered during the searches. Because no archaeological

FIGURE 144. Keik'uliyáa family sealing camp, Subcamp 3 on the west bank of Aquadulce Creek, showing tents, a single smokehouse, canoes, and a meat rack. Painting by Frederick Dellenbaugh. This subcamp was probably used by visitors from Juneau or Sitka. National Museum of the American Indian, Smithsonian Institution, N38337.

evidence was found and the oral testimony was considered insufficient, both the original claim and an appeal were denied (U.S. Department of the Interior 1993).

During 2011–2013, Yakutat Seal Camps Project researchers discovered substantial archaeological evidence at both Keik'uliyáa and at Woogaani Yé and recommended that the site numbering be revised. As enacted by the State Historic Preservation Office at the request of the U.S. Forest Service on 26 March 2014, site number YAK-012 now refers exclusively to Keik'uliyáa, including its three subcamps. A new site number, YAK-202, was assigned to Woogaani Yé. No archaeological remains were found at the other two reported locations, which were removed from the Alaska Heritage Resource Survey.

Subcamp 1

Curtis's images of Subcamp 1 at Indian Camp Creek in 1899 show 6 smokehouses spaced 20–30 m apart along the crest of the beach east of the creek, backed by a line of 18 canvas dwelling tents, all facing toward the bay (Figure 142). The smokehouses are framed with driftwood poles, and the roofs are draped with sheets of pounded bark that exhibit the accordion folds recalled by Harry Bremner. Frames for stretching sealskins lean against the sides and rest on top of the bark-covered structures. Seal processing activities including butchering, flensing, oil rendering, and hide preparation took place in and around the smokehouses, and hanging strips of meat were cured inside over a fire, as indicated by smoke that rises through their roofs. A blubber-aging vat made of sealskins on a wooden stand can be seen in front of one smokehouse (Figure 73).

The row of six smokehouses suggests a socio-spatial arrangement mirroring that of Khantaak winter village in Monti Bay (Port Mulgrave), where there were six lineage houses: Shark House, Brown Bear House, Drum House, Moon House, Fort House, and Wolf Den House (De Laguna 1972:319). The same cooperative house groups (*hit*) may have lived and worked together at Keik'uliyáa to harvest and process seals, each constructing its own smokehouse and occupying an adjacent group of sleeping tents.

Archaeological remnants of the subcamp today occupy a 30 m long section of uplifted beach terrace east of the creek. The 1899 view of the camp from offshore (Figure 145A) can be compared with the area of archaeological deposits (Figure 145B), with the creek mouth providing a common point of reference. Seismic movement during the 1899 earthquake had the effect of shifting the occupation surface upward and inland relative to the modern shore, where it became densely overgrown with alders, devil's club, ferns, and other vegetation (Figure 146). Today the earthquake terrace is 2.0 m above the modern high tide limit, and the difference between this elevation and Tarr's local uplift estimate of 3–3.5 m suggests that about a meter of net subsidence has occurred since 1899.

It may be seen by comparing Figures 145A and 145B that only a part of the 1899 subcamp has survived. Its western end was washed away by flooding from Indian Camp Creek, as indicated by younger, lower vegetation adjacent to the stream, and its eastern end was destroyed by an intermittent stream that scoured the base of the terrace. Flooding occurs on the Shaanáx Kuwóox' delta during heavy fall rains, and streams also would have regraded and cut new channels after the 1899 earthquake. Silt that partially covers the Subcamp 1 site indicates past episodes of standing water when flooding encroached on the terrace.

Archaeological deposits were discovered on the terrace in 2011 through metal detection of iron artifacts and brass cartridge casings. In 2013, brush and leaf litter were cleared away, revealing seven rock outlines 4–8 m long (Structures 1–7) and a rock-lined hearth (Feature 1; Figure 147). The terrace substrate consists of sand, water-smoothed pebbles, and small cobbles (the beach composition can be seen in Figure 141). Larger cobbles (20–40 cm wide) that constitute the structural outlines were emplaced by the site's occupants and were probably brought up from the lower intertidal zone. The bases of these larger cobbles rest on top of the old beach stratum rather than emerging from it. The Harriman photographs and oral information (E. Abraham, 27 June 2013, IN-28) indicate that rocks were used to secure tent walls, brace the bottoms of framing poles for smokehouses and meat racks, weigh down the bark roofs of smokehouses, and construct outdoor hearths for cooking and blubber trying.

Three of the rock features (Structures 1, 2, and 3) at Subcamp 1 were identified as the outlines of tents, including large rocks used to anchor guy lines and lines of smaller rocks that held down the bottom edges of the canvas walls, particularly along the predominantly upwind (northeast) side (Figure 148). Structure 3 is a larger, single outline of rocks, interpreted as a double or extended tent. Based on their relative sizes and

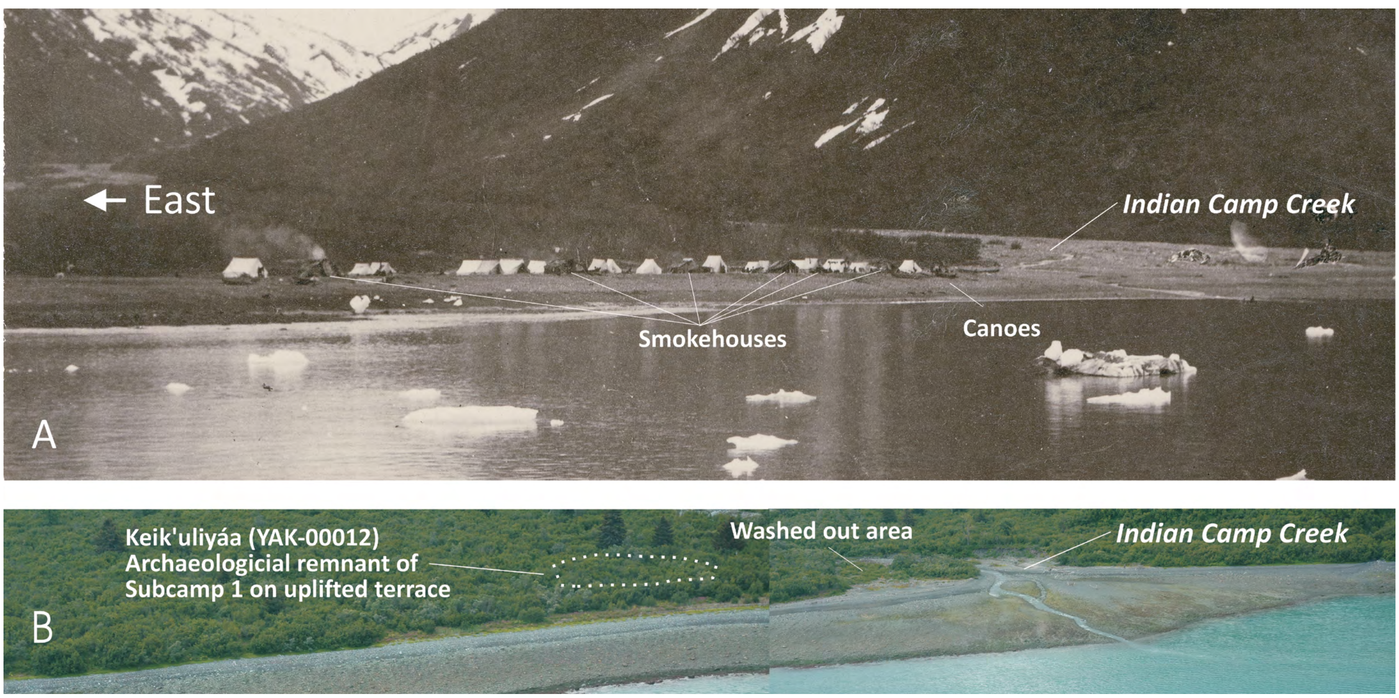

FIGURE 145. Comparative views of Keik'uliyáa Subcamp 1 at Indian Camp Creek, showing (A) the camp in 1899 and (B) the area today. The uplifted and preserved site area is indicated in B. The western part of the 1899 camp was destroyed by flooding from the creek. Upper photo: Edward Curtis, NMAI P10969. Lower photo: National Oceanic and Atmospheric Administration Alaska ShoreZone program, Yakutat images se05_ml_4863 and se05_ml_4864 (https:/www.fisheries.noaa.gov/alaska/habitat-conservation/alaska-shorezone).

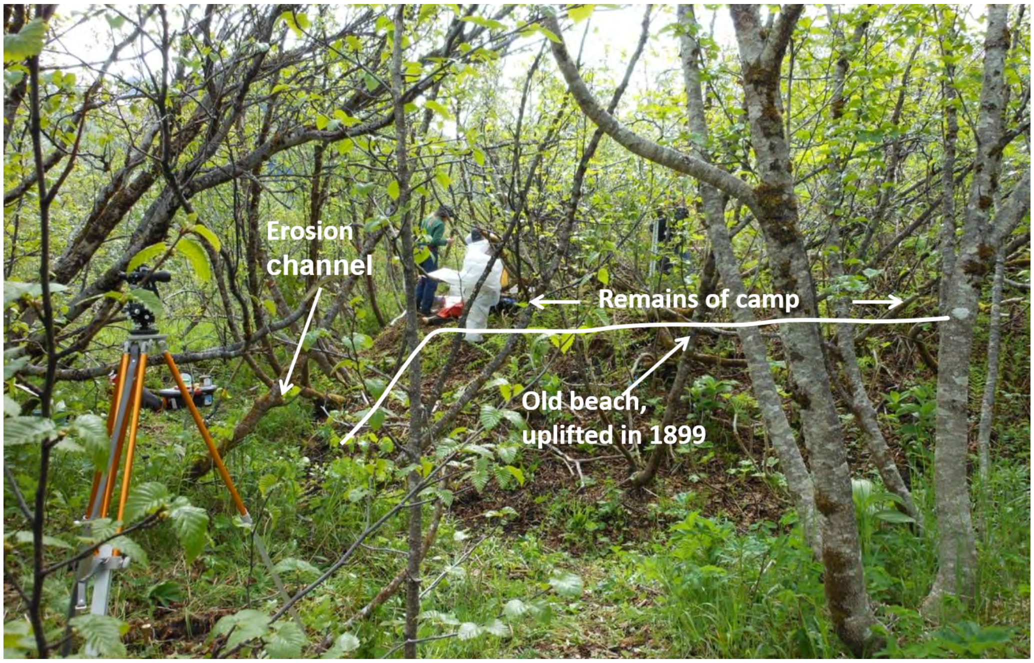

FIGURE 146. View to the southeast of YAK-012, Subcamp 1, showing the 1899 uplift terrace where remains of the camp have been preserved, June 2011. The northern and western edges of the terrace have been eroded by seasonal flooding; labeled here and on Figure 147 as "erosion channel." Photo © Smithsonian Institution.

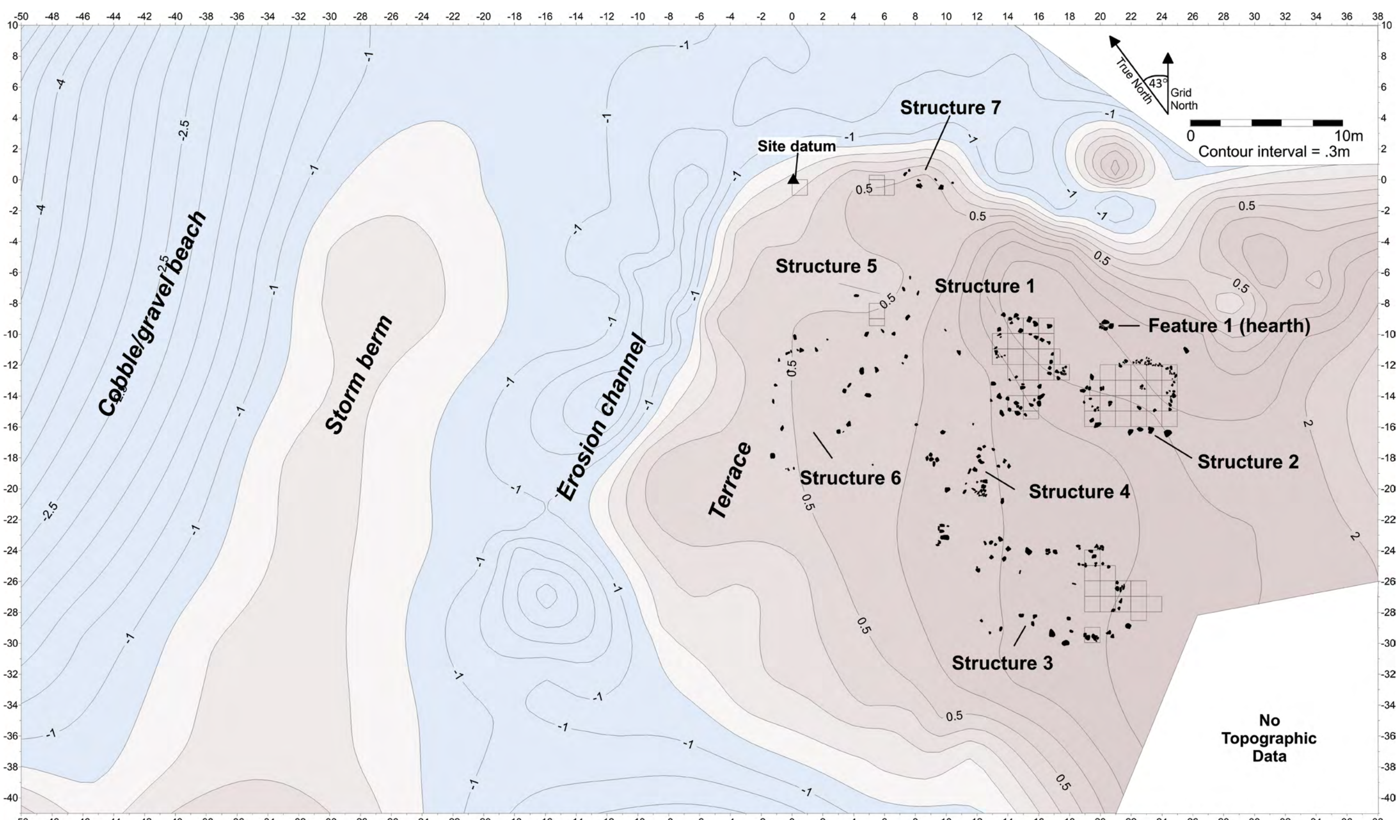

FIGURE 147. Contour map of Keik'uliyáa (YAK-012) Subcamp 1, showing terrain, rock features outlining tents (Structures 1–7), an outdoor hearth (Feature 1), and grids of 1 x 1 m squares excavated in 2011 and 2013. Axis units are 1.0 m; contour interval is 10 cm. © Smithsonian Institution.

positions, Structures 1, 2, and 3 appear to correspond with three tents photographed by Curtis in the eastern part of the 1899 camp (Figure 149). No tents in the photograph correspond to Structures 4, 5, or 6, but these rock outlines may have been from an earlier occupation; they were also less well-defined, suggesting that they were scavenged for reusable rocks. The tent and smokehouse seen at the far left in Figure 149 have apparently been removed by stream erosion, although the tent may be represented by Structure 7, a truncated outline at the edge of the terrace in Figure 147.

Feature 1 is an exterior cooking or blubber-rendering hearth, outlined by rocks and filled with charcoal and surrounded by metal can fragments and lenses of oil-saturated sand. It would have been adjacent to the destroyed bark smokehouse, consistent with the focus of seal processing activities around these structures. No hearths or charcoal other than a few scattered fragments were found inside Structures 1, 2, or 3, supporting their interpretation as tents, whereas smokehouses would contain evidence of wood burning (e.g., Structure 1 at the Spoon Lake 3 site, chapter 4, this volume).

A rebar stake with aluminum survey cap was driven into the ground at the edge of the terrace as a permanent site datum for mapping and recording. A total of 62 m^2 was excavated at Subcamp 1 during 2011 and 2013, including Structure 1, Structure 2, part of Structure 3, Feature 1, and several midden test units (Figure 147). The sandy/pebbly cultural deposits were 8–10 cm thick and underlay 5–10 cm of modern humus. At Structure 3, up to 15 cm of gray silt was found under the humus and above the cultural stratum, indicating postoccupation overwash by flood water. Shovel tests showed that cultural midden covers an area of about 1,200 m^2 (30 × 40 m), so that the Smithsonian excavations affected approximately 5% of the total extent.

The results of excavations at Structure 1 and Structure 2 are shown in Figure 150 and at Structure 3 in Figure 151. Almost all of the artifacts recovered in this area were factory-made consumer items, reflecting extensive Yakutat trade with the ACC. Firearms-related items included brass cartridges from breech-loading rifles of types that the seal hunters were using in 1899 (Burroughs et al. 1901:60, 162–163). Lead fragments and spent center-fire primers demonstrate that the hunters were casting bullets from lead and reloading cartridges to economize on ammunition costs. A cluster of 32 spent primers was found in Structure 3, evidently where a batch of ammunition was reloaded (Figure 151).

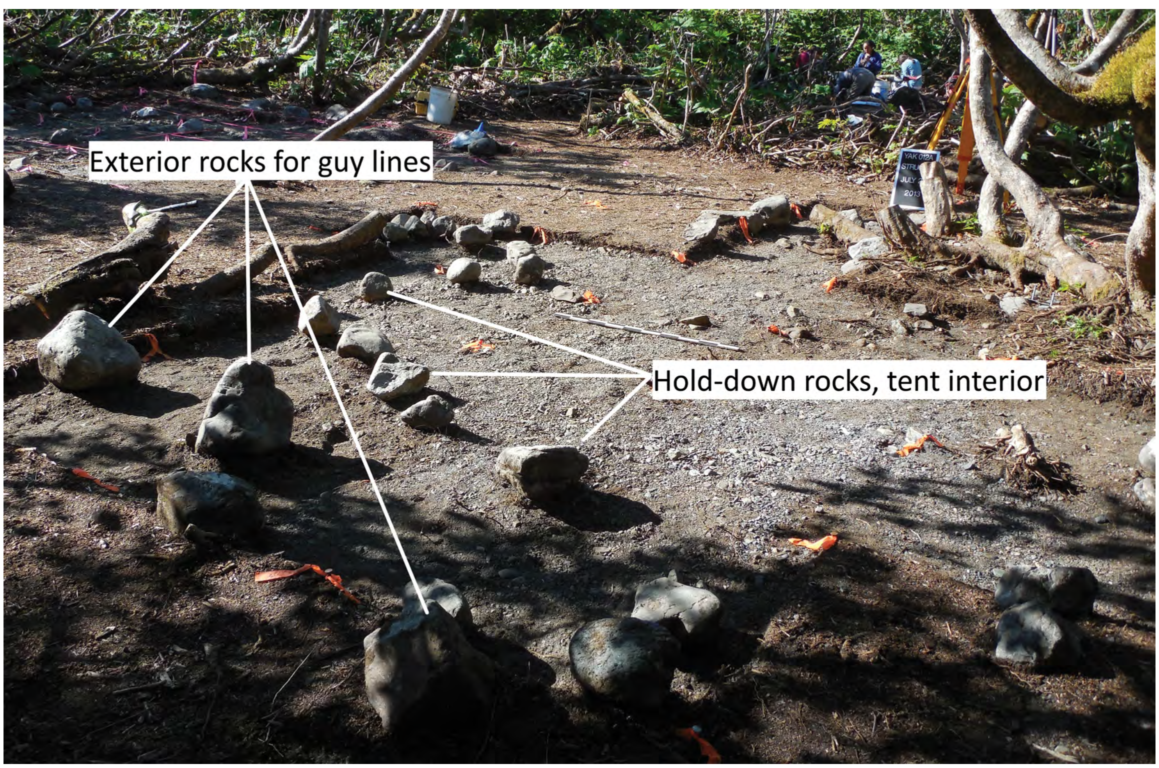

FIGURE 148. A tent floor (Structure 1) at YAK-012 Subcamp 1 after excavation in 2013. The large rocks to the left were for securing guy lines on the upwind side of the tent, while the smaller rocks held down the canvas wall from the inside. The entrance to the tent was at right. Photo © Smithsonian Institution.

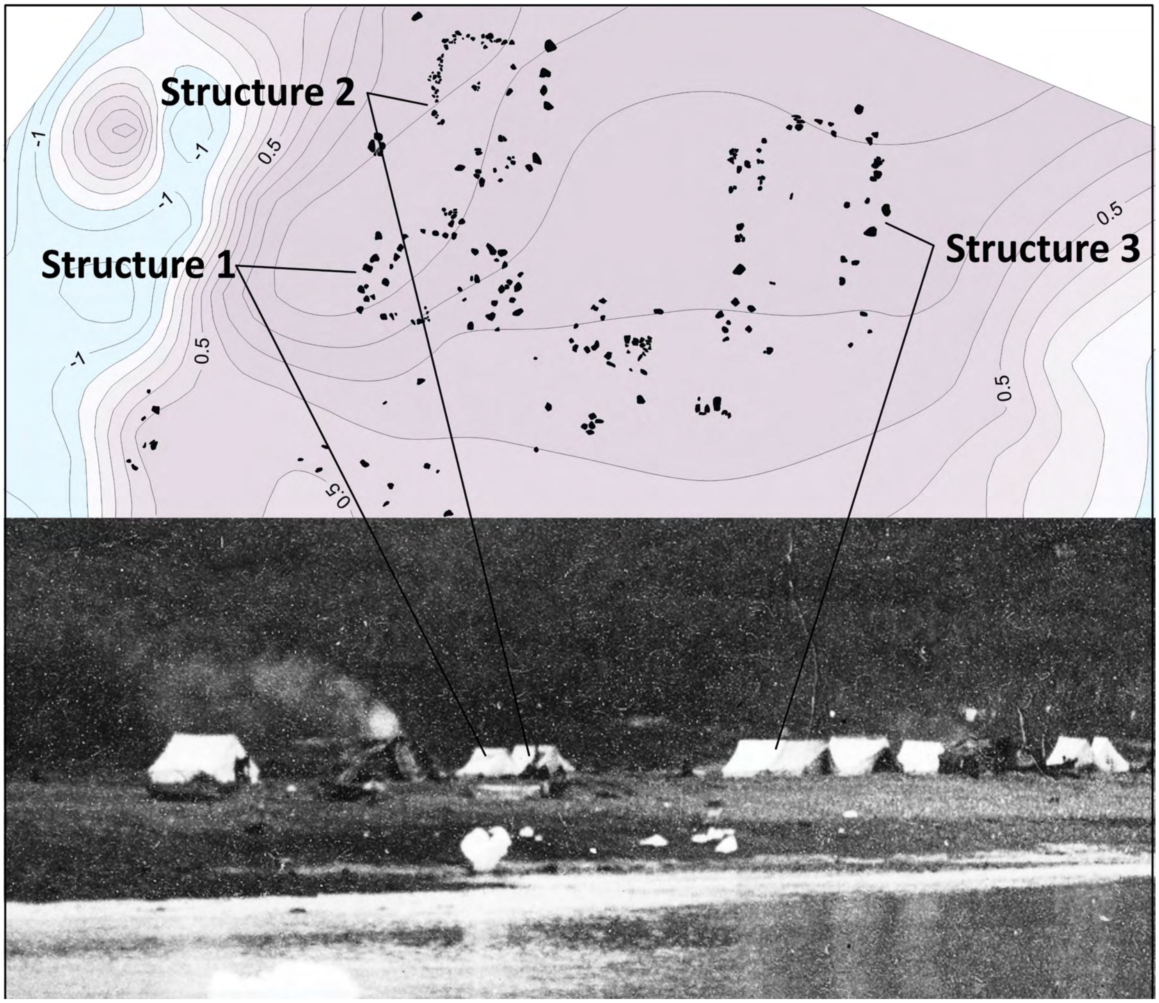

FIGURE 149. Archaeological features at YAK-012 Subcamp 1 compared with the Curtis photo of the camp in 1899 (NMAI P10969).

A variety of domestic artifacts including grommets for canvas tents, rivets, nails, iron spoons, and a tea kettle were found in and around the tents. The most abundant artifacts were tiny glass "seed" beads, a late nineteenth century type in Alaska (Figure 152). Beads occurred in clusters along the walls and at the ends of the tents, most likely the result of women sitting on hemlock bough mattresses while doing their beadwork. The largest bead concentration was at the northwest doorway of tent Structure 2, possibly where there was better working light (Figure 150). Beads were easily lost in the sand, and Elaine Abraham remembered that her mother sometimes buried her beadwork in the tent floor for safe-keeping and left it there (E. Abraham, 27 June 2013, IN-28). One cluster of 41 light blue beads found in Structure 1, all within a few cm of each other, might have been from an earring or other small article or was perhaps a supply of beads enclosed in an envelope or bag.

Subcamp 2

Subcamp 2, located about 300 m east of Aquadulce Creek, was photographed in 1899 (Figure 143). As discussed above, this area was most likely occupied by Tlingit families from Juneau or Sitka. Views from several angles show eight canvas tents at the top of a sloping cobble beach below a cliff; a smokehouse near the tents; and about a dozen residents, including women who are flensing blubber from sealskins. Sealskins on stretching frames have been placed against the smokehouse, on the beach, and on top of two dugout canoes.

The location was identified in 2013 by matching the ridge, cliff, and shoreline seen in the historic images to modern terrain. Archaeological remains (Figure 153) occupy a narrow bench at the base of the cliff and extend down the upper beach slope, with a total site area of about 40 × 15 m (600 m^2).The site is

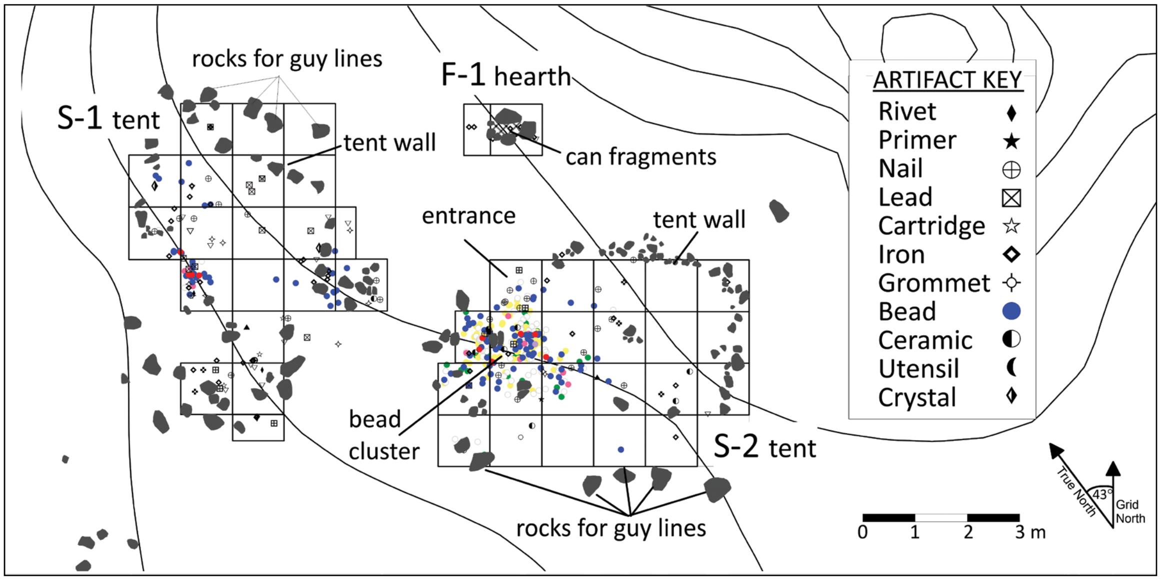

FIGURE 150. Rock outlines and artifact distributions at Structures 1 and 2 (tent floors) and hearth Feature 1, YAK-012 Subcamp 1. © Smithsonian Institution.

9 m above the present-day beach and was farther away from the water than Subcamp 1 even prior to the earthquake, and probably less convenient. The slope below the camp, bare in 1899, is now covered with alders and salmonberry bushes.

Rocks that are larger than the gravel substrate occur in clusters on the site surface, but structural outlines were less obvious than at Subcamp 1. Most of the rocks are flat, angular slabs rather than rounded beach cobbles and some may be noncultural colluvium that has fallen from the cliff face. The indistinct cultural features may also reflect multiple seasons of reuse and rock recycling within a small occupation area. Nonetheless, several possible tent outlines (Structures 2–4) may be discerned in the northern half of the site, matching tents seen in the Curtis photographs (Figure 153). At the south end, four large rocks (40–50 cm wide) form a square (Structure 1) corresponding to the corners of the 1899 smokehouse; small boulders of this size can be seen supporting its front posts in Figure 143. There is no indication of post-1899 erosion, and the entire occupation area has been preserved intact.

After an initial metal detector scan of Subcamp 2, four 1 × 1 m square test units were excavated to test the stratigraphy and obtain a sample of artifacts. As at Subcamp 1, the cultural level was thin, consisting of a brown sand and pebble layer 4–10 cm thick containing charcoal fragments, found below 2–3 cm of surface humus and leaves. Artifacts, discussed below, included rifle cartridges, a section of gun barrel, the door of a cast iron stove, an 1886 patent medicine dispenser, a glass perfume or medicine bottle, part of a rubber comb, glass beads, shreds of woven fabric, wire nails, and iron fragments.

Subcamp 3

Subcamp 3 was located on the west bank of Aquadulce Creek where it enters Disenchantment Bay. It was apparently not photographed in 1899 but was depicted in several watercolors by Harrington Alaska Expedition artist Frederick Dellenbaugh. The mountain ridgelines seen in the paintings and the view across Disenchantment Bay are consistent with this location.

The Dellenbaugh painting (Figure 144) shows women and children near a group of six canvas tents, a bark-covered smokehouse, hunting canoes, and a meat rack. The camp is situated on a gravel beach backed by a pool of water. This feature was noted by the Harriman visitors: "Back of the beach is a lagoon of fresh water [supplied by the creek], from which the Indians get their drinking water, in which the children wade about, sailing their canoes, and in which the mothers bathe their babies" (Burroughs et al. 1901:165).

No archaeological remains of Subcamp 3 were discovered. Today the west side of Aquadulce Creek is an eroding bank of exposed glacial till about 4 m high, marking the end of the uplift terrace that extends from Subcamp 1. The top of the bank was checked for traces of occupation, but no remains other than a recent campfire were found. The beach as well as banks of the creek for about a kilometer upstream were also investigated without result.

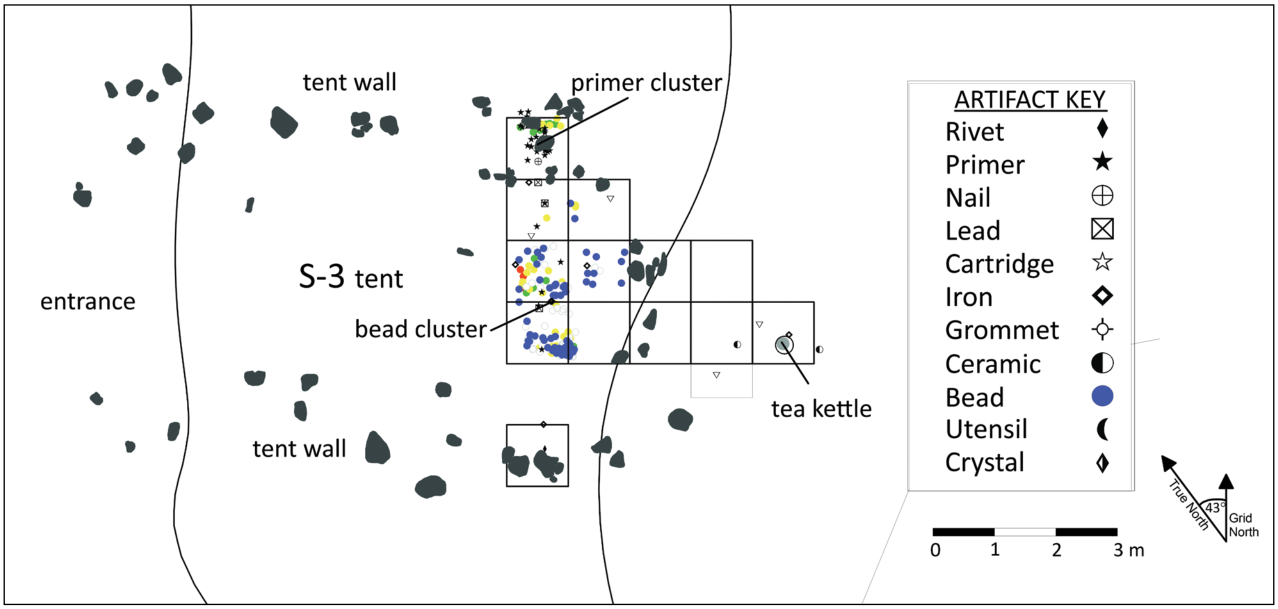

FIGURE 151. Rock outline and artifact distributions at tent Structure (S) 3, YAK-012, Subcamp 1. © Smithsonian Institution.

Beach Terrace

Surface surveys and metal detector scanning were conducted along the uplifted beach terrace that extends from Indian Camp Creek to Aquadulce Creek (Figure 140). The seaward side of the terrace is an eroding bank of glacial till, dissected by dry stream channels and covered with thick brush. Midway between Subcamp 1 and Subcamp 3 two lead bullets with circular grooves around their bases, probably made for mid-nineteenth century rifled muskets, were discovered. Surface examination and excavation of a 1 × 2 m test unit in the area of the bullets produced no additional cultural evidence.

FIGURE 152. A light blue seed bead from Structure 2, YAK-012, Subcamp 1, on the tip of an excavating trowel. Photo © Smithsonian Institution.

Artifacts: Firearms

A brief overview of firearms in nineteenth century Alaska provides historical context for interpreting related artifacts from Keik'uliyáa (Figure 154). The first generations of weapons available to Yakutat residents included muzzle-loading flintlock muskets by the 1790s and muzzle-loading percussion cap muskets and rifles by the 1840s; parts and lead shot for these guns were found in the early nineteenth century Tlingit deposits at Diyaaguna.éit (Davis 1996:438). Muzzle-loading .44 caliber rifled muskets/12-gauge shotgun combinations were reportedly the most common weapon at Yakutat by 1884 (Abercrombie 1900:395), and these "double guns" are listed in Nuchek inventories of the 1880s (Alaska Commercial Company 1869–1905).

Breech-loading rifles firing brass cartridges became available in the United States during the 1860s, but sale of these weapons to Alaska Natives was intermittently prohibited by the federal government, during 1868–1869, 1875–1896, and 1899–1924 (Carlisle 1897:873–874; Porter 1911:779; Murton 1965; Strobridge and Noble 1999). Nonetheless, the Harriman expedition reported the use of Winchester carbine rifles at Keik'uliyáa in 1899, and archaeological evidence from Subcamps 1 and 2 points to primary reliance on various makes and calibers of breech-loading guns.

The sealers at Keik'uliyáa reloaded their expended rifle cartridges with new primers, gunpowder, and hand-cast lead bullets, an economy to save on the cost of ammunition. The

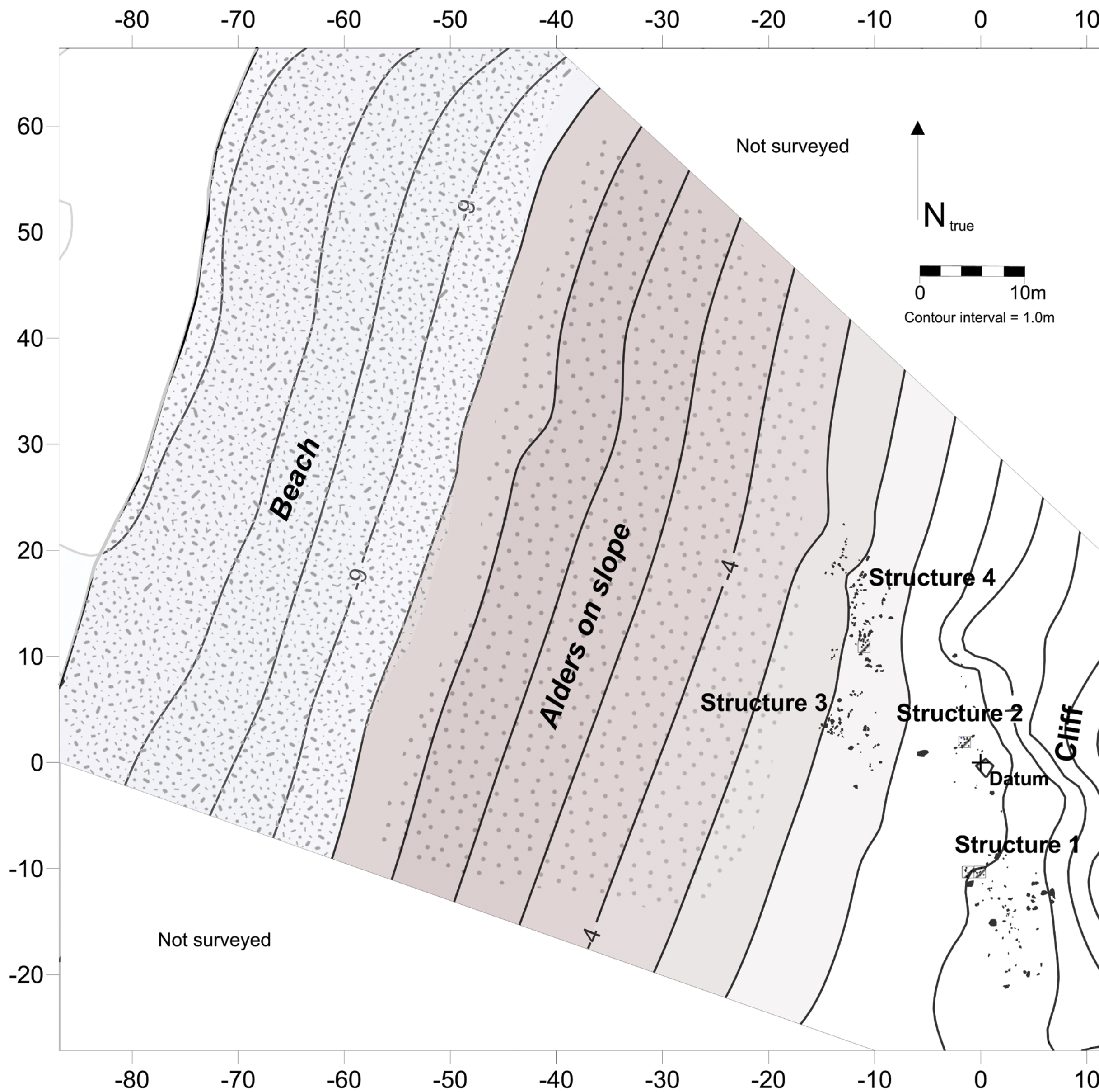

FIGURE 153. Contour map of Keik'uliyáa (YAK-012) Subcamp 2 east of Aquadulce Creek showing the site area under a cliff, sloping ground down to the shoreline, rock clusters (Structures S1–S4), and locations of test pits (shown as squares). Axis units are 1.0 m; contour interval is1.0 m. © Smithsonian Institution.

artifact collection from the camp (Table 13) includes expended brass rifle and shotgun cartridge casings (*n* = 9); expended center-fire primers removed from casings as the first step in reloading (*n* = 40); used bullets, most deformed by impact and probably removed from seals or other game during butchering (*n* = 10); a shotgun pellet (*n* = 1); lead bar stock for casting new bullets (*n* = 3); and lead drips and fragments generated by the casting process (*n* = 13; Table 13). No molds for casting bullets were found, although a pliers-style single-bullet mold found at Xakwnoowú, an 1880s Tlingit hunting camp in Glacier Bay National Park, probably represents the type used at Keik'uliyáa (Crowell et al. 2013a:56–57). The earliest manufacturing dates for most Keik'uliyáa cartridge casings fall before 1899 as expected, although several with later dates suggest incidental post-earthquake use of Subcamps 1 and 2. The collection includes the following artifacts.

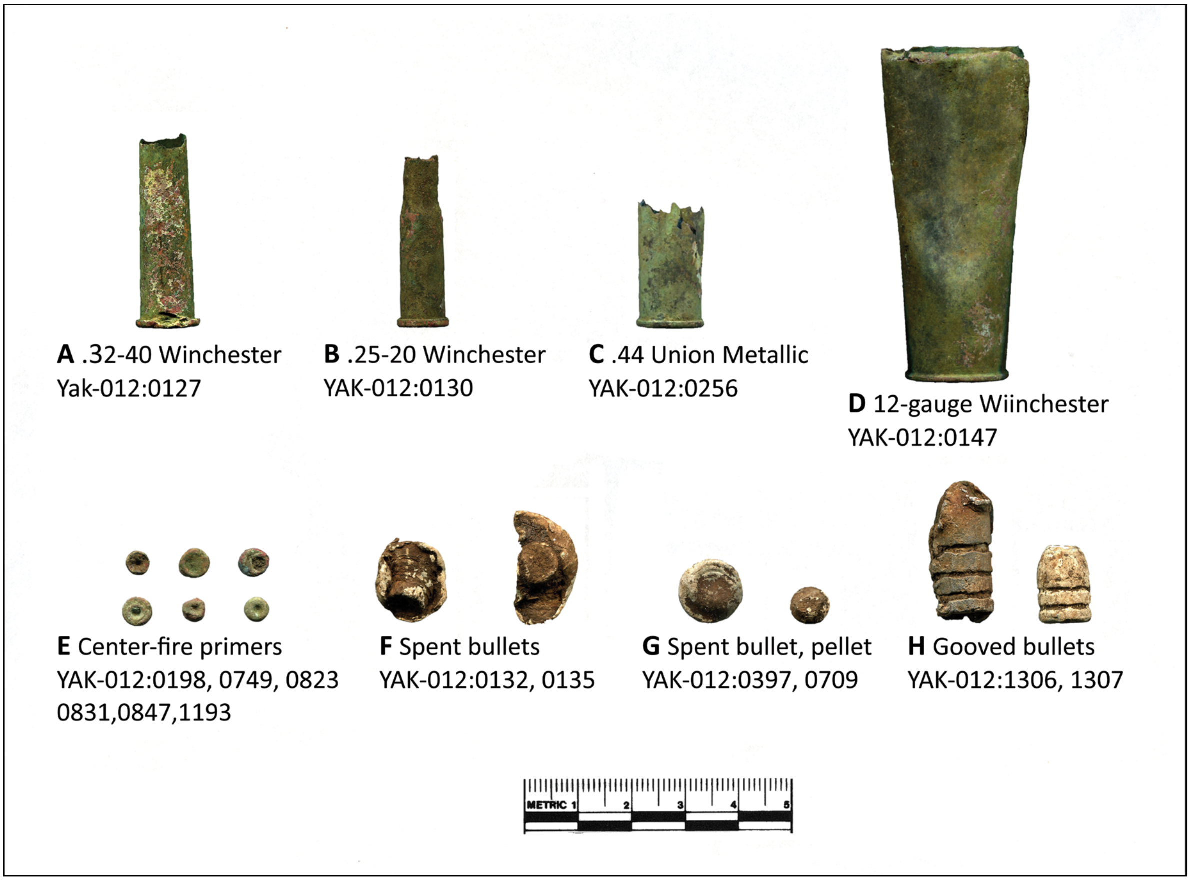

FIGURE 154. Firearms-related artifacts from Keik'uliyáa (YAK-012) Subcamp 1: (A–C) rifle cartridges; (D) a brass shotgun cartridge; (E) expended center-fire primers; (F–G) spent bullets and pellets; and (H) grooved bullets. Scans © Smithsonian Institution.

.22 Union Metallic Company Rifle Cartridge Casing

A .22 Union Metallic Company rifle cartridge casing (YAK-012:1250, Figure 155E). Brass. Length = 2.6 cm; diameter at base = 0.6 cm. Rim-fire, extra-long cartridge with "U" head stamp; from the early twentieth century, but the exact date has not been determined. Fired, with linear firing pin mark on rim.

.22 Remington Hornet Rifle Cartridge Casing

A .22 Remington Hornet rifle cartridge casing (YAK-012:0148). Brass. Length = 3.4 cm; diameter at base = 0.6 cm. Center-fire casing with "REM UMC 22 HORNET" head stamp. A post-1930s cartridge (Barnes 2012:17) used through the twentieth century by Yakutat hunters (G. Ramos Sr., 11 June 2011, IN-3; R. Sensmeier, 12 June 2011, IN-6). Fired, with primer indented by firing pin.

.25-20 Winchester Rifle Cartridge Casings

Two .25-20 Winchester rifle cartridge casings (YAK-012:0130 and YAK-012:0462, Figure 154B). Brass. Length = 3.2 cm; diameter at base = 0.8 cm. Center-fire casing with "W.R.A. Co. W.C.F. 25-20" head stamp. Made for the Winchester Model 1892 rifle (Barnes 2012:113). Both have been fired, with primers indented by firing pin.

.30-06 Franklin Arsenal Rifle Cartridge Casing

A .30-06 Franklin Arsenal rifle cartridge casing. (YAK-012:0141). Brass. Length = 6.1; diameter at base = 1.2 cm. Center-fire casing with "F. A. 7" head stamp. This cartridge was designed for the .30-06 Springfield military rifle, first made in 1906 (Barnes 2012:383). Fired, with primer indented by firing pin.

TABLE 13. Artifacts from Keik’uliyáa (YAK-012).

Artifact	YAK-012 subcamp 1	YAK-012 subcamp 2	YAK-012 terrace
Firearms and accessories			
Rifle cartridge	6	2	
Shotgun cartridge	1		
Cartridge primer (expended)	39	1	
Bullets	8		2
Shotgun pellet	1		
Lead casting	1		
Lead stock (small ingots)	2		
Melted lead waste	13		
Gun barrel		1	
Metal fasteners and parts			
Iron nails	60	5	
Iron rivets	15	1	
Brass rivets	8		
Grommets	7		
Stove door		1	
Wire handle, clasp, or ring	1		
Tube	2		
Stanchion	1		
Assembly pin	1		
Cap or ornamental boss	1		
Miscellaneous iron fragments	91	1	
Sheet copper scrap	4		
Household containers			
Food cans	13	1	
Barrel strap		1	
Spoons	2		
Cap for container		1	
Tea kettle	1		
Household containers (*continued*)			
Transfer willow pattern whiteware bowl	1		
Earthenware cup	1		
Porcelain cup or bowl	1		
Porcelain fragments	4		
Vase	1		
Clothing and accessories			
Fabric (wool, cotton, canvas)	3	4	
Leather	3		
Belt buckle (iron)	1		
Button	1		
Rubberized cloth bag	1		
Seed beads	951	2	
Wire-wound bead	1		
Copper bead	1		
Brooch	1		
Clasp loop	1		
Rubber comb		1	
Pocket watch plate	1		
Perfume bottle		1	
Pain medication applicator		1	
Toys			
Ceramic doll head	1		
Foot of porcelain figurine	1		
Marble	2		
Lithics			
Quartz crystal	3		
Quartzite pebble	1		
Slate awl	1		
Totals	**1,260**	**245**	**2**

FIGURE 155. Artifacts from Keik'uliyáa (YAK-012), Subcamp 2: (A) applicator for pain lineament; (B) perfume bottle; (C) section of gun barrel; (D) rubber comb; (E) rifle cartridge; and (F) cast iron stove door. Scans © Smithsonian Institution.

.32-40 Winchester Rifle Cartridge Casing

A .32-40 Winchester rifle cartridge casing. (YAK-012:0127, Figure 154A). Brass. Length = 3.5 cm (incomplete); diameter at base = 1.0 cm. Center-fire casing with "W.R.A. Co. 32-40" head stamp. First manufactured in 1886 (Barnes 2012:125–126). The primer has been removed for reloading.

.35 Winchester Rifle Cartridge Casing

A .35 Winchester rifle cartridge casing. (YAK-012:1255). Brass. Length = 5.0 cm; diameter at base = 1.3 cm. Center-fire casing with "W. R. A. Co. .35 M" head stamp. Made for the Winchester Model 1895 lever-action rifle (Barnes 2012:128). Primer removed for reloading.

.44 Union Metallic Company Rifle Cartridge Casing

A .44 Union Metallic Company rifle cartridge casing. (YAK-012:0256, Figure 154C). Brass. Length = 2.2 cm (incomplete); diameter at base = 1.1 cm. Center-fire casing with "U.M.C. .44 C.L.M.R." head stamp. Made for the Colt Lightening Magazine Rifle, which was produced by Colt Patent Firearms Company between 1884 and 1904 (Barnes 2012:147; Flayderman 2001:669). Fired, with primer indented by firing pin.

12-Gauge Winchester Shotgun Shell

A 12-gauge Winchester shotgun shell. (YAK-012:0147, Figure 154D). Brass. Length = 6.4 cm; diameter at base = 2.0 cm. Center-fire casing with "WINCHESTER No. 12" head stamp. Probably made for the Winchester Model 1887 shotgun (Kirkland 2007). Ammunition for breech-loading shotguns was listed in 1874 among ACC purchases for the Nuchek station (Alaska Commercial Company 1869–1905). Primer removed for reloading.

Primers for Center-Fire Cartridges

Primers for center-fire cartridges. (n = 40, Figure 154E). Metal. Diameter = 0.42–0.52 cm. All primers were expended, that is, indented with firing pin marks. Primers contain a small charge of fulminate to ignite the main gunpowder load; they fit into the base of a cartridge and are set off when struck by the firing pin. They are removed and replaced as the initial step in reloading.

Grooved Bullets

Grooved lead bullets (*n* = 2, YAK-12:1306 and YAK-12:1307, Figure 154H). Length = 2.4 cm, diameter = 0.9 cm (1306); length = 1.3, diameter = 0.8 cm (1307). Both are circumferentially grooved and resemble Minié bullets ("Minnie balls") but have flat rather than conically indented bases. Bullets similar to YAK-012:1306 were made for mid-nineteenth century percussion rifled muskets such as the .69 caliber U.S. Model 1842 (Gluckman 1965:187), while the smaller bullet (YAK-012:1307) may have been for a pistol or smaller caliber rifle.

Large Spent Bullets

Large spent bullets (*n* = 5, YAK-012:0132, 0135, 0180, 0279, and 0824, Figure 154F). Lead. Weight 10.2–10.5 gm. All have been flattened and deformed by impact.

Small Spent Bullets

Small spent bullets (*n* = 3, YAK-012:0134, 0397, and 0997, Figure 154G). Lead. Weight 2.0–4.2 gm. All have been flattened and deformed by impact.

Shotgun Pellet

Shotgun pellet. (YAK-012:0709, Figure 154G). Lead. Diameter = 0.7 cm.

Lead Casting

Lead casting (YAK-012:0806). Length = 5.3 cm; width = 3.9 cm; weight = 189.0 gm. Apparently waste from the reservoir of a mold for slender lead ingots; the bases of three ingots, triangular in cross section, extend from the main body. No equivalent artifacts were identified at other nineteenth century sites.

Lead Ingots

Lead ingots (*n* = 2, YAK-012:0144 and YAK-012:0155). Both pieces are triangular in cross section and 0.6 cm thick. These appear to be a small form of bar stock for casting bullets.

Melted Lead Waste

Variously shaped fragments and drips resulting from bullet casting (*n* = 13).

Gun Barrel Section

Gun barrel section (YAK-012:1252; Figure 155C). Iron. Length = 4.7 cm; diameter = 2.2 cm; bore diameter = 0.5 cm. A sawn piece of a heavy-walled, small-caliber gun barrel. Sections of barrels were used as bowls for Tlingit tobacco pipes (Emmons 1991:157), but the interior diameter of this example seems too small for this purpose.

Artifacts: Metal Fasteners and Parts

Archaeological collections from Subcamps 1 and 2 (Table 13) included almost 200 small brass, copper, and iron artifacts, some identifiable as fasteners or parts but others too corroded or fragmentary to be recognized.

Iron Nails

Nails (*n* = 65, Figure 156C). All are machine-made iron wire nails with round cross-sections, a type that largely displaced square-section cut nails in the United States by the mid-1880s (Adams 2002). Most are heavily rusted and broken. The size distribution of 16 complete examples (length = 1.6, 2.5, 3.9, 3.9, 5.0, 5.1, 5.3, 6.1, 6.5, 7.2, 7.7, 7.7, 7.8, 8.1, 9.0, and 10.0 cm) suggests a variety of applications, including the construction of tent frames, meat racks, and skin-stretching frames.

Iron Rivets

Iron rivets (*n* = 16, Figure 156B). Outer disk, diameter = 1.6 cm; inner disk, diameter = 0.6 cm; thickness of joined rivet = 0.6 cm. Circular rivets with inner and outer disks joined by a central pin, used to fasten layers of canvas. Remnant canvas is visible between the disks of some specimens. Fifteen rivets were found along the south wall of Structure 1 at Subcamp 1 and are likely from the same item, perhaps a folded tent or tarp. One multilayered fragment of canvas and thinner cloth found in this cluster (Figure 156B) is fastened by an iron rivet and two brass rivets.

Brass Rivets

Brass rivets (*n* = 8, Figure 156B). Inner and outer disks diameter = 0.6 cm; thickness of joined rivet = 0.3 cm. Functionally similar to the iron rivets above but smaller and used for thinner fabrics, such as serge (blue jeans). All but one were found in Structure 1 in association with iron rivets and may have been from the same composite object.

Brass Grommets

Grommets (*n* = 7, Figure 156A). Outside diameter = 2.2–2.7 cm. Two-part, circular rings for reinforcing line holes in tents and tarps.

FIGURE 156. Metal fasteners and parts from Keik'uliyáa (YAK-012) Subcamp 1: (A) a brass grommet; (B) canvas with brass and iron rivets; (C) iron nails; (D) can lid; (E) spoon; (F) buckle; and (G) wire link. Scans © Smithsonian Institution.

Cast Iron Stove Door

Stove door (YAK-012:1310, Figure 155F). Width = 9.7 cm; height = 9.2 cm; thickness = 0.5 cm. A sliding door for a small cast iron camp stove, embossed with "N° 6." No maker's mark is present, and the manufacturer was not identified. Small metal stoves were used to heat tents at Keik'uliyáa and were vented through stovepipes that can be seen in the Harriman photos (Figure 141).

Iron Wire Handle

Wire handle, clasp, or link (YAK-012:0008, Figure 156G). Length = 7.1 cm; width = 3.3 cm. The gap is not from breakage; the function of this artifact was not determined.

Iron Tubing

Tubing (n = 2, YAK-012:0253, 0258). Two pieces of an iron tube; outer diameter = 0.6 cm, interior diameter = 0.2 cm. Function not determined.

Stanchion

Stanchion (YAK-012:1280). Iron. Base length = 8.4 cm, width = 2.5 cm; tube length = 3.2 cm, exterior diameter = 1.7 cm, interior diameter = 1.1 cm. The flat base has two screw holes for mounting. A half-inch (1.1 cm) metal rod or wooden dowel would fit into the tube.

Assembly Pin

Assembly pin (YAK-012:0133). Cast and machined metal. Length = 4.1 cm; diameter = 0.4 cm. There is a longitudinally grooved outer sleeve with an inserted pin, which has a dimple on one end. The object was not specifically identified but is probably from a firearm.

Cap or Ornamental Boss

Cap or ornamental boss (YAK-012:0142). Iron. Diameter = 2.6 cm. A hollow hemisphere of 1 mm thick iron with an attaching screw.

Miscellaneous Iron Fragments

Miscellaneous/unidentified iron pieces (*n* = 92). Small, heavily rusted, and unidentifiable fragments of iron.

Copper Scrap

Copper scrap (*n* = 4). Small cuttings and scraps of thin sheet copper, 2 cm or less in length.

Artifacts: Household Containers and Food Service

Household containers and serving items including glass bottles, wooden barrels, and metal food tins, bowls, kettles, coffee pots, and kerosene cans can be seen on the ground outside tents in the 1899 photos (De Laguna 1972: plates 72, 74–80; Figure 141). The archaeological assemblage includes such items as well as others such as ceramic dishes, which were probably stored inside the tents.

Metal Cans

Cans (*n* = 14, Figure 156D). Steel with tin coating. The 14 catalog numbers cover several hundred rusted fragments; thickness = 0.12–0.15 cm. Tinned steel cans for food were manufactured as early as the 1820s and were common in the United States by the beginning of the twentieth century. Artifact YAK-012:0131 (Figure 156D) was the most complete example; it is a cylindrical food tin including an intact base, 7.0 cm in diameter.

Barrel Strap

Barrel strap (YAK-012:1263). Iron. Length = 64 cm; width = 4.5 cm. Seal oil and dried seal meat were packed in reused wooden "nail kegs" at the Disenchantment Bay camps (E. Abraham, 11 June 2011, IN-2), and one of these is visible in a Harriman photo of Subcamp 1 (Figure 141).

Spoons

Spoons (*n* = 2, Figure 156E). Iron. One is a nearly complete spoon (YAK-012:0146), 21.5 cm long; another (YAK-12:0152) consists of handle fragments. A similar but larger spoon (length = 30 cm) was found at the 1880s Xakwnoowú site in Dundas Bay, Glacier Bay National Park (Crowell et al. 2013a:60–61).

Cap for Container

Cap for container (YAK-012:1268). Iron. Diameter = 2.7 cm. The cap is perforated by corrosion.

Copper Tea Kettle

Tea kettle (YAK-012:0820). Diameter at base = 20.0 cm. The kettle was found sitting upright inside Structure 3 (Figure 157). It has a curved spout and an iron wire handle; the lid was not found. The kettle and perhaps other items may have been left at the camp from year to year rather than transported back and forth from Yakutat.

Willow Pattern Ceramic Bowl

Willow pattern ceramic bowl (YAK-012:1308, Figure 158D). Base and side fragments (*n* = 10) from an earthenware bowl (estimated diameter of complete vessel = 20 cm). The bowl was finished with white glaze and a transfer-printed blue chinoiserie "Willow" pattern. Transfer-printed ceramics with this pattern were mass-produced in England starting in about 1810 and are common in nineteenth century Alaskan archaeological sites, especially from about 1870 to 1900 (Hodder Blee 1986; Jackson 1991; Crowell 2006).

Earthenware Cup

Earthenware cup (base fragment, YAK-012:0770). Earthenware with white glaze; a base fragment from a plain, straight-sided cup or mug. Approximate diameter of complete vessel is 8 cm.

Small Porcelain Vessel

Porcelain bowl, cup, or bottle fragment (YAK-012:0818, Figure 158C). A small vessel of undetermined form; width of fragment = 2.9 cm. White porcelain with an area of gray-brown brushwork on a light gray background and a clear overglaze.

Ceramic Vase

Ceramic vase (YAK-012:0821). An earthenware vase, wheel-turned with a greenish-brown glaze. Three pieces from the neck, body, and base were found together in Structure 3 near the teapot. The complete vase would have been about 15 cm tall.

Artifacts: Clothing, Jewelry, and Accessories

The Tlingit residents of K̲eik'uliyáa dressed in garments sourced from the ACC either as cloth for sewing or as ready-to-wear items, including cotton shirts, dresses, skirts, blouses, vests, and pants; brimmed felt hats; and woolen caps, jackets, scarves, and blankets (Figures 141 and 143). Indigenous clothing not shown in the photos included sealskin garments worn for hunting in the ice floes.

FIGURE 157. Tea kettle in situ in Feature 3, YAK-012, Subcamp 1 (catalog number YAK-012:0820). Photo © Smithsonian Institution.

Fabrics

Wool, cotton, and canvas fabric (*n* = 7). Nondescript shreds and scraps of clothing and tent fabrics. One multilayered piece (YAK-012:0172, Figure 156B) was held together with iron and brass rivets.

Leather

Leather fragments (*n* = 3). Small unidentifiable scraps of skin or leather, probably from shoes or boots.

Buckle

Buckle (YAK-012:0710, Figure 156F). Iron. Width = 3.0 cm. Part of a buckle for a strap or belt.

Button

Four-hole shirt button (YAK-012:0164, Figure 158B). White glass. Diameter = 1.0 cm. Buttons of this type were first made in France and introduced to the United States in about 1860 and have been found at Tikchik Village and other late nineteenth century Alaska sites (VanStone 1968; Crowell 2006).

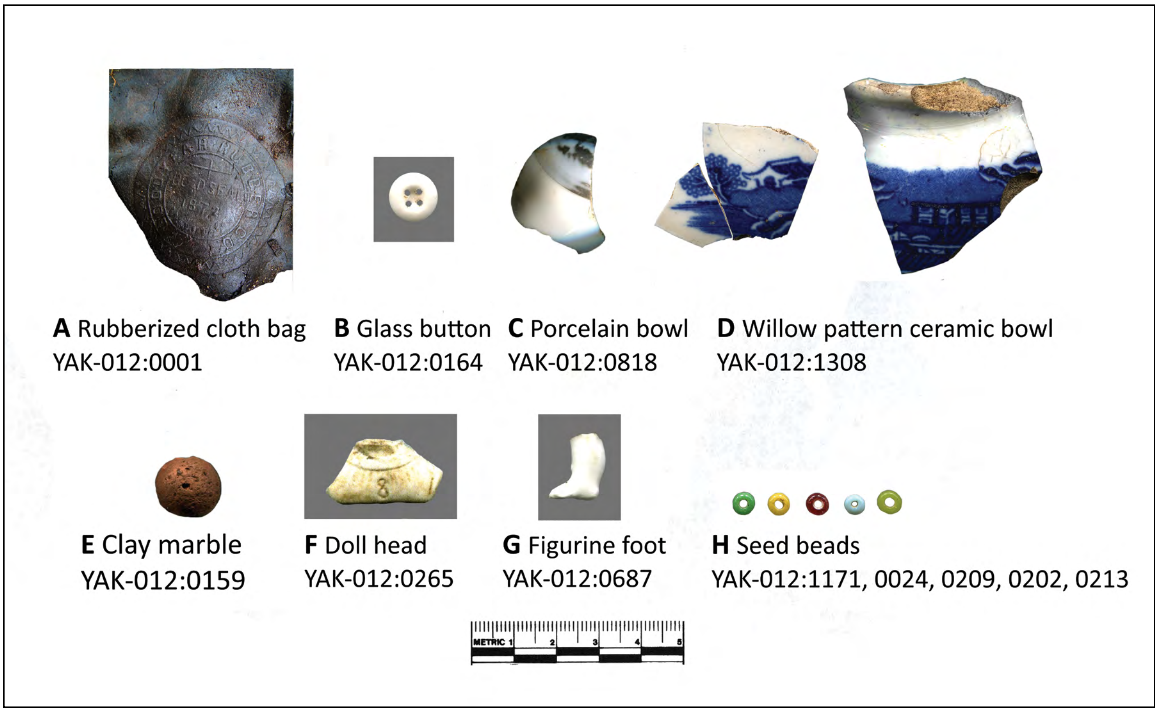

FIGURE 158. Rubber, glass, and ceramic artifacts from Keik'uliyáa (YAK-012) Subcamp 1: (A) rubberized cloth bag with trademark medallion; (B) glass button; (C) porcelain bowl; (D) willow pattern transfer ware ceramic bowl; (E) clay marble; (F) fragment of porcelain doll's head; (G) porcelain figurine foot; and (H) glass seed beads. Scans © Smithsonian Institution.

Rubberized Cloth Bag

Rubberized cloth bag (YAK-012:0001, Figure 158A). A rubber-coated canvas waterproof bag for storing clothes or valuables. Length = 38 cm, width = 20 cm (folded flat). The exterior is stamped with a trademark medallion which has a toothed outer rim and "GOODYEAR RUBBER CO." printed around the inside edge. "GOLD SEAL 1872" is printed horizontally in the center, under a crossed-line emblem. This trademark was first used by the Goodyear Rubber Company (New York) in 1884 and was registered with the U.S. Patent and Trademark Office in 1906 (https://uspto.report/TM/71006394).

Drawn Glass Seed Beads

Drawn glass beads (*n* = 953, Figure 158H). Diameters = 0.15–0.21 cm. Factory-made "seed beads" averaging about 2 mm in diameter were produced in Europe and sold in bulk by the ACC. They were made from a bubble of glass that was drawn out into a hollow cane and chopped into segments. They became the dominant type of bead in Alaska Native sites after 1867, replacing larger and less uniform drawn and wire-wound beads that were common during the Russian colonial period (Vanstone 1968, 1970; Oswalt 1980; Crowell 1997; Crowell et al. 2008). Yakutat artists used seed beads to decorate blankets, moccasins, bags, shirts, tunics, vests, ceremonial robes, and other traditional clothing and regalia, employing a variety of colors to depict clan emblems and floral themes (De Laguna 1972).

At least 14 different colors were used at Keik'uliyáa, dominated by white, various shades of blue, and yellow. Color identifications are from Munsell Color (n.d.). By color, the Keik'uliyáa collection includes white (*n* = 256), yellow (*n* = 250, Munsell 2.5Y 7/12), light blue (*n* = 161, Munsell 2.5B 5/10), blue (*n* = 79, Munsell 5B 5/12), dark blue (*n* = 56, Munsell 5PB 3/10), light green (*n* = 44, Munsell 5G 7/10), greenish yellow (*n* = 27, Munsell 2.5GY 8/12), pale blue (*n* = 25, Munsell 5B 9/2), pink (*n* = 16, Munsell 5R 6/6), red (*n* = 14, Munsell 5R 4/10), clear dark green (*n* = 9, Munsell 5G 4/10), orange (*n* = 8, Munsell 5 YR 6/12), and clear (*n* = 4). Two beads have the "Cornaline d'Aleppo" color pattern—a red outer layer (Munsell 5R 4/10) over a white center.

Wire-Wound Glass Bead

Wire-wound glass bead (YAK-012:0300). Length = 0.4 cm, diameter = 0.4 cm. A barrel-shaped, wire-wound bead of opaque grayish-blue glass. Wound glass trade beads are uncommon in Alaskan sites after the 1820s (Crowell 1997), and this example is therefore probably older than other beads found at K̲eik'uliyáa.

Copper Bead

Copper bead (YAK-012:0488). Length = 1.1 cm, diameter = 0.7 cm. A fancy, thin-walled copper bead with longitudinal grooves.

Brooch

Brooch (YAK-012:0909). Copper and cast metal. Length = 4.2 cm. The inexpensive brooch depicts a delicate hand and wrist, a bracelet tucked with a spiral and leaves, and the end of an ornamented sleeve. There is a wire pin and clasp on the back.

Clasp Loop

Clasp loop (YAK-012:0723). Copper. Length = 0.7 cm. Made of thin copper wire, bent with loops at both ends; possibly a jewelry clasp.

Hair Comb

Comb (YAK-012:1253, Figure 155D). Hard rubber. Width = 4.1 cm. The broken end of a factory-made comb.

Pocket Watch Plate

Pocket watch plate (YAK-012:0145). Diameter = 3.4 cm; thickness = 0.5 mm. A thin, machined brass disk identifiable as the backing plate for a pocket watch dial. It has a central perforation for the shaft that drove the hour and minute hands and a smaller offset perforation for the shaft of a dial that displayed seconds. Three raised pins around the edge of the disk are "feet" that supported the dial face from behind (see https://cwrnh.com/pocket-watch-nomenclature).

Perfume or Medicine Bottle

Perfume, cologne, or medicine bottle (YAK-012:1249, Figure 155B). Glass. Height = 7.5 cm; width = 3.5 cm; thickness = 1.8 cm. A flat-sided bottle blown in a two-piece mold, a manufacturing technique that was common in the United States from about 1810 to 1880 (Jones and Sullivan 1989). The mold seam is diagonal, hidden along two edges of the bottle but visible as it crosses the shoulders. The neck, which would have had a cork stopper, was added separately. The bottle is embossed on the bottom with an eight-pointed asterisk design and on one side with overlaid "T" and "M" (or perhaps "H") in an ornate font. This emblem or brand mark was not identified.

Pain Medication Applicator

Pain medication applicator (YAK-012:1309, Figure 155A). Unknown metal, possibly aluminum. The tube is part of an applicator for a "rubefacient medical remedy" patented by John Wyeth and Brother, a Philadelphia pharmaceutical company established in 1861. Both the applicator and medication—a lineament consisting of capsicum (red pepper) and menthol in a paraffin base—were filed under Patent No. 350,405 with the U.S. Patent Office in 1886 (searchable at https://uspto.gov). The tube has a round opening in its distal end for dispensing the lineament onto the skin. A metal stopper with a flat finger grip (missing) fit into the proximal end of the tube. The tube is stamped with "JOHN WYETH AND BRO, PHILADA" and below, "PAT OCT 5, 1886."

Artifacts: Toys

Doll Head

Doll head (two pieces, YAK-012:0158 and YAK-012:0265, Figure 158F). Width = 2.5 cm. Unglazed white ceramic. The two fragments are from the base and neck of a ceramic doll head, stamped with the number "8". Although the maker has not been determined, dolls with ceramic heads and cloth bodies were exported to the United States from Germany during the late nineteenth century (Cieslik and Cieslik 1985). Similar dolls have been found at two other Tlingit sites: Xakwnoowú (Crowell et al. 2013a:62) and Homeshore Lineage House (Ackerman 1965:35), both in Glacier Bay National Park.

Doll or Figurine Foot

Doll or figurine foot (YAK-012:0687, Figure 158G). Porcelain. Height = 1.2 cm. The foot might have been attached to the cloth body of a doll or been part of a small figurine.

Clay Marble

Clay marble (*n* = 2; YAK-012:0159, Figure 158E). Red earthenware. Diameter = 1.4 cm. Half of a sphere molded from red clay. Unglazed clay marbles were common toys in the nineteenth century. Other small fragments of baked red clay (*n* = 6) that may be from broken marbles were found at Subcamp 1.

Indigenous Artifacts

Many items of traditional Yakutat culture, including canoes, paddles, harpoons, bentwood boxes, spruce root baskets, stretching frames for sealskins, skin clothing, moccasins, and flensing knives were used at K̲eik'uliyáa but are not represented in the archaeological record. This is likely due to both poor organic preservation and cultural values attached to such items, hence the unlikelihood that they would be left behind at camp.

Quartz Crystals

Quartz crystals (YAK-012:0095, 0263, and 0298). Three small fragments of crystalline quartz were found at Subcamp 1, an unusual material not naturally occurring on the terrace (Figure 159). Elaine Abraham suggsted that these finds were significant and added that quartz crystals were traditionally collected at Point Gilbert near the head of Disenchantment Bay (E. Abraham, 27 July 2013, IN-34). De Laguna recorded that a "crystal person" was a high-ranking person who was "like the sun. Nothing [no stain] in their body or their spirit—just pure" (De Laguna 1972:463, 467). However, the meaning of the K̲eik'uliyáa crystals was not shared by Yakutat elders and remained private.

Quartzite Pebble

Quartzite pebble (YAK-012:0260, Subcamp 1). A naturally formed square pebble of quartzite (2.0 × 2.0 × 1.0 cm) that may have been acquired because of its unusual form.

Slate Awl

Slate awl (YAK-012:0424, Subcamp 1). Slate. Length = 5.0 cm. A sliver of black slate, with use wear or polish at its tip, that may have been used as an awl or chisel.

Faunal Remains

Faunal preservation at K̲eik'uliyáa was poor and only a few fragments of bone (NISP = 10) were recovered. Unsurprisingly, six of these were identified as elements of harbor seal (*Phoca vitulina*), including thoracic vertebra (2), radius (1), and humerus (3; Michael Etnier, Western Washington University, personal communication, 20 February 2015). The other four bones were mammalian but not identifiable to any taxon.

The zoologist for the Harriman Alaska Expedition, C. Hart Merriam, collected three harbor seal skulls (two juveniles and an adult) at K̲eik'uliyáa, and these samples are cataloged in the Mammals Division of the Smithsonian's National Museum of Natural History in Washington, D.C. (NMNH catalog numbers 98064, 98139, and 98140). Merriam collected the skin of one of the animals (98064, a juvenile female).

Site Discussion

Late nineteenth century Tlingit harbor seal hunts at Disenchantment Bay were conducted both for subsistence and to produce surplus skins and oil for the ACC. Combined oral, archaeological, photographic, and historical evidence from K̲eik'uliyáa illustrates the socioeconomic agency of Yakutat's matrilineal society in undertaking the mass harvest of this key resource. The hunt was a cooperative effort involving nearly the entire Yakutat community, organized on the basis of clan affiliation, house membership, and reciprocity between Raven and Eagle moieties. K̲eik'uliyáa was on Kwáashk'i K̲wáan (Raven) land and members of the Yakutat Teik̲weidí (Eagle), L'uknax̲.ádi (Raven), G̲alyáx̲ Kaagwaantaan (Eagle), and Shank̲ukeidí (Eagle) participated with the consent and permission of Kwáashk'i K̲wáan leaders.

This network of matrilineally structured participation extended beyond Yakutat to related Tlingit clans from other communities. The inclusion of groups from Hoonah, Sitka, Juneau,

FIGURE 159. Quartz crystal (YAK-012:0095) found in Structure 2, K̲eik'uliyáa (YAK-012), Subcamp 1. Photo © Smithsonian Institution.

and other towns in Southeast Alaska was almost certainly based on kinship ties, since Teikweidí, L'uknax.ádi, and Shankukeidí clan members migrated to Yakutat from these communities in the eighteenth century and would have maintained connections.

In the reconstruction suggested here, a Yakutat contingent of 200 or more people occupied the beach at Indian Camp Creek (Subcamp 1) in 1899, and visitors from Juneau and Sitka lived at Subcamps 2 and 3 in the vicinity of Aquadulce Creek. There was probably a similar pattern of local and visitor occupancy at the different subcamps during previous years. It is further suggested that the principal Yakutat houses (*hít)* each maintained its own smokehouse and group of 2–4 adjacent dwelling tents at Indian Camp Creek. Similarly, the two Aquadulce subcamps each included a single smokehouse and associated tents, although the number of tents (6–8) was proportionally higher. Therefore, it appears that a tent group occupied by the women, men, and children of a single *hít*, along with a smokehouse for preserving seal meat, constituted the basic functional and spatial unit of a "family camp," existing either as a single component (Subcamps 2 and 3 in 1899) or in multiples (the six units at Subcamp 1 in 1899).

The reason for the higher ratio of tents per smokehouse at the guest subcamps is unknown, although one possibility is that the men's hunting camps on Haenke Island and other locations (see chapter 3, this volume) were open only to hunters from Yakutat, so that men from other communities stayed with their families at Aquadulce Creek, requiring additional tents.

The archaeologically investigated portion of Subcamp 1 included three rock outlines (Structures 1, 2, and 3) that correspond with tents shown in the 1899 Harriman photographs. While the nearby smokehouse was apparently lost to erosion, an outdoor hearth for cooking food and rendering blubber (Feature 1) was found. The 2013 excavations thus appear to have uncovered almost an entire *hít* unit revealing the living and working patterns of its members.

These activities were varied, as shown by finds associated with seal hunting (rifle cartridges, primers, bullets, lead); seal processing (fat-soaked ground around Feature 1, a strap from a barrel for packing meat); family cooking and meals (tea kettle, cup, bowl, cans, utensils); the use and repair of equipment (nails, grommets, metal parts); personal dress, grooming, and care (clothing, beads, waterproof bag, comb, lineament applicator, perfume or medicine bottle, brooch, pocket watch); and children's play (dolls, marbles).

This diverse array of factory-made goods highlights the extent to which the people of Yakutat and other northern Tlingit communities had adopted Western firearms, tools, housewares, and clothing by the end of the nineteenth century as well as their ready access to these goods through ongoing interaction with U.S. traders. There is a much greater variety of trade imports at Keik'uliyáa than at Diyaaguna.éit, reflecting the relative ease with which the ACC could supply its Alaskan mercantile operations with products made in U.S. factories and shipped from San Francisco compared with the limited production and shipping capacity of the Russian–American Company (Crowell 1997).

Manufacturing dates for trade items indicate that the investigated areas of Subcamp 1 at Indian Camp Creek and Subcamp 2 near Aquadulce Creek were occupied primarily in the 1880s and 1890s, although several rifle cartridges with early twentieth century dates suggest at least incidental use of these locations after the 1899 earthquake. The scarcity of pre-1880s artifacts is notable since sealing began at Disenchantment Bay during the first half of the nineteenth century and intensified after 1867 with establishment of the commercial market. The late date range of the excavated materials is particularly evident in the predominance of breech-loading guns; no ammunition or percussion caps for muzzle-loading rifles, common in Alaska from the 1860s through the 1880s, were found except for two bullets at the Terrace location. Areas of earlier occupation at Keik'uliyáa may have been lost to erosion.

Community Perspectives on the Research at Keik'uliyáa

Rediscovery of the YAK-012 site generated strong interest on the part of the Yakutat Tlingit Tribe, Yak-Tat Kwaan (the village corporation), and members of the Yakutat community. The archaeological work gave material reality to oral traditions about Keik'uliyáa that have been passed down from grandparents and great-grandparents. It also validated the Alaska Native Claims Settlement Act (ANCSA) request for transfer of the land first put forward in 1975 but denied because physical evidence of historical use was lacking. The discovery opens the possibility that the claim could be reconsidered and approved, resulting in conveyance of the site from the federal government to Sealaska, the ANCSA regional corporation. The boundaries of claim AA 10529 for "Disenchantment Bay Camp" encompass all three of the historically known and archaeologically documented subcamps.

During a project-hosted visit to Keik'uliyáa in July 2013, community members viewed the completed excavations, spoke about the historical significance of the camp, and honored ancestors who lived there during the heyday of Disenchantment Bay sealing (Figures 160 and 161). Elaine Abraham and Lena Farkas, as Kwáashk'i Kwáan (Gineix Kwáan) Owl House elders and traditional owners of the land, led a potlatch mourning ceremony to remember the deceased:

> The first part of our potlatch, we have the mourning ceremony, where we sing our mourning songs. Our mourning is the *yéik* (spirit) of the owl. It's what we drum at our mourning, and then we start the calling of the names, and we start with Gineix Kwáan. We start usually with the host, which would be Owl House and then Moon House and then Fort House. We go through every name that has passed and the opposite clan, the Eagle moiety. . . . We don't know what people were there [at Keik'uliyáa], but they have left an essence of their spirit at that place. It will always be there. That's who we were talking to. We were talking to something unseen. (E. Abraham, 4 August 2013, IN-29)

FIGURE 160. Elaine Abraham (left) and Lena Farkas (right) calling the names of Kwáashk'i Kwáan ancestors during a community visit to the excavations at Keik'uliyáa in July 2013. Photo © Smithsonian Institution.

Judith Ramos reflected on the significance of the ceremonies at Keik'uliyáa and the importance of community involvement in archaeological research:

> It's kind of exciting to see what's being excavated, but still, you don't want to disturb the spirits, the spirits of the land. When the excavation was done last year, the elders went out and did a blessing of the land—that was the ceremony they conducted to appease the spirits of the area who might have been disturbed by the research. This is something that's maybe not in a traditional scientific research program, but it's something that we felt needed to be done. (J. Ramos, 29 July 2014, IN-48)

WOOGAANI YÉ: A TWENTIETH CENTURY SEALING CAMP

Oral Tradition

The site of Woogaani Yé, meaning "burned up" in Tlingit (Harrington 1940; Thornton 2012:21), is located along the shore of the first cove north of Aquadulce Creek (Figure 140). The gravel beach at Woogaani Yé, adjacent to a prominent rock outcrop, is crossed by a creek and backed by a short valley and steep hills (Figure 162). The Tlingit name refers to the destruction of a Laaxaayík Teikweidí fort at this location by L'uknax.ádi attackers (De Laguna 1972:67–68).

That episode—the final battle in a war between the two clans—took place in the early nineteenth century, probably only a few years after the Laaxaayík Teikweidí drove Russian fur traders from their outpost at Yakutat in 1805, although Harrington estimated the date as "ca. 100 years ago" in 1940 (De Laguna 1972:268). The fort was said to be on a hilltop, surrounded by a stone wall with loopholes for firing muskets.

The oral accounts also describe Woogaani Yé as a Laaxaayík Teikweidí sealing camp, the earliest known camp in Disenchantment Bay. Much later in time, Woogaani Yé was used by twentieth century Tlingit sealers and bear hunters who stayed at a dilapidated cabin nicknamed the "Tiltin' Hilton" (E. Abraham, 16 June 2012, IN-13A).

Site Description

Yakutat Seal Camps Project archaeologists searched Woogaani Yé in both 2011 and 2013, examining the shoreline, nearshore areas, both banks of the stream, and possible locations for the fort on high points around the valley. No traces of the fort or nineteenth century sealing camp were found, but a mid-twentieth century camp was discovered on the level beach terrace behind the storm berm (Figure 163). Eleven surface features constructed of beach cobbles and slabs were identified, including a charcoal-filled hearth ring (Feature 1); four possible tent rings (Features 2, 6, 7, and 8), a rock pavement (Feature 3), a rock cache pile (Feature 5), and more

FIGURE 161. Dance in remembrance of the Kwáashk'i Kwáan migration and ancestors who are spiritually present at the Keik'uliyáa sealing camp, July 2013. Left to right in foreground: Elaine Abraham, Gavin Klushkan, Devlin Anderstrom, George Ramos Sr., Kai Monture, and Janice Piccard. Photo © Smithsonian Institution.

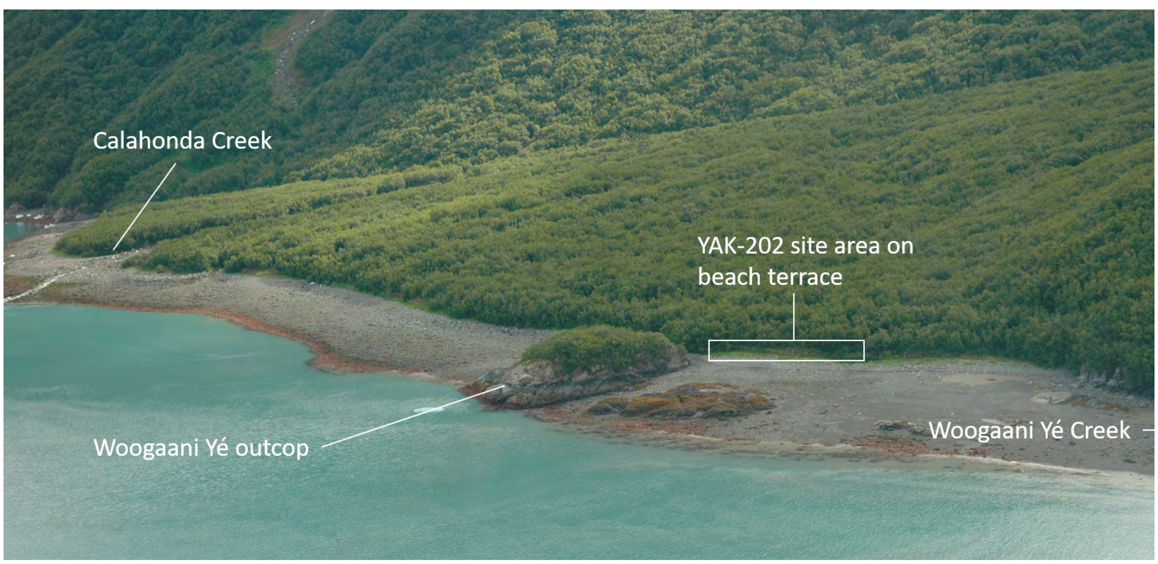

FIGURE 162. Location of the Woogaani Yé site (YAK-202). Aerial photo: National Oceanic and Atmospheric Administration Alaska ShoreZone program, Yakutat image se05_ml_4890 (https:/www.fisheries.noaa.gov/alaska/habitat-conservation/alaska-shorezone).

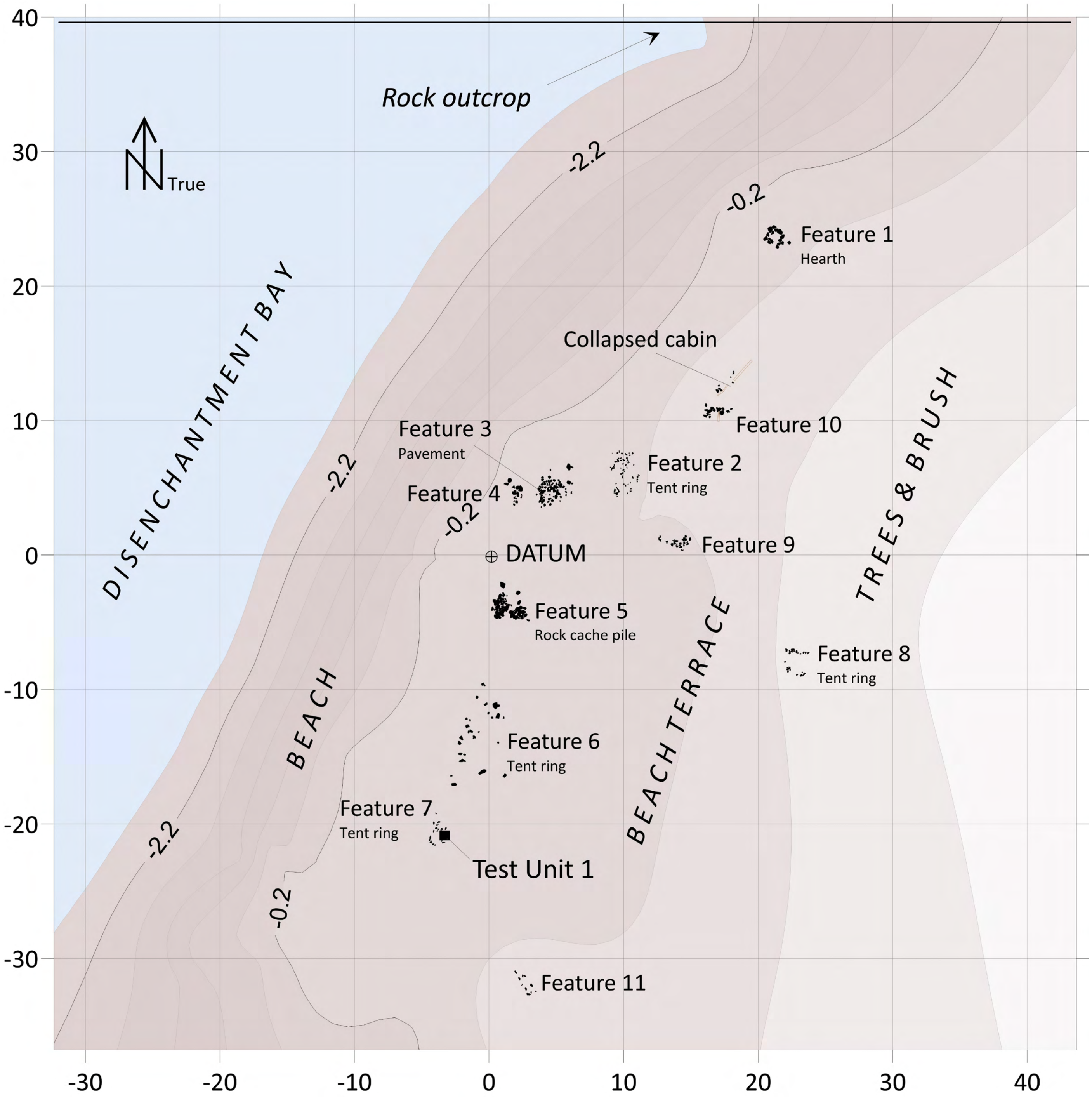

FIGURE 163. Contour map of the Woogaani Yé site (YAK-202) showing rock Features 1–11. Axis units are 1.0 m; contour interval is 40 cm. © Smithsonian Institution.

ambiguous groupings (Features 4, 9, and 10; Figure 164). Milled framing timbers, plywood, a stove pipe, and sheet metal roofing from the collapsed cabin were also mapped.

Artifacts

Rifle cartridges found in and among the rock features were all of mid to late twentieth century vintage (Barnes 2012) and included small-caliber ammunition used by modern seal hunters (.22 Magnum, .22 Hornet, .222 Remington) as well as larger rounds suitable for bear (.32 Remington, .30-30 Remington UMC, .44 Remington Magnum). Wire nails, brown machine-molded bottle glass, a 1976 Bicentennial Mason jar, and a 1959 State of Alaska license plate (the first year of statehood) were found on the surface of the site along with other scattered glass, plastic, and metal). A 1 × 1 m square test unit was excavated in Feature 7, yielding six harbor seal bones (a vertebra, humerus, tarsal, femur, and unidentifiable fragments) in beach gravel mixed with humus.

Discussion

The features and artifacts found at Woogaani Yé were products of twentieth century (1950s–1970s) subsistence, bounty, and commercial sealing and bear hunting, while evidence relating to the earlier history of the site was not discovered. Older remains, if still preserved, would be of exceptional significance for community history.

FIGURE 164. Rock features 1, 3, and 5 at Woogaani Yé (YAK-202). Photos © Smithsonian Institution.

7

A Human Role in the Ecosystem

Eyak, Ahtna, and Tlingit people migrated to Yakutat fiord at different stages of the evolving postglacial landscape, and during centuries of occupation their descendants observed and refined their understanding of this natural world. They applied diverse skills, tools, and constructions to shelter and sustain the community and to harvest food and materials from the ocean and land; shared tasks and resources within a cooperative, multiethnic society; preserved and taught essential cultural, historical, and ecological knowledge to succeeding generations; and lived by spiritual conceptions of interconscious, reciprocal relationships among people, animals, and the natural world (Figure 165). Through these processes, continually enacted over more than a millennium, they constructed a human place in the fiord's glacially influenced web of life.

In environmental archaeology, long-term processes of human colonization, adaptation, and modification of ecosystems can be modeled by the theory of *niche construction* (Oetelaar and Oetelaar 2007; Laland and O'Brien 2010; Reide 2011; Lightfoot et al. 2013; Spengler 2014; Lullfitz et al. 2017; Fitzhugh et al. 2019; Crowell and Arimitsu 2023). The underlying concept of human niche construction is from evolutionary ecology, where *niche* refers to the interrelationships of an organism with its habitat and biotic community through exchanges of energy and matter (Lewontin 1983; Kylafis and Loreau 2011; Odling-Smee et al. 2013). Species are incorporated into trophic webs as predators and prey, the niche representing a node in this web of interactions. Niche construction refers to "the modification of both biotic and abiotic components in environments via trophic interactions and the informed (i.e., based on genetic or acquired information) physical 'work' of organisms"; further, "it includes metabolic, physiological, and behavioral activities of organisms, as well as their choices" (Odling-Smee et al. 2013:5). Whether learned or genetically determined, niche constructing behaviors increase energy balances, modify selection pressures, improve evolutionary fitness, and enable long-term survival.

In archaeology and anthropology, culture itself is "the human ecological niche" (Hardesty 1972), and human beings are "the ultimate niche constructing species" (Smith 2007). This view emphasizes human agency and posits culture—both cognitive and material—as the foundation for successful adaptation to diverse environmental circumstances as well as the mode of inheritance by which successive generations perpetuate a niche (Laland and O'Brien 2010). Fundamental to the concept of human niche construction "is the premise that humans are an embedded component of their natural environment, rather than an interacting but separate entity, and thus play an active role in shaping it" (Lullfitz et al. 2017:204). Moreover, niche construction is an ongoing, contingent process, influenced by fluctuations and directional changes in biophysical environments that require resilient responses (Oetelaar and Oetelaar 2007).

FIGURE 165. George Ramos Sr. and Judith Ramos at Disenchantment Bay in 2011. Traditional ecological knowledge is passed on through the generations by teaching and lived experience on the land. Photo © Smithsonian Institution.

Nonindustrial societies modify their biotic and physical environments in ways such as harvesting and consuming other species, constructing dwellings and facilities, burning to renew wild plant communities, modifying terrain, cultivating crops, and domesticating animals (Reide 2011; Rowley-Conwy and Layton 2011; Smith 2011; Lightfoot et al. 2013; Spengler 2014; Ellis 2015). Niche construction can involve both *perturbation*, for example, changes to the environment effected by the construction of settlements or modification of animal populations, and *relocation*, for example, the seasonal movement of populations into alternative habitats to take advantage of resource availabilities (Odling-Smee et al. 2003; Laland and O'Brien 2010). All represent means of maximizing the extraction of energy from the biotic system (Smith 2011).

The acquisition and intergenerational transfer of ecological knowledge are central to human niche construction (Inglis 1993; Lullfitz et al. 2017; Laland and O'Brien 2010). At Yakutat, people participate in the ecosystem at the highest trophic level as consumers of many other species, a niche that requires detailed understanding of plant and animal distributions, behaviors, and seasonal cycles (chapter 2, this volume). Traditional ecological knowledge is learned from older generations ("ecological inheritance") both directly and through oral tradition, which provides context for changes that may have unfolded over many lifetimes (De Laguna 1972; Goldschmidt and Haas 1998; Ramos and Mason 2004; Ramos 2020). Traditional ecological knowledge informs the contemporary harvesting effort and guided the traditional cycle of seasonal relocation between villages and subsistence camps. This study includes a special focus on traditional ecological knowledge related to a critically important food species, the harbor seal (chapter 3, this volume).

Technological repertoire was a second key component of niche construction at Yakutat, involving built *facilities*, such as houses, camp shelters, food storage caches, smokehouses, drying racks, and fish weirs; technical *processes*, such as stone and copper working, hide tanning, and food preservation; and *implements*, including skin clothing, watercraft, hunting weapons, fishing equipment, cutting tools, storage boxes, and baskets (chapter 2, this volume). Western technologies, from American-style houses to factory-made clothing, rifles, boats, plastic containers, and freezers are today's functional equivalents.

Whether old or new, facilities, processes, and implements aid in the capture of food energy and raw materials from the ecosystem and function as "counteractive niche construction" (Odling-Smee et al. 2003) by mediating stressful environmental fluctuations. For example, methods of food preservation and storage allow delayed consumption, counteracting seasonal changes in availability; clothing and houses ameliorate harsh weather and temperatures; villages and camps are built or abandoned in response to changes in the biogeography of the fiord; and boats provide maritime mobility to harvest fish, game, and plants at widely separated, periodically productive locales.

The Eyak and Tlingit people who migrated to Yakutat fiord centuries ago were coastal dwellers in their previous territories who already possessed the requisite knowledge and material culture for adaptative success at Yakutat, and they innovated other practices and technologies as needed, such as the specialized *goodi.yee* canoe for ice floe sealing. Ahtna immigrants from the Copper River, while culturally equipped for salmon fishing, forest gathering, and hunting land animals, had no prior experience of coastal life. Oral and archaeological data suggest that the Ahtna relied on their Eyak social allies for technological and ecological knowledge to establish a foothold at Yakutat (chapter 5). Elaine Abraham described how the indwelling spirits of the fiord welcomed and taught the newly arrived Ahtna:

> Hubbard Glacier and Mt. St. Elias became the caretakers of these foreign people who were coming down and settling on their land. Through dreams they were able to learn how to live on seals and salmon and belugas in this area here. So, they gave this part of the Gulf to the incoming people. (E. Abraham, 10 June 2011, IN-1)

A cooperative, kin-based mode of production has been equally fundamental to human niche construction at Yakutat fiord, enabling coordinated subsistence harvesting and resource sharing by households, clans, and the community as a whole. Social integration of the three Na-Dene peoples who settled permanently at Yakutat—Eyak, Ahtna, and Tlingit—was enabled by analogous matrilineal kinship systems that prescribed exogamous marriage and socioeconomic reciprocity between clans of the Raven and Eagle moieties, extending across ethnic and linguistic divisions (chapter 2, this volume). Clan ownership of specific territories and resources was a central feature of this system, combined with obligations to share access with clans of the opposite moiety, both on a quotidian basis and through ceremonial redistributions. In ecological terms, this interdependent pattern of resource ownership, production, and exchange minimized conflict among the three ethnic groups so that *competitive exclusion*—the principle that two or more populations cannot occupy the same niche (Hardesty 1972)—did not manifest beyond comparatively brief episodes of interclan conflict. Perpetual exclusion of the Sugpiat, with whom social integration was not possible because of their incompatible bilateral kinship system, highlights the opposite case.

Among hunting, fishing, and gathering societies of the Northwest Coast, abundant coastal resources and population growth during the late precontact period were accompanied by the development of large corporate households, social stratification into noble, common, and enslaved classes, and the increasing prestige and power of elite lineage heads who directed subsistence production, controlled wealth and territory, and redistributed food and material goods through the potlatch system (De Laguna 1972; 1990b; Matson and Coupland 1995; Ames 2003; O'Neill 2014; Furholt et al. 2020). These trends, evident at Yakutat if to a lesser degree than among more southern groups, are social indicators of niche construction and elaboration. In combination, the three principal components of niche construction at Yakutat—traditional ecological knowledge, technology, and social organization—led to adaptive success and stability over the course of 11 centuries.

ENVIRONMENTAL AND ECOLOGICAL CHANGE

Changes in the physical environment of Yakutat fiord and progressive development of its marine and terrestrial ecosystems had important influences on human niche construction. Late Pleistocene glaciation and Neoglacial advances carved and deepened the inlet, in retreat leaving the terminal moraine that extends across its entrance, the lake-dotted Yakutat and Malaspina forelands, and the reefs and islands of eastern Yakutat Bay (chapter 1, this volume). Final withdrawal of the ice began about 800 years ago, and except for a brief Little Ice Age readvance during the seventeenth century, the retreat of Malaspina and Hubbard Glaciers steadily uncovered the fiord, opening new habitats for marine life that moved in from the Gulf of Alaska and for terrestrial plants and animals that spread from adjacent coastal forests.

Russell Fiord's glacial history led to a different outcome. Never directly connected to the Gulf of Alaska and overrun completely by ice during the Little Ice Age readvance, its ecological clock was reset to the late eighteenth century after Hubbard, Nunatak, Hidden, and Fourth Glaciers retreated for the last time. As a result, it is a comparatively unproductive biome and was never fully incorporated into clan territory, although the Bear House Teik̲weidí claim its lower end. Today, Russell Fiord is accessed for few subsistence activities other than occasional black bear hunting.

As the marine and terrestrial ecosystems of Yakutat fiord evolved, they were nurtured by the presence of glaciers in the surrounding mountains and at tidewater in Disenchantment Bay (chapter 1, this volume). Cryogenic influences lend an arctic aspect to subarctic Yakutat fiord, with ice floes from Hubbard and Turner Glaciers filling its inner reaches and silt-laden glacial rivers discharging plumes of dissolved minerals into the sea, nourishing plankton and energizing the entire trophic web (Figure 166). Some species are well adapted to the periglacial environment of Disenchantment Bay, including harbor seals that rear their pups on the ice floes, while many others thrive in the outer fiord where relatively clear, warm waters are nutritionally charged by the outer edges of the glacial plumes. At just below 60° north latitude, the annual variation in day length at Yakutat drives a dramatic summer pulse of ocean productivity that, because of nutrient conditions, is far greater than in the open Gulf of Alaska. With the summer plankton bloom comes the arrival of migratory species, including whales, seabirds, salmon, eulachon, and herring.

On land, botanical colonization and succession follow glacial retreat, leading over time to mature, complex forests at the farthest distance from the ice, while areas proximal to the glaciers are characterized by younger forests, lower tree lines, and less biodiversity. Cold air flowing from the glaciers is an additional factor, suppressing plant growth and succession in Disenchantment Bay and Russell Fiord. Diverse populations of mammals and birds have moved onto the postglacial terrain, including moose that arrived only in the last century. Rivers and streams flow from the glaciers and proglacial lakes, providing water and minerals to the forests, and as these watersheds mature, they support fish and aquatic invertebrates and develop into productive spawning and rearing grounds for salmon. Spawning salmon link the sea to the forest, transporting ocean nutrients in their bodies to enrich riparian environments and feed bears, eagles, and other predators.

Centuries of ecosystem development under conditions of glacial retreat produced biogeographic zonation that has influenced the lifeways of the Yakutat people. The four principal zones considered in this volume are (1) the Yakutat foreland, where old growth forest intermingles with lakes and wetlands, the Situk River and other rivers support large salmon runs, and the coast is strung with offshore bars and lagoons frequented by fish and sea mammals; (2) the eastern outer fiord from Ocean Cape to Knight Island, characterized by morainal islands, protected shallow waters, and high levels of marine productivity, bordered on shore by relatively young forests and lakes; (3) the Malaspina foreland on the west side of Yakutat Bay with its floodplain plant communities, stands of old growth forest, braided glacial rivers, and surf-pounded ocean beaches; and (4) Disenchantment Bay, where Hubbard and Turner Glaciers calve into the sea, ice floes support the harbor seal rookery, and primary marine productivity is depressed by silty, opaque water.

FIGURE 166. Ice floes from Hubbard Glacier fill Disenchantment Bay, surrounded by mountains of the St. Elias Range, July 2013. Photo © Smithsonian Institution.

NICHE CONSTRUCTION THROUGH TIME

Niche construction provides a scientific frame for interpreting historical ecology and changing ways of life at Yakutat since 900 CE. Several long-term trends in niche development are observable in the oral and archaeological records of Yakutat history, deriving from the energetics of human foraging in the fiord's mosaic of habitats, the evolution of the ecosystem under conditions of glacial retreat, and the pronounced seasonal cyclicity of a high-latitude environment. These include (1) expansion of the population into new biogeographic zones as these became available; (2) progressive diversification of the subsistence effort; (3) new technologies and constructions; (4) the adjustment of seasonal settlement and mobility patterns to maximize access to resources; (5) increasing social integration and complexity; and (6) growth of the human population.

Eyak Period (900–1500 CE)

At the beginning of the Eyak Period (chapter 3, this volume) the fiord was covered by Malaspina and Hubbard Glaciers, but the Yakutat foreland had long been ice free, allowing growth of a mature coastal forest. Archaeological research at Diyaaguna.éit and Wulilaayi Aan demonstrated sophisticated use of the foreland ecosystem by pioneering Eyak settlers who migrated from the coast between Icy Bay and the mouth of the Copper River. Faunal remains from these sites indicate primary reliance on forest and wetland species, including brown bear, black bear, beaver, marmot, Arctic hare, river otter, mountain goat, ducks, and salmon. The residents also hunted harbor seals and porpoises in the coastal lagoons and consumed whales that occasionally washed up on shore. From the forest they collected berries, spruce roots, cedar bark, and wood for carving and construction.

Numerous cache houses—over 50 at Diyaaguna.éit—were built to store preserved foods for winter consumption. Archaeologically recovered stone and copper tools included awls, needles, lance points, knives, scrapers, adzes, chisels, mauls, and oil lamps, while bone harpoon heads for sea mammal hunting and arrow points for land game may be inferred from ethnohistoric sources. Hunting, fishing, and gathering from spring through fall, a mixed forest and ocean-based diet, and year-round occupation of both villages are indicated.

The population of Diyaaguna.éit may initially have been about 50–70 people, growing to 100 or more by the time the Tlingit took over the village in the early eighteenth century. Wulilaayi Aan, established around 1200 CE, was a smaller settlement with perhaps 50 residents, although erosion of the site by the Lost River makes an estimate difficult. No other early foreland settlements are known from archaeology or oral tradition. A possible explanation for the comparatively low population during the early Eyak Period—less than half the number of Yakutat residents in the early nineteenth century—is that only a single biogeographic zone, the Yakutat foreland, was available as a subsistence catchment due to the extent of the glaciers and that 100–120 people represented its maximum carrying capacity.

Turning to indicators of socioeconomic scale and complexity, most houses at Diyaaguna.éit and Wulilaayi Aan were simple in design and 4–5 m long, similar in size to historic Eyak dwellings but with less than half the interior space of later Tlingit houses. Households likely included members of a Raven or Eagle clan, spouses from the opposite moiety, and their children. House 1 at Diyaaguna.éit was considerably larger (12 × 14 m) and more architecturally elaborate, suggesting social differentiation within the Eyak community and residence by a prosperous, high-ranking lineage.

The Spoon Lake 3 site near Point Manby was the first known settlement on the shores of the fiord itself, with occupation beginning in the mid-thirteenth century as Malaspina Glacier withdrew. Ice floes along the nearby glacial front likely hosted a harbor seal rookery, placing this species at the center of the subsistence effort. In the beginning, the Spoon Lake Eyak would have had few other resources to rely on in this barren, newly deglaciated zone. Willow and spruce found in palaeobotanical samples indicate subsequent forest growth, and waterfowl, salmon, and bears would have become available as the terrestrial ecosystem matured.

A smokehouse for preserving meat and fish, a summer residence, outdoor hearths, and a refuse midden containing stone tools for cutting meat and scraping skins were located along the former ocean shoreline at Spoon Lake 3 (Figure 96), an arrangement that closely resembled later sealing camps at Disenchantment Bay, where each *hít* maintained a smokehouse, seal processing area, and adjacent tents. Spoon Lake 3 also had a winter residential area, comprising a deep, 9 m long house pit surrounded by 15 storage caches.

By the mid-1400s Malaspina and Hubbard Glaciers had retreated north of Knight Island, and Eyak expansion into the eastern Yakutat Bay biogeographic zone took place. Pioneering settlement in this area is likely represented by middens at Canoe Pass and Dolgoi Island, although these sites have not yet been tested or dated. According to oral tradition, by the time Ahtna migrants arrived (in about 1500 CE), Eyak clans were well established in eastern Yakutat Bay and were harvesting berries on deglaciated Knight Island and fishing for salmon at Humpback Salmon Creek.

Expansion into eastern Yakutat Bay, diversification of the subsistence effort, and increased food production appears to have resulted in modest population growth by the end of the Eyak period. Estimated residence at the known fifteenth century winter villages—Diyaaguna.éit (100), Wulilaayi Aan (50), Spoon Lake 2 (10), Spoon Lake 3 (15–20)—suggests a total Yakutat population of 175–180.

Ahtna Period (1500–1700 CE)

The migration of an Ahtna Raven clan, the Gineix̲ K̲wáan, to Yakutat from the Copper River took place in about 1500 CE, based on radiocarbon dates from Tlákw.aan village, which the Ahtna cofounded on Knight Island with an Eagle Eyak clan, the

G̱alyáx̱ Kaagwaantaan (chapter 5, this volume). After a period of initial conflict, the Ahtna group, renamed the Kwáashk'i Ḵwáan, reached a territorial agreement with the Yakutat Eyak clans, trading copper *tináa* shields for ownership of Yakutat fiord extending from the glacial front (then near Point Latouche) to Naasoodat village on the Lost River, west of Diyaaguna.éit.

The Ahtna purchase did not result in displacement of the Eyak from Yakutat fiord; rather, it eventuated an alliance between the two groups, facilitated by their compatible matrilineal social systems. The Ahtna and Eyak intermarried and settled together at Tlákw.aan and at the foreland villages of Naasoodat, Áa Ká, and Gooch Shakee Aan. Co-exploitation of the ice floe seal rookery in Kwáashk'i Ḵwáan territory, and of salmon rivers on the foreland territory of the Laax̱aayík Teiḵweidí and other Eyak clans, was initiated, expanding the scale of social cooperation in food production.

Archaeofaunal evidence from Tlákw.aan demonstrates greater use of marine species than at Diyaaguna.éit and Wulilaayi Aan, consistent with Tlákw.aan's location in the productive eastern Yakutat Bay ecozone. The subsistence harvest—conducted from the site during spring, summer, and fall—included clams, mussels, scallops, and other intertidal invertebrates; salmon, Pacific cod, and other fish; and sea mammals, predominantly harbor seal but also harbor porpoise, fur seal, sea lion, and sea otter. A significant portion of the harbor seal remains were from pups, a signature of hunting at the glacial rookery. The use of terrestrial species was limited but included beaver or porcupine, possible muskrat or marmot, mountain goat, black bear, and deer. The artifact assemblage included Ahtna weapons for land hunting (copper and barbed bone arrow points) and maritime technologies adopted from the Eyak, including sea mammal harpoons, slate lances, sea otter arrows, halibut hooks, and oil lamps.

The seven lineage houses at Tlákw.aan ranged in length from 6 m to 15 m, several with deep central floors and Tlingit-style side platforms that may have been built late in the occupation period. There were at least 25 large caches at Tlákw.aan for storing food supplies, confirming winter residence at the site. The late population of the village was about 120, based on the combined floor areas of the houses. The total Yakutat population at the end of the Ahtna Period may therefore have been about 420, based on estimates for Tlákw.aan (120), Diyaaguna.éit (100), Wulilaayi Aan (50), and perhaps another 150 persons combined for the three poorly known Kwáashk'i Ḵwáan–Eyak villages of Naasoodat, Áa Ká, and Gooch Shakee Aan. The Point Manby sites were abandoned during the late Ahtna Period, with occupation at Spoon Lake 3 ending around 1600 CE.

During the Ahtna Period, the fiord population thus appears to have expanded both by in-migration and natural increase. The settlement pattern included new winter villages on Knight Island and the foreland; the subsistence base was diversified through exploitation of the foreland, midfiord, and ice edge ecozones; Eyak and Ahtna clans merged socially with minimal intergroup conflict; and the range of house sizes and architecture at Tlákw.aan suggests increasing social differentiation. Kwáashk'i Ḵwáan access to copper through trade connections with their homeland, their use of copper *at.óow* shields to purchase rights to Yakutat fiord, and the abundance of copper artifacts found at Tlákw.aan including earrings, bracelets, and other jewelry, suggest a link between social prestige and possession of this valuable metal.

Tlingit Period (1700–1900 CE)

The Tlingit Period began with the migration of Tlingit clans—the Teiḵweidí, L'uknax̱.ádi, Kaagwaantaan, and Shanḵukeidí—from different parts of Southeast Alaska to Dry Bay at the beginning of the eighteenth century (chapter 6, this volume). The Drum and Bear lineages of the Teiḵweidí continued moving north to the Yakutat foreland, where they fought and defeated the Eyak, took over territory between the Ahrnklin and Lost Rivers, and drove them out of Diyaaguna.éit and Wulilaayi Aan. At Diyaaguna.éit, about 150 Teiḵweidí took up residence in a palisaded settlement of eight lineage houses with multitiered side platforms and deep central pits, the largest (15 m long) belonging to the Bear House headman. These large dwellings, with their extended households and division of interior space by social rank, expressed the high level of stratification in Tlingit society.

Tlingit conquests on the Yakutat foreland did not extend into territory controlled by the Kwáashk'i Ḵwáan, who continued to live at Naasoodat, Áa Ká, and Goosh Shakee Aan with their Eyak allies, and there is no oral record of conflict with this group. The Eagle Teiḵweidí married Raven Kwáashk'i Ḵwáan moiety opposites and moved to the latter's villages, including Tlákw.aan. Members of the Dry Bay L'uknax̱.ádi and Shanḵukeidí were also absorbed into the ethnically diverse community at Yakutat.

The cooperative subsistence system took final form, with the Kwáashk'i Ḵwáan granting permission to other clans to hunt with their relatives at the sealing grounds in Disenchantment Bay and the Teiḵweidí allowing the Kwáashk'i Ḵwáan to fish at Situk River and other salmon rivers on the foreland. Settlements included at least six winter villages on the foreland (Ahrnklin, Diyaaguna.éit, Wulilaayi Aan, Naasoodat, Áa Ká, and Goosh Shakee Aan) in addition to Khantaak Island Village at Monti Bay and Tlákw.aan on Knight Island. Several sealing camps (Laax̱aa Tá, Ḵeik'uliyáa, and Woogaani Yé) were established near Hubbard Glacier as it retreated to the head of Disenchantment Bay. Tlingit Period archaeofaunal samples from the upper layers at Diyaaguna.éit, Wulilaayi Aan, and Tlákw.aan do not suggest any departure from long-established subsistence practices. Social balance, cooperation among clans, and access for community members to all biogeographic zones is indicated, despite the initial period of warfare and disruption.

Russian, British, and American sea otter traders were active at Yakutat in the 1780s and 1790s, and Native residents traded furs for foreign goods including ceramics, glass, metal tools, and muzzle-loading guns, abundantly represented by artifacts at Diyaaguna.éit and Wulilaayi Aan. No Western trade items have been found at Tlákw.aan, suggesting that the residents abandoned the village immediately before or after first Western contact, perhaps moving to the foreland near Monti Bay (Port Mulgrave) to gain access to the foreign ships. In 1805, the Laax̲aayík Teik̲weidí destroyed the Russian–American Company's Novo Rossiysk fort, and their looting and seizure of Russian goods led to warfare with the L'uknax̲.ádi, ending with the latter's victory at Woogaani Yé. A plausible interpretation of these episodes is that foreign intrusion, trade, and market-driven hunting spurred interclan and interethnic competition, upsetting the social and ecological equilibrium that held during the preceding century.

The most devastating consequence of Western contact was the smallpox epidemic of 1837–1840, which burned through the foreland villages and led to consolidation of the surviving population at Khantaak Island. A Russian census enumerated only 150 residents at Yakutat in 1840, whereas the pre-epidemic population may have been as high as 500 (Veniaminov 1984). This number is consistent with estimated populations for Diyaaguna.éit (150), Wulilaayi Aan (50), Naasoodat and the other foreland villages (200), and Khantaak Village (50–100).

A second period of intensive Western contact and trade began with the U.S. purchase of Alaska in 1867 and fur trade operations of the ACC. Yakutat residents harvested hundreds to thousands of harbor seals each year at K̲eik'uliyáa and other camps, acquiring skins and oil for trade with the company and large quantities of meat for subsistence consumption. Intensive harbor seal hunting at Yakutat and other Southeast Alaska communities during the 1870s to early 1900s was made possible by the use of breech-loaded repeating rifles, a significant technological advance over muzzle-loading weapons. Severe overhunting of this species—repeated in the 1950s–1970s in response to state-sponsored bounties and a surge in prices for skins—may be understood as a negative niche modification since it depleted a key biotic resource that recovers very slowly. Socially, the nineteenth century sealing camps represented a high point of coproduction and interclan cooperation, engaging the entire Yakutat community as well as visiting Tlingit from other Southeast Alaska communities, but the market-driven scale of the enterprise led to a maladaptive result.

CONTEMPORARY ROLE IN THE ECOSYSTEM

Through the twentieth and early twenty-first centuries, the relationship of the Yakutat people to their land has remained grounded in ancestral knowledge while changing through ongoing processes of ecosystem interaction and modification. Subsistence harvesting remains vitally important today, with high per-capita consumption of wild foods, use of over 100 varieties of plants, fish, and animals, annual harvesting by virtually all Yakutat Native households, and extensive sharing of foods with matrilineal and affinal kin. Successful hunting, fishing, and gathering require a broad foundation of training and ecological education, provided by parents and matrilineal uncles and aunts in the traditional manner. Modern seal hunters rely on the same stock of knowledge about ice, currents, the marine food web, and seal behavior as generations of hunters who preceded them.

Nonetheless, in Yakutat's increasingly cash-based and externally linked economy participation in subsistence is declining, with per-household consumption of wild foods dropping by about 40% between 1985 and 2015 and the harvest of harbor seals declining by over 80% between 1996 and 2008. Fewer young people are participating in subsistence activities, a matter of deep regret to some older community members.

Patterns of land use have also changed; subsistence activities are now concentrated in eastern Yakutat Bay and the Yakutat foreland, respectively the most productive marine and terrestrial ecozones, while use of Disenchantment Bay and the Malaspina foreland has declined. Some species are less abundant than in the past, notably harbor seals and herring, both because of commercial overharvesting; some species, such as moose and deer, have increased in population and become more important in the subsistence basket. Meanwhile, hotter summers accompanying climate change have reduced important berry crops.

Motorized boats and four-wheelers enable a new logistics of subsistence based on day trips or short excursions to harvest areas from the town of Yakutat, but at the same time these conveniences require significant cash outlays for purchase, maintenance, and fuel. The older pattern of seasonal rotation by the whole population between winter villages and harvesting camps is gone, although individual families maintain cabins on the Situk River for salmon fishing and on the shores of eastern Yakutat Bay for other subsistence activities (Figure 167).

It is evident that most modern alterations to the human ecological niche at Yakutat have arisen because the community is no longer embedded in a geographically closed system of energy and material exchange. Since the late eighteenth century, it has been increasingly tied to national and global systems of production, markets, technology, education, and governance. The modern Yakutat Native population of around 350 is substantially smaller than the estimated pre-smallpox peak of 500–550, a demographic shift of complex origins that is more closely linked to the dire legacies of epidemic disease and Western contact than to shifts in ecosystem capacity or in the mode of human interaction.

CONCLUSION

Endowed with a rich oral heritage, Yakutat residents are knowledgeable about the fiord's environmental and cultural history—the retreat of the glaciers, the growth of forests and animal populations, settlement by Eyak, Ahtna, and Tlingit ancestors, the locations of former villages and camps, the traditional territories of the different clans, and customary places for hunting, fishing, and gathering. This historical perspective on the community's relationship to a dynamic, perpetually changing environment guided George Ramos Sr.'s original concept for the Yakutat Seal Camps Project—that archaeologists should follow the people as they followed the glaciers through time.

FIGURE 167. Fishing camp cabins at the Situk River, July 2014. Photo © Smithsonian Institution.

In the cultural ecoscape of Yakutat fiord, human and environmental legacies are mapped cognitively by Indigenous place names and oral traditions and materially by artifacts and physical traces of former settlements, faunal and botanical remains, and geological evidence of glacial movements. The multiplicity of sources and ways of knowing about the past opens the way to a multidisciplinary synergy of interpretation and for the confluence of Indigenous and scientific knowledge.

From the external, scientific viewpoint of historical ecology, the peoples who settled Yakutat fiord undertook an intentional process of niche construction, applying knowledge, technology, and social cooperation to build a sustainable human role and mode of interaction within the ecosystem's networks of energy and material exchange. Far beyond adapting to the ecosystem as an external entity, they made themselves an integral part of it.

From the spiritual perspective that underlies Yakutat's sacred ecology, people, animals, glaciers, and all of nature are joined in an even greater totality, sharing consciousness as well as physical coexistence and interaction. Natural processes are the intentional acts of spirit beings, epitomized by Sít' Tlein's protection and release of the seals, and the human role in the ecosystem is actuated through thought, prayer, and ritual communication. As Elaine Abraham said, "Your mind, your spirit is turned towards the spirits of this place, that they will bless you, and they will do no harm" (A. Abraham, 10 June 2011, IN-1).

These words are a fitting conclusion to the collaborative research program at Yakutat, to which the people of the community contributed so greatly (Figure 168). This publication celebrates their remarkable achievement and spirit and the provident place that has been their home for so many generations. The legacy of knowing and being of Yakutat fiord lives on.

FIGURE 168. Lena Farkas (center) during the Yakutat community visit to the K̲eik'uliyáa sealing camp, July 2013, assisted by Aron Crowell (left) and Kai Monture (right); Devlin Anderstrom with Raven drum. Photo © Smithsonian Institution.

Acknowledgments

On behalf of all who were involved in the Yakutat project, my deep appreciation goes to Yakutat senior community scholars Elaine Abraham, Bertrand J. Adams Sr., Lena Farkas, George Ramos Sr., Raymond Sensmeier, and Ted Valle, some of whom are with us only in memory now.

Many other members of the community made invaluable contributions including Devlin Anderstrom, Ronnie Converse, Victoria Demmert, Eli Hanlon, Jeremiah James, Gary Johnson, Hayley Lekanoff, Kai Monture, Maka Monture, Sheri Nelson, Janice Piccard, David Ramos, Judith Ramos, Ingrid Shodda, and Jennie Wheeler. Senior researcher Judith Ramos served as project cultural liaison, working in this capacity to arrange and conduct interviews, set up public presentations at Yakutat High School and the Alaska Native Brotherhood and Sisterhood Hall, and organize community visits to the archaeological excavations at Disenchantment Bay in 2013 and Knight Island in 2014.

The Yakutat Tlingit Tribe, Sealaska Corporation, and Sealaska Heritage Institute provided essential cooperation, permissions, and support, with special thanks to Victoria Demmert (president, Yakutat Tlingit Tribe), Rosita Worl (director, Sealaska Heritage Institute), and Chuck Smythe (senior ethnologist, Sealaska Heritage Institute). United States Forest Service staff Myra Gilliam (archaeologist, Juneau and Yakutat Ranger Districts, Tongass National Forest), Rachel Myron (archaeologist, Juneau and Yakutat Ranger Districts, Tongass National Forest), Lee Benson (ranger, Yakutat Ranger District), and Daryl James (forester, Yakutat Ranger District) supported our work and issued an Archaeological Resource Protection Act permit that covered survey and excavation work on federal lands. Greg Biddle (cultural resource manager, Wrangell–St. Elias National Park) administered the 2014 surveys and excavations within Wrangell–St. Elias National Park, conducted under a National Park Service research permit. The Alaska Office of History and Archaeology in Anchorage issued state permits for archaeological work on intertidal lands and assisted all parties in implementing the National Historic Preservation Act Section 106 Memorandum of Understanding.

Funding for the Yakutat Seal Camps Project included a National Science Foundation EAGER (early concept grants for exploratory research) grant (1132295) in 2011; a National Science Foundation Arctic Social Sciences research grant (1203417) in 2012 and supplemental award in 2018; a National Park Foundation Coastal Marine Program grant (PMIS204602) in 2014; a Smithsonian Institution Grand Challenges award in 2013; and a Sealaska Heritage Institute gift in 2010.

My sincere appreciation goes out to all members of the research teams during four years of community-based studies. In 2011 these were Elaine Abraham, Steve Langdon (Department of Anthropology, University of Alaska Anchorage), Mark Luttrell (independent archaeologist, Seward), Myra Gilliam, Rachel Myron, Judith Ramos, and Tim Johnson (physician assistant/volunteer). In 2012, the group included Elaine Abraham, Gary Holton (Director, Alaska Native Language Archive), David Jensen (intern, Smithsonian Arctic Studies Center), Tim Johnson, Steve Langdon, Mark Luttrell, Kai Monture (intern, Smithsonian Arctic Studies Center), and Judith Ramos.

In 2013, additional researchers included Daniel H. Mann (University of Alaska Fairbanks) and Matt O'Leary (archaeologist, Bureau of Indian Affairs ANCSA Office). We were assisted by graduate and undergraduate students enrolled in a University of Alaska Anchorage archaeological field methods course conducted at Disenchantment Bay: Fawn Abt, Emma Bailey, Emily Rose Bryson, Meghan Caves, Tamara Holman, Katherine House, Sarah Jones, Emily F. Silber, Sarah Wilson, and Patricia Wright.

The 2014 team was joined by Darian LaTocha and Avery Underwood (Anchorage Museum) and University of Alaska Anchorage field school students who worked at the Knight Island and Spoon Lake sites: Penelope Baggs, Pierce Batemen, Ray Dummar, Hillary Hogue, Kaitlyn McGlamery, Lorena Medina-Dirkson, Alexandra Painter, Emalie Thern, and Daniel Thom. Maka Monture supervised Yakutat high school students Kayla Drumm, Hayley Lekanof, and Devlin Anderstrom during their participation in the excavations at Knight Island.

Christie Haupert, Matt Irinaga, and Ken Jessen of CH2M-Hill Polar Services provided Zodiac inflatable boats for coastal reconnaissance and field support, local fixed-wing and helicopter air travel, field equipment, logistics, safety training, and camp management during 2012–2014 on behalf of the National Science Foundation, and their support was truly outstanding. In Yakutat we benefitted from the logistical assistance of Bill Lucey (Yakutat Coastal Studies), Gary Klushkan, Erving Grass (Yakutat harbor master), and David Ramos. Progressive Media Alaska, led by videographer Brandon McElroy with assistance from Aron Johnson, Kai Monture, Zachary Lasiter, Nick Bradford, Sarah Betcher, and Zachary Speiser, filmed research interviews and documented archaeological fieldwork and community events.

Archaeological lab work at the Arctic Studies Center was carried out by Pierce Bateman, Meghan Caves, Tiffany Chilton, Christina Fieldhouse, David Jensen, and Michaela Stith. Interviews were transcribed by Meghan Cecil, Dawn Biddison, David Jensen, Molly Johanson, Heather McClain, and Michaela Stith at the Arctic Studies Center. Jeff Leer translated and transcribed Tlingit portions of the interviews. Dawn Biddison (Arctic Studies Center) oversaw transcription work, compiled and edited the Yakutat video archive, and provided project management. Scientific illustration intern Emily Kearney-Williams painted ancestral scenes based on information from oral tradition and archaeology and assisted with map figures. Funding from the National Science Foundation came with the excellent advice and support of Anna Kerttula, Collen Strawhacker, and Erica Hill at the National Science Foundation's Arctic Social Sciences Program.

To all the people of Yakutat, who welcomed and participated in this research in their community and on their lands: *gunalchéesh tlein*!

References

Abercrombie, William R. 1900. Supplementary Expedition into the Copper River Valley, Alaska, 1884. In *Compilation of Narratives of Explorations in Alaska*, pp. 381–408. Washington, D.C.: U.S. Government Printing Office.

Abraham, Elaine, and Judith Ramos. 2006. This Is Kuxaankutaan's (Dr. De Laguna's) Song. *Arctic Anthropology* 43(2):14–19. https://doi.org/10.1353/arc.2011.0041

Ackerman, Robert. 1965. *Archaeological Survey Glacier Bay National Monument, Southeastern Alaska Part II*. Report of Investigations 36. Pullman: Washington State University.

Ackerman, Robert. 1968. *The Archaeology of the Glacier Bay Region, Southeastern Alaska. Final Report of the Archaeological Survey of the Glacier Bay National Monument*. Report of Investigations 44. Pullman: Washington State University.

Adams, William Hampton. 2002. Machine Cut Nails and Wire Nails: American Production and Use for Dating 19th-Century and Early 20th-Century Sites. *Historical Archaeology* 36(4):66–68. https://doi.org/10.1007/BF03374370

Alaska Climate Research Center. 2020. Climate Normals 1981–2010. Geophysical Institute, University of Alaska Fairbanks. https://akclimate.org/data/air-temperature-normals/ (accessed 23 January 2020).

Alaska Commercial Company (ACC). 1869–1905. USUAF3 Alaska Commercial Company Records (Nuchek). Rasmuson Library, Alaska and Polar Regions Collections and Archives, University of Alaska Fairbanks.

Alaska Department of Fish and Game. 1986a. *Alaska Habitat Management Guide, Reference Maps, Southeast Region*. Volume 1: *Distribution of Mammals and Birds and Human Use of Mammals*. Juneau: State of Alaska, Department of Fish and Game, Division of Habitat.

Alaska Department of Fish and Game. 1986b. *Alaska Habitat Management Guide, Reference Maps, Southeast Region*. Volume 2: *Distribution and Human Use of Fish, and Community Use of Fish and Wildlife*. Juneau: State of Alaska, Department of Fish and Game, Division of Habitat. Juneau.

Alaska Department of Fish and Game. 1987. Community Subsistence Information System (CSIS) Yakutat 1987. http://www.adfg.alaska.gov/sb/CSIS/index.cfm?ADFG=commInfo.Summary&CommID=373&Year=1987 (accessed 14 January 2020).

Alaska Department of Fish and Game. 2001. Community Subsistence Information System (CSIS) Yakutat 2001. http://www.adfg.alaska.gov/sb/CSIS/index.cfm?ADFG=harvInfo.Harvest&CommID=373&Year=2001 (accessed 14 January 2020).

Alaska Department of Fish and Game. 2005. *Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes*. Anchorage: Alaska Department of Fish and Game, Division of Sport Fish and Department of Natural Resources, Office of Habitat Management and Permitting. https://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=main.home (accessed 14 January 2020).

Alaska Department of Natural Resources 2023. Alaska Heritage Resources Survey. Office of History and Archaeology, Alaska Department of Natural Resources, Anchorage. https://dnr.alaska.gov/parks/oha/ahrs/ahrs.htm. (Restricted access online database; accessed 9 November 2023.)

Albert, David, and John Schoen. 2007. A Conservation Assessment for the Coastal Forests and Mountains Ecoregion of Southeastern Alaska and the Tongass National Forest. In *The Coastal Forests and Mountains Ecoregion in Southeastern Alaska and the Tongass National Forest*, ed. J. Schoen and E. Dovchin, pp. 1–46. Anchorage: Audubon Alaska and the Nature Conservancy.

Allen, Henry T. 1887. *Report of an Expedition to the Copper, Tanana, and Koyukuk Rivers, in the Territory of Alaska, in the Year 1885, for the Purpose of Obtaining All Information Which Will Be Valuable and Important, Especially to the Military Branch of the Government*. Washington, D.C.: U.S. Government Printing Office.

Ames, Kenneth M. 2003. The Northwest Coast. *Evolutionary Anthropology* 12:19–33. https://doi.org/10.1002/evan.10102

Arimitsu, Mayumi L. 2016. Influence of Glaciers on Coastal Marine Ecosystems in the Gulf of Alaska. PhD diss., School of Fisheries and Ocean Sciences, University of Alaska Fairbanks.

Arimitsu, Mayumi L., John F. Piatt, Michael A. Litzow, Alisa A. Abookire, Marc D. Romano, and Martin D. Robards. 2008. Distribution and Spawning Dynamics of Capelin (*Mallotus villosus*) in Glacier Bay, Alaska: A Cold Water Refugium. *Fisheries Oceanography* 17:137–146. https://doi.org/10.1111/j.1365-2419.2008.00470.x

Arimitsu, Mayumi L., John F. Piatt, Erica N. Madison, Jeffrey S. Conaway, and Nicola Hillgruber. 2012. Oceanographic Gradients and Seabird Prey Community Dynamics in Glacial Fjords. *Fisheries Oceanography* 21(2–3):148–169. https://doi.org/10.1111/j.1365-2419.2012.00616.x

Arimitsu, Mayumi L., John F. Piatt, and Franz Mueter. 2016. Influence of Glacier Runoff on Ecosystem Structure in Gulf of Alaska Fjords. *Marine Ecology Progress Series* 560:19–40. https://doi.org/10.3354/meps11888

Balée, William L. 1998. Historical Ecology: Premises and Postulates. In *Advances in Historical Ecology*, ed. William L. Balee, pp. 13–29. New York: Columbia University Press.

Barclay, David J., Parker E. Calkin, and Gregory C. Wiles. 2001. Holocene History of Hubbard Glacier in Yakutat Bay and Russell Fiord, Southeastern Alaska. *Geological Society of America Bulletin* 113(3):338–402. https://doi.org/10.1130/0016-7606(2001)113<0388:HHOHGI>2.0.CO;2

Barclay, David J., Gregory C. Wiles, and Parker E. Calkin. 2009. Holocene Glacial Fluctuations in Alaska. *Quaternary Science Reviews* 28:2034–2048. https://doi.org/10.1016/j.quascirev.2009.01.016

Barnes, Frank C. 2012. *Cartridges of the World*, 13th ed. Ed. Richard A. Mann and Jennifer L. S. Pearsall. Iola, Kans.: Gun Digest Books/F+W Media/Krause Publications.

Benson, Ashleen, and Andrew W. Trites. 2002. Ecological Effects of Regime Shifts in the Bering Sea and Eastern North Pacific Ocean. *Fish and Fisheries* 3:95–113. https://doi.org/10.1046/j.1467-2979.2002.00078.x

Berkes, Fikret. 2012. *Sacred Ecology: Traditional Ecological Knowledge and Resource Management*, 2nd ed. London: Routledge.

Betts, Robert C., Christopher B. Wooley, Charles M. Mobley, James C. Haggarty, and Aron Crowell. 1991. *Site Protection and Oil Spill Treatment at SEL-188: An Archaeological Site in Kenai Fjords National Park, Alaska*. Anchorage: Exxon Shipping Company and Exxon Company USA.

Birket-Smith, Kaj. 1941. Early Collections from the Pacific Eskimos: Ethnographical Studies. *Nationalmuseets Skrifter Etnografisk Række* 1:121–163. Copenhagen: National Museum of Denmark.

Birket-Smith, Kaj. 1953. The Chugach Eskimo. *Nationalmuseets Skrifter Etnografisk Raekke* 6. Copenhagen: National Museum of Denmark.

Birket-Smith, Kaj, and Frederica de Laguna. 1938. *The Eyak Indians of the Copper River Delta, Alaska*. Copenhagen: Levin and Munksgaard.

Blackwelder, Elliot. 1909. The Yakutat Coastal Plain of Alaska: A Combined Terrestrial and Marine Formation. *American Journal of Science* 27:459–466.

Braje, Todd J., and Torben C. Rick, eds. 2011. *Human Impacts on Seals, Sea Lions, and Sea Otters: Integrating Archaeology and Ecology in the Northeast Pacific*. Berkeley: University of California Press.

Burrell, David C. 1986. Interaction between Silled Fjords and Coastal Regions. In *The Gulf of Alaska: Physical and Biological Resources*, ed. Donald W. Hood and Steven T. Zimmerman, pp. 187–216. Alaska Office, Ocean Assessments Division, National Oceanic and Atmospheric Administration. Washington, D.C.: U.S. Government Printing Office.

Burroughs, John, John Muir, and George Bird Grinnell. 1901. *Alaska. Volume 1: Narrative, Glaciers, Natives*. Harriman Alaska Expedition with cooperation of Washington Academy of Sciences. New York: Doubleday, Page.

C. Hart Merriam Collection of Native American Photographs, ca. 1890–1938. Catalog No. 1978.008-PIC, Folder Misc. P/3, Vol. 42 (Prints 1–5) and Vol. 43 (Prints 6–24). [Photographs of Yakutat sealing camp and sealers at Glacier Bay, 1899.] Bancroft Library, University of California, Berkeley.

Calkin, Parker E., Gregory C. Wiles, and David J. Barclay. 2001. Holocene Coastal Glaciation of Alaska. *Quaternary Science Reviews* 20:449-461. https://doi.org/10.1016/S0277-3791(00)00105-0

Carlisle, John G. 1897. *Synopsis of the Decisions of the Treasury Department and the Board of U.S. General Appraisers on the Construction of the Tariff, Immigration, and Other Laws for the Year Ending December 31, 1896*. Washington, D.C.: U.S. Government Printing Office.

Carlson, Paul R. 1989. Seismic Reflection Characteristics of Glacial and Glaciomarine Sediment in the Gulf of Alaska and Adjacent Fjords. *Marine Geology* 85:391–416. https://doi.org/10.1016/0025-3227(89)90161-8

Castellote, Manuel, Kathleen M. Stafford, A. Darcie Neff, and William Lucey. 2015. Acoustic Monitoring and Prey Association for Beluga Whale, *Delphinapterus leucas*, and Harbor Porpoise, *Phocoena phocoena*, off Two River Mouths in Yakutat Bay, Alaska. *Marine Fisheries Review* 77(1):1–10.

Chapin, F. Stuart, Lawrence R. Walker, Christopher L. Fastie, and Lewis C. Sharman. 1994. Mechanisms of Primary Succession Following Deglaciation at Glacier Bay, Alaska. *Ecological Monographs* 64:149–175. https://doi.org/10.2307/2937039

Cieslik, Jürgen, and Marianne Cieslik. 1985. *German Doll Encyclopedia 1800–1939*. Cumberland, Md: Hobby House Press.

Clark, Donald W. 1974a. *Contributions to the Later Prehistory of Kodiak Island, Alaska*. Archaeological Survey of Canada Paper No. 20. Ottawa: National Museums of Canada. https://doi.org/10.2307/2937039

Clark, Donald W. 1974b. *Koniag Prehistory: Archaeological Investigations at Late Prehistoric Sites on Kodiak Island, Alaska*. Stuttgart: Verlag W. Kohlhammer.

Clark, Donald W. 1984. Prehistory of the Pacific Eskimo Region. In *Handbook of American Indians*, ed. William C. Sturtevant. Volume 5: *Arctic*, ed. David Damas, pp. 136–148. Washington, D.C.: Smithsonian Institution Press.

Connor, Cathy, Greg Streveler, Austin Post, Daniel Monteith, and Wayne Howell. 2009. The Neoglacial Landscape and Human History of Glacier Bay, Glacier Bay National Park and Preserve, Southeast Alaska, USA. *The Holocene* 19(3):381–393. https://doi.org/10.2307/2937039

Cooney, Theodore. 2007. The Marine Production Cycle. In *Long-term Ecological Change in the Northern Gulf of Alaska,* ed. Robert B. Spies, pp. 47–60. Amsterdam: Elsevier.

Cooper, H. Kory, M. John M. Duke, Antonio Simonetti, and GuangCheng Chen. 2008. Trace Element and Pb Isotope Provenance Analysis of Native Copper in Northwestern North America: Results of a Recent Pilot Study Using INAA, ICP-MS, and LA-MC-ICP-MS. *Journal of Archaeological Science* 35:1732–1747. https://doi.org/10.1016/j.jas.2007.11.012

Cooperative Park Studies Unit. 1980. Sites No. AA10532 and AA10529, Abbreviated ANCSA 14(h)(1) Site Survey Forms. Fairbanks: University of Alaska Fairbanks.

Crockford, Susan J. 2012. Archaeozoology of Adak Island: 6000 Years of Subsistence History in the Central Aleutians. In *The People Before: The Geology, Paleoecology and Archaeology of Adak Island, Alaska*, ed. Dixie West, Virginia Hatfield, Elizabeth Wilmerding, Christina Lefèvre, and Lyn Gualtieri. BAR International Series 2322. Oxford, U.K.: Archaeopress.

Crowell, Aron L. 1994. Alutiiq Poison Dart Whaling. In *Anthropology of the North Pacific*, ed. William W. Fitzhugh and Valérie Chaussonnet, pp. 217–242. Washington, D.C.: Smithsonian Institution Press.

Crowell, Aron L. 1997. *Archaeology and the Capitalist World System: A Study from Russian America*. New York: Plenum Press. https://doi.org/10.1007/978-1-4757-9279-9

Crowell, Aron L. 2006. *The Outer Coast Project: Kenai Fjords Oral History and Archaeology*. Final Technical Report, Grant SI 634019, Ocean Alaska Science and Learning Center, Seward, Alaska.

Crowell, Aron L. 2010. *Smithsonian Archaeological Survey of Nuka Bay, Kenai Fjords National Park*. Final Report Grant KEFJ 2007 00029. National Park Service, Kenai Fjords National Park, and Ocean Alaska Science and Learning Center, Seward, Alaska.

Crowell, Aron L. 2011a. *Archaeological Survey on the Malaspina Foreland, Wrangell–St. Elias National Park, Alaska*. Final Report on Smithsonian Fieldwork. National Park Service, Wrangell–St. Elias National Park, Copper Center, Alaska.

Crowell, Aron L. 2011b. Ethnicity and Periphery: The Archaeology of Identity in Russian America. In *The Archaeology of Capitalism in Colonial Contexts*, ed. S. K. Croucher and L. Weiss, pp. 85–104. Contributions to Global Historical Archaeology. New York: Springer. https://doi.org/10.1007/978-1-4614-0192-6_4

Crowell, Aron L. 2011c. *Yakutat Tlingit Sealing Camps: Investigating the Relationship among Language, Indigenous Knowledge, and Glacial Movement*. Smithsonian Institution proposal to the National Science Foundation, Arctic Social Sciences Program, Early Concept Grant for Exploratory Research. Award #1132295.

Crowell, Aron L. 2012. *Collaborative Research: Glacial Retreat and the Cultural Landscape of Ice Floe Sealing at Yakutat Bay, Alaska*. Smithsonian Institution and University of Alaska Fairbanks proposal to the National Science Foundation, Arctic Social Sciences Program. Award #1203417.

Crowell, Aron L. 2015. The Glacier's Eternal Gift: Sealing, Science, and Indigenous Knowledge at Yakutat Bay, Alaska. In *Keeping Our Traditions Alive: Compendium of Best Practices in Promoting Traditional Ways of Life of Arctic Indigenous Peoples*, pp. 48–49. Ottawa: The Arctic Council Secretariat.

Crowell, Aron L. 2016. Ice, Seals, and Guns: Late 19th-Century Alaska Native Commercial Sealing in Southeast Alaska. *Arctic Anthropology* 52(2):11–32. https://doi.org/10.3368/aa.53.2.11

Crowell, Aron L. 2020. The 1960s–1970s Harbor Seal Crash in Alaska: A Historical and Ecological Perspective. In *Arctic Crashes: People and Animals in the Changing North*, ed. Igor Krupnik and Aron L. Crowell, pp. 317–335. Washington, D.C.: Smithsonian Institution Scholarly Press.

Crowell, Aron L. 2022. What "Really Happened": A Migration Narrative from Southeast Alaska Compared to Archaeological and Geological Data. In *Memory and Landscape: Indigenous Responses to a Changing North*, ed. Ken Pratt and Scott Heyes, pp. 24–55. Edmonton, AB: Athabasca University Press.

Crowell, Aron L., and Mayumi Arimitsu. 2023. Climate Change and Pulse Migration: Intermittent Chugach Inuit Occupation of Glacial Fiords on the Kenai Coast, Alaska. *Frontiers in Environmental Archaeology* 2:1145220. https://doi.org/10.3389/fearc.2023.1145220

Crowell, Aron L., and Wayne K. Howell. 2013. Time, Oral Tradition, and Archaeology at Xakwnoowú, a Little Ice Age Fort in Southeastern Alaska. *American Antiquity* 78(1):2–23. https://doi.org/10.7183/0002-7316.78.1.3

Crowell, Aron L., Wayne Howell, Daniel H. Mann, and Greg Streveler. 2013a. *The Hoonah Tlingit Cultural Landscape in Glacier Bay National Park and Preserve*. Gustavus, Alas.: National Park Service, Glacier Bay National Park and Preserve.

Crowell, Aron L., Joseph Liddle, and Mark Matson. 2013b. Spatial Correlation of Archaeological Sites and Subsistence Resources in the Gulf of Alaska. *Alaska Park Science* 11(2):4–9.

Crowell, Aron L., and Daniel H. Mann. 1996. Sea Level Dynamics, Glaciers, and Archaeology along the Central Gulf of Alaska Coast. *Arctic Anthropology* 33(2):16–37.

Crowell, Aron L., and Daniel H. Mann. 1998. *Archaeology and Coastal Dynamics of Kenai Fjords National Park, Alaska*. Anchorage: National Park Service.

Crowell, Aron L., Daniel H. Mann, and Mark Matson. 2003. Implications of "Punctuated Productivity" for Coastal Settlement Patterns: A GIS Study of the Katmai Coast, Gulf of Alaska. *Alaska Journal of Anthropology* 2(1):62–96.

Crowell, Aron L., Amy F. Steffian, and Gordon L. Pullar. 2001. *Looking Both Ways: Heritage and Identity of the Alutiiq People*. Fairbanks: University of Alaska Press.

Crowell, Aron L., Rosita Worl, Paul C. Ongtooguk, and Dawn D. Biddison, eds. 2010. *Living Our Cultures, Sharing Our Heritage: The First Peoples of Alaska*. Washington, D.C.: Smithsonian Books.

Crowell, Aron L., and David R. Yesner, Rita Eagle, and Dianne K. Hansen. 2008. An Historic Alutiiq Village on the Outer Kenai Coast: Subsistence and Trade in the Early Contact Period. *Alaska Journal of Anthropology* 6(1–2):225–251.

Cruikshank, Julie. 1981. Legend and Landscape: Convergence of Oral and Scientific Traditions in the Yukon Territory. *Arctic Anthropology* 18(2):67–93.

Cruikshank, Julie. 2001. Glaciers and Climate Change: Perspectives from Oral Tradition. *Arctic* 54(4):377–393. https://doi.org/10.14430/arctic795

Cruikshank, Julie. 2005. *Do Glaciers Listen? Local Knowledge, Colonial Encounters, and Social Imagination*. Vancouver: University of British Columbia Press.

Crumley, Carole, ed. 1994. *Historical Ecology: Cultural Knowledge and Changing Landscapes*. Santa Fe, N.Mex.: School of American Research.

Crumley, Carol L. 2007. Historical Ecology: Integrated Thinking at Multiple Temporal and Spatial Scales. In *The World System and the Earth System: Global Socioenvironmental Change and Sustainability since the Neolithic,* ed. A. Hornborg and C. L. Crumley, pp. 15–28. Left Coast Press, Walnut Creek.

Crumley, Carole L., Tommy Lennartsson, and Anna Westin, eds. 2017. *Issues and Concepts in Historical Ecology: The Past and Future of Landscapes and Regions*. Cambridge, U.K.: Cambridge University Press. https://doi.org/10.1017/9781108355780

Dall, William H. 1877. Tribes of the Extreme Northwest Coast. *Contributions to North American Ethnology* 1:1–156.

Dauenhauer, Nora M., and Richard Dauenhauer. 1987. *Haa Shuka*, *Our Ancestors: Tlingit Oral Narratives*. Seattle: University of Washington Press, and Juneau: Sealaska Heritage Foundation.

Davidson, George. 1901. The Tracks and Landfalls of Bering and Chirikof on the Northwest Coast of America. *Geographical Society of the Pacific Transactions and Proceedings*, series 2, 1:75–82.

Davidson, George. 1904. The Glaciers of Alaska that are Shown on Russian Charts or Mentioned in Older Narratives. *Transactions and Proceedings of the Geographical Society of the Pacific* 3:43–47, map 6.

Davis, Stanley D. 1989. *The Hidden Falls Site, Baranof Island, Alaska*. Aurora 5. Anchorage: Alaska Anthropological Association.

Davis, Stanley D. 1990. Prehistory of Southeastern Alaska. In *Handbook of North American Indians*, ed. William C. Sturtevant. Volume 7: *Northwest Coast*, ed. W. Suttles, pp. 197–202. Washington, D.C.: Smithsonian Institution Press.

Davis, Stanley D. 1996. The Archaeology of the Yakutat Foreland: A Sociological View. PhD diss., Department of Anthropology, Texas A & M University, College Station.

De Laguna, Frederica. 1952. List of place names from Yakutat to Cordova recorded by [Frederica] de Laguna from Yakutat informants, 1952, with annotations by [Michael] Krauss; also maps with names from Sampson Harry and Anna Nelson Harry, transcribed by [Michael] Krauss, 1965. Alaska Native Language Archive, University of Alaska Fairbanks, EY933 KD1965.

De Laguna, Frederica. 1956. *Chugach Prehistory: The Archaeology of Prince William Sound, Alaska*. Seattle: University of Washington Press.

De Laguna, Frederica. 1958. Geological Confirmation of Native Traditions, Yakutat Alaska. *American Antiquity* 23(4):434. https://doi.org/10.2307/276497

De Laguna, Frederica. 1960. *The Story of a Tlingit Community (Angoon): A Problem in the Relationship between Archaeological, Ethnological, and Historical Methods*. Bureau of American Ethnology Bulletin 172. Washington, D.C.: U.S. Government Printing Office.

De Laguna, Frederica. 1972. *Under Mt. St. Elias: The History and Culture of the Yakutat Tlingit*. Smithsonian Contributions to Anthropology. 3 volumes. Washington, D.C.: Smithsonian Institution Press. https://doi.org/10.5479/si.00810223.7.1

De Laguna, Frederica. 1975. The Archaeology of Cook Inlet, Alaska. 2nd ed. Anchorage: Alaska Historical Society.

De Laguna, Frederica. 1990a. Eyak. In *Handbook of North American Indians*, ed. William C. Sturtevant. Volume 7: *Northwest Coast*, ed. Wayne Suttles, pp. 189–196. Washington, D.C.: Smithsonian Institution Press.

De Laguna, Frederica. 1990b. Tlingit. In *Handbook of North American Indians*, ed. William C. Sturtevant. Volume 7: *Northwest Coast*, ed. Wayne Suttles, pp. 203–228. Washington, D.C.: Smithsonian Institution Press.

De Laguna, Frederica, and Catharine McClellan. 1981. Ahtna. In *Handbook of North American Indians*, ed. William C. Sturtevant. Volume 6: *Subarctic*, ed. June Helm, pp. 641–663. Washington, D.C.: Smithsonian Institution Press.

De Laguna, Frederica, Francis A. Riddell, Donald F. McGeein, Kenneth S. Lane, J. Arthur Freed, and Carolyn Osborne. 1964. *Archaeology of the Yakutat Bay Area, Alaska*. Smithsonian Institution Bureau of Ethnology Bulletin 192. Washington, D.C.: U.S. Government Printing Office.

Deur, Douglas, Thomas Thornton, Rachel Lahoff, and Jamie Herbert. 2015. *Yakutat Tlingit and Wrangell–St. Elias National Park and Preserve: An Ethnographic Overview and Assessment*. Copper Center, Alas.: National Park Service, Wrangell–St. Elias National Park and Preserve,.

Dixon, E. James. 1985. Cultural Chronology of Central Interior Alaska. *Arctic Anthropology* 22(1):47–66.

Dixon, George. 1968. *A Voyage Round the World; But More Particularly to the North-West Coast of America: Performed in 1785, 1786, 1787, and 1788, in* The King George *and* Queen Charlotte*, Captains Portlock and Dixon*. New York: Da Capo Press.

Dods, Robert Robin. 2004. Knowing Ways / Ways of Knowing: Reconciling Science and Tradition. *World Archaeology* 36:547–557. https://doi.org/10.1080/0043824042000303719

Edwards, Keri. 2009. *Dictionary of Tlingit*. Juneau: Sealaska Heritage Institute.

Ellis, Earle C. 2015. Ecology in an Anthropogenic Biosphere. *Ecological Monographs* 85(3):287–331. https://doi.org/10.1890/14-2274.1

Elmore, Christopher R., Sean P. S. Gulick, Bryce Willams, and Ross Powell. 2015. Seismic Stratigraphic Evidence for Glacial Expanse during Glacial Maxima in the Yakutat Bay Region, Gulf of Alaska. *Geochemistry, Geophysics, and Geosystems* 14:1294–1311. https://doi.org/10.1002/ggge.20097

Emmons, George T. n.d. Tlingit tribes and families. Emmons Collection, Reel A0176, Box 60, File 7. British Columbia Archives, Royal British Columbia Museum, Victoria.

Emmons, George T. 1991. *The Tlingit Indians*. Ed., with additions, Frederica De Laguna. Seattle: University of Washington Press.

Ericson, P. G. P., and J. Storå. 1999. A Manual for the Skeletal Measurements of the Seal Genera *Halichoerus* and *Phoca* (Mammalia: Pinnipedia). Department of Vertebrate Zoology, Swedish Museum of Natural History, Stockholm. Unpublished handout.

Erlandson, Jon, Aron L. Crowell, Christopher Wooley, and James Haggarty. 1992. Spatial and Temporal Patterns of Alutiiq Paleodemography. *Arctic Anthropology* 29(2):42–62.

Eslinger, D. L., R. T. Cooney, C. P. McRoy, A. Ward, T. C. Kline, E. P. Simpson, J. Wang, and J. R. Allen. 2001. Plankton Dynamics: Observed and Modeled Responses to Physical Conditions in Prince William Sound, Alaska. *Fisheries Oceanography* 10(supplement 1):81–96. https://doi.org/10.1046/j.1054-6006.2001.00036.x

Estes, J. A., D. F. Doak, A. M. Springer, and T. M. Williams. 2009. Causes and Consequences of Marine Mammal Population Declines in Southwest Alaska: A Food-Web Perspective. *Philosophical Transactions of the Royal Society* 364:1647–1658. https://doi.org/10.1098/rstb.2008.0231

Etnier, Michael A. 2002. The Effects of Human Hunting on Northern Fur Seal (*Callorhinus ursinus*) Migration and Breeding Distributions in the Late Holocene. PhD diss., Department of Anthropology, University of Washington, Seattle.

Etnier, Michael A. 2011. The Faunal Assemblage from *Awa'uq* (Refuge Rock): A Unique Record from the Kodiak Archipelago, Alaska. *Alaska Journal of Anthropology* 9(2):55–64.

Etnier, Michael A. 2017. Faunal Analysis of the Tlákw.aan (Knight Island) Site (YAK-007), Yakutat, Alaska. Bellingham: Western Washington University.

Etnier, Michael A. 2020. Unangax̂ Subsistence Use of Northern Fur Seals in Alaska: Changing Patterns Over the Past 2,000 Years. In *Arctic Crashes: People and Animals in the Changing North*, ed. Igor Krupnik and Aron L. Crowell, pp. 272–283. Washington, D.C.: Smithsonian Institution Scholarly Press.

Fastie, C. L. 1995. Causes and Ecosystem Consequences of Multiple Pathways of Primary Succession at Glacier Bay, Alaska. *Ecology* 76:1899–1916. https://doi.org/10.2307/1940722

Fautin, Daphne, Penelope Dalton, Lewis S. Incze, Jo-Ann C. Leong, Clarence Pautzke, Andrew Rosenberg, Paul Sandifer, George Sedberry, John W. Tunnell Jr., Isabella Abbott, Russell E. Brainard, Melissa Brodeur, Lucius G. Eldredge, Michael Feldman, Fabio Moretzsohn, Peter S. Vroom, Michelle Wainstein, and Nicholas Wolff. 2010. An Overview of Marine Biodiversity in United States Waters. *PLOS One* 5(8):1–47. https://doi.org/10.1371/journal.pone.0011914

Finney, Bruce P., Irene Gregory-Eaves, Marianne S. V. Douglas, and John P. Smol. 2002. Fisheries Productivity in the Northeastern Pacific Ocean over the Past 2,200 years. *Nature* 416:729–732. https://doi.org/10.1038/416729a

Fitzhugh, Ben. 2003. *The Evolution of Complex Hunter–Gatherers: Archaeological Evidence from the North Pacific*. New York: Kluwer Academic/Plenum.

Fitzhugh, Ben, Virginia L. Butler, Kristine M. Bovy, and Michael A. Etnier. 2019. Human Ecodynamics: A Perspective for the Study of Long-Term Change in Socioecological Systems. *Journal of Archaeological Science: Reports* 23:1077–1094.

Fitzhugh, William W. 1972. *Environmental Archaeology and Cultural Systems in Hamilton Inlet, Labrador: A Survey of the Central Labrador Coast from 3000 B.C. to the Present*. Washington, D.C.: Smithsonian Institution Press. https://doi.org/10.5479/si.00810223.16.1

Flayderman, Norm. 2001. *Flayderman's Guide to Antique American Firearms and Their Values*. Iola, Kans.: Krause Publications.

Fortuine, Robert. 1989. *Chills and Fever: Health and Disease in the Early History of Alaska*. Fairbanks: University of Alaska Press.

Freed, Arthur, and Kenneth S. Lane. 1964. Analysis of Faunal Remains from Old Town, Knight Island. In *Archaeology of the Yakutat Bay Area, Alaska*, by Frederica de Laguna, Francis A. Riddell, Donald F. McGeein, Kenneth S. Lane, J. Arthur Freed, and Carolyn Osborne, pp. 77–84. Bureau of American Ethnology Bulletin 192. Washington, D.C.: U.S. Government Printing Office.

Friesen, Max, and Owen K. Mason, eds. 2016. *The Oxford Handbook of the Prehistoric Arctic*. Oxford, U.K.: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199766956.001.0001

Furholt, Martin, Colin Grier, Matthew Spriggs, and Timothy Earle. 2020. Political Economy in the Archaeology of Emergent Complexity: A Synthesis of Bottom-Up and Top-Down Approaches. *Journal of Archaeological Method and Theory* 27:157–191. https://doi.org/10.1007/s10816-019-09422-0

Gilbert, Grove Karl. 1910. *Glaciers and Glaciation*. Harriman Alaska Series Vol. 3. Washington D.C.: Smithsonian Institution.

Gluckman, Arcadi. 1965. *Identifying Old U.S. Muskets, Rifles, and Carbines*. New York: Bonanza Books.

Goldschmidt, Walter R., and Theodore H. Haas. 1998. *Haa Aaní, Our Land: Tlingit and Haida Land Rights and Use*. Ed. Thomas F. Thornton. Seattle: University of Washington Press, and Juneau: Sealaska Heritage Foundation. [Originally published in 1946 as "Possessory Rights of the Natives of Southeastern Alaska: A Report to the Commissioner of Indian Affairs."]

Grinnell, George B. 1901. Natives. In *Harriman Alaska Expedition*. Volume 1, ed. C. Hart Meriam, pp. 158–165. New York: Doubleday, Page.

Hanson, Diane. 2008. Archaeological Investigations in the 1990s at the Ringling Site, GUL-077, near Gulkana, Alaska. *Alaska Journal of Anthropology* 6(1–2):109–130.

Hardesty, Donald L. 1972. The Human Ecological Niche. *American Anthropologist* 74(3):458–466. https://doi.org/10.1525/aa.1972.74.3.02a00150

Harriman Expedition and Yakutat Collections. 1899. Harriman Expedition collection (692 photographic prints and lantern slides) and Yakutat collection (52 photographic prints and lantern slides), National Museum of the American Indian Photo Archives, Washington, D.C.

Harrington, John P. 1940. Yakutat notes, 1939–1940. Files EY940H11940a and EY940H1940c. Alaska Native Language Archive, University of Alaska, Fairbanks.

Heizer, Robert F. 1956. *Archaeology of the Uyak Site, Kodiak Island, Alaska*. Anthropological Records 17:1. Berkeley: University of California Press.

Helfield, J. M., and R. J. Naiman. 2006. Keystone Interactions: Salmon and Bear in Forests of Alaska. *Ecosystems* 9:167–180. https://doi.org/10.1007/s10021-004-0063-5

Helser Thomas, Craig Kastelle, Aron L. Crowell, Takayuki Ushikubo, Ian J. Orland, Reinhard Kozdon, and John W. Valley. 2018. A 200-Year Archaeozoological Record of Pacific Cod (*Gadus Macrocephalus*) Life History as Revealed through Ion Microprobe Oxygen Isotope Ratios in Otoliths. *Journal of Archaeological Science Reports* 21:1236–1246. https://doi.org/10.1016/j.jasrep.2017.06.037

Henige, David P. 1974. *The Chronology of Oral Tradition, Quest for a Chimera*. Oxford, U.K.: Clarendon Press.

Higueras, Maria Dolores. 1991. *NW Coast of America: Iconographic Album of the Malaspina Expedition, a Study*. Madrid: Museo Naval.

Hirons, Amy C., Donald M. Schell, and Bruce P. Finney. 2001. Temporal Records of $\delta^{13}C$ and $\delta^{15}N$ in North Pacific Pinnipeds: Inferences Regarding Environmental Change and Diet. *Oecologia* 129:591–601. https://doi.org/10.1007/s004420100756

Hodder Blee, C. 1986. *Wine, Yaman, and Stone: The Archaeology of a Russian Hospital Trash Pit, Sitka National Historic Park, Sitka, Alaska*. Sitka, Alas.: National Park Service, Sitka National Historic Park.

Hood, Donald W., and Steven T. Zimmerman, eds. 1986. *The Gulf of Alaska: Physical and Biological Resources*. National Oceanic and Atmospheric Administration, Ocean Assessments Division, Alaska Office. Washington, D.C.: U.S. Government Printing Office. https://doi.org/10.5962/bhl.title.60759

Hood, Eran, Ginny Eckert, Sonia Nagorski, and Carrie Talus. 2006. *Assessment of Coastal Water Resources and Watershed Conditions at Wrangell–S. Elias National Park and Preserve*. Technical Report NPS/NRWRD/NRTR-2006/346. Fort Collins, Colo.: National Park Service, Water Resources Division.

Hoover-Miller, A. Anne. 1994. *Harbor Seal (*Phoca vitulina*) Biology and Management in Alaska*. Report by Pacific Rim Research (Seward, Alas.) to the Marine Mammal Commission, Washington, D.C.

Hu, F. S., E. Ito, T. A Brown, B. B. Curry, and D. R. Engstrom. 2001. Pronounced Climatic Variations during the Last Two Millennia. *Proceedings of the National Academy of Sciences of the USA* 98:10552–10556. https://doi.org/10.1073/pnas.181333798

Hymes, Dell. 1990. Mythology. In *Handbook of North American Indians*, ed. William C. Sturtevant. Volume 7: *Northwest Coast*, ed. Wayne Suttles, pp. 593–601. Washington, D.C.: Smithsonian Institution Press.

Inglis, Julian T. 1993. *Traditional Ecological Knowledge: Concepts and Cases*. Ottawa: International Program on Traditional Ecological Knowledge, International Development Research Centre.

Institute of Social, Economic, and Government Research. 1966. *The Fur Industry in Alaska*. Fairbanks: Alaska Review of Business and Economic Conditions, University of Alaska.

Interagency Arctic Research Policy Committee. 2018. Principles for Conducting Research in the Arctic. https://www.nsf.gov/geo/opp/arctic/conduct.jsp#:~:text=To%20guide%20research%20activities%20throughout%20the%20Arctic%2C%20the,Build%20and%20Sustain%20Relationships%20Pursue%20Responsible%20Environmental%20Stewardshipiv (accessed 2 September 2021).

Ismailov, Gerasim G. 1981. The Voyage of Izmailov and Bocharov. In *A Voyage to America, 1783–1786*, by Grigorii I. Shelikhov, trans. Marina Ramsay, ed. Richard A. Pierce, pp. 93–99. Kingston, ON: Limestone Press.

Iverson, Sara J., Alan M. Springer, and James Bodkin. 2007. Marine Mammals. In *Long-term Ecological Change in the Northern Gulf of Alaska*, ed. Robert B. Spies, pp. 114–135. Amsterdam: Elsevier.

Jackson, Louise M. 1991. Interethnic Contact and Nineteenth Century British Ceramic Distribution. *Canadian Journal of Archaeology / Journal Canadien d'Archéology* 15:129–142.

Jansen, John K., John L. Bengtson, Peter L. Boveng, Shawn P. Dahle, and Jay Ver Hoef. 2006. *Disturbance of Harbor Seals by Cruise Ships in Disenchantment Bay: An Investigation at Three Spatial and Temporal Scales*. Seattle: National Marine Mammal Laboratory, Alaska Fisheries Science Center.

Jansen, John K., Peter L. Boveng, Jay M. Ver Hoef, Shawn P. Dahle, and John L. Bengtson. 2014. Natural and Human Effects on Harbor Seal Abundance and Spatial Distribution in an Alaskan Glacial Fjord. *Marine Mammal Science* 31(1):66–89. https://doi.org/10.1111/mms.12140

Johnson, Albin. 2014. *Seventeen Years in Alaska: A Depiction of Life among the Indians of Yakutat*, ed., trans. Mary Ehrlander. Fairbanks: University of Alaska Press.

Jones, Olive R., and Catherine Sullivan. 1989. *The Parks Canada Glass Glossary for the Description of Containers, Tableware, Closures, and Flat Glass*. Rev. ed.. Ottawa: National Historic Parks and Sites, Canadian Parks Service, Environment Canada.

Jordan, Richard H., and Richard A. Knecht.1988. Archaeological Research on Western Kodiak Island, Alaska: The Development of Koniag Culture. In *The Late Prehistoric Development of Alaska's Native People*, ed. Robert D. Shaw, Roger K. Harritt, and Don. E. Dumond, pp. 225–236. Alaska Anthropological Association Monograph Series No. 4. Anchorage: Alaska Anthropological Association.

Keeley, Annika T. H., Paul Beier, and Jeff S. Jenness. 2021. Connectivity Metrics for Conservation Planning and Monitoring. *Conservation Biology* 255:1–14. https://doi.org/10.1016/j.biocon.2021.109008

Ketz, James A. 1983. *Paxson Lake: Two Nineteenth Century Ahtna Sites in the Copper River Basin, Alaska*. Anthropology and Historic Preservation, Cooperative Park Studies Unit, Occasional Paper No. 33. Fairbanks: University of Alaska.

Ketz, James A., and Katherine L. Arndt. 2010. *Calendar of the Russian-American Company and the Alaska-Commercial Company Documents Relating to Nuchek, Alaska (1818–1905)*. Anchorage: Chugach Alaska Corporation.

Kirkland, K. D. 2007. *America's Premier Gunmakers: Winchester*. East Bridgewater, Mass.: World Publications Group JG Press.

Knecht, Richard A. 1995. The Late Prehistory of the Alutiiq People: Culture Change on the Kodiak Archipelago from 1200–1750 A.D. PhD diss., Department of Anthropology, Bryn Mawr College, Bryn Mawr, Penn.

Kováčik, Peter. 2017. *Charcoal identification and AMS radiocarbon age determination of samples from Spoon Lake 3 (YAK-076) and Knight Island North Point (YAK-205), Yakutat Bay, Alaska*. Golden Colo.: PaleoResearch Institute.

Kováčik, Peter, and Linda Scott Cummings. 2015. *Charcoal Identification and AMS Radiocarbon Age Determination, Site YAK-00007, Yakutat Bay, Alaska*. Golden, Colo.: PaleoResearch Institute.

Krause, Aurel. 1956. *The Tlingit Indians: Results of a Trip to the Northwest Coast and the Bering Straits*. Trans. Erna Gunther. Seattle: American Ethnological Society and the University of Washington Press.

Krupnik, Igor, Rachel Mason, and Tonia W. Horton, eds. 2004. *Northern Ethnographic Landscapes: Perspectives from Circumpolar Nations*. Washington, D.C.: Arctic Studies Center, National Museum of Natural History, Smithsonian Institution, in collaboration with the National Park Service.

Kruse, Gordon H., and Alan M. Springer. 2007. Marine Mammal Harvest and Fishing. In *Long-Term Ecological Change in the Northern Gulf of Alaska*, ed. Robert B. Spies, pp. 192–219. Amsterdam: Elsevier.

Kylafis, G., and M. Loreau. 2011. Ecological and Evolutionary Consequences of Niche Construction for its Agent. *Ecology Letters* 14:1072–1081. https://doi.org/10.1111/j.1461-0248.2008.01220.x

Laland, Kevin N., and Michael J. O'Brien. 2010. Niche Construction Theory and Archaeology. *Journal of Archaeological Method and Theory* 17 (4):303–322. https://doi.org/10.1007/s10816-010-9096-6

Langdon, Steve J. 2019. Spiritual Relations, Moral Obligations, and Existential Continuity: The Structure and Transmission of Tlingit Principles of Sustainable Wisdom. In *Indigenous Sustainable Wisdom: First Nation Know-How for Global Flourishing*, ed. Darcia Narvaez, Four Arrows (Don Trent Jacobs), Eugene Halton, Brian C. Collier, and Georges Enderle, pp. 153–182. New York: Peter Lang Verlag.

Larrance, J. D., D. A. Tennant, A. J. Chester, and P. A. Ruffio. 1977. Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska and Lower Cook Inlet: Final Report. Research Unit 425. *Environmental Assessment of the Alaskan Outer Continental Shelf, Annual Reports of Principal Investigators for the Year Ending March 1977* 10:1–136.

Larsen, Christopher F., Roman J. Motyka, Jeffrey T. Freymuller, Keith A. Echelmeyer, and Erik R. Ivins. 2005. Rapid Viscoelastic Uplift in Southeast Alaska Caused by Post-Little Ice Age Glacial Retreat. *Earth and Planetary Science Letters* 237:548–560. https://doi.org/10.1016/j.epsl.2005.06.032

Lee, Molly. 1996. Context and Contact: The History and Activities of the Alaska Commercial Company, 1867–1900. In *Catalogue Raisonné of the Alaska Commercial Company Collection: Phoebe Apperson Hearst Museum of Anthropology*, ed. Nelson H. H. Graburn, Molly Lee, and Jean-Loup Rousselot, pp. 19–38. Berkeley: University of California Press.

Lepofsky, Dana, Chelsey Geralda Armstrong, Spencer Greening, Julia Jackley, Jennifer Carpenter, Brenda Guernsey, Darcy Mathews, and Nancy J. Turner. 2019. Historical Ecology of Cultural Keystone Places of the Northwest Coast. *American Anthropologist* 119(3):448–463.

Lewontin, Richard C. 1983. Gene, Organism and Environment. In *Evolution from Molecules to Men*, ed. D. S. Bendall, pp. 273–285. Cambridge, U.K.: Cambridge University Press.

Lidicker, William Z., Jr. 2008. Levels of Organization in Biology: On the Nature and Nomenclature of Ecology's Fourth Level. *Biology Review* 83:71–78. https://doi.org/10.1111/j.1469-185X.2007.00032.x

Lightfoot, Kent G., Rob Q. Cuthrell, Chuck J. Striplen, and Mark G. Hylkema. 2013. Rethinking the Study of Landscape Management Practices among Hunter–Gatherers in North America. *American Antiquity* 78(2):285–301. https://doi.org/10.7183/0002-7316.78.2.285

Litwin, Thomas S., ed. 2005. *The Harriman Expedition Retraced: A Century of Change, 1899–2001*. New Brunswick, N.J.: Rutgers University Press.

Litzow, Michael A., and Franz J. Mueter. 2014. Assessing the Ecological Importance of Climate Regime Shifts: An Approach from the North Pacific Ocean. *Progress in Oceanography* 120:110–119. https://doi.org/10.1016/j.pocean.2013.08.003

London, Josh M., Kymberly M. Yano, Erin L. Richmond, David E. Withrow, Shawn P. Dahle, John K. Jansen, Heather L. Ziel, Gavin M. Brady, and Peter L. Boveng. 2015. Observed Haul-Out Locations for Harbor Seals in Coastal Alaska. Seattle: National Oceanic and Atmospheric Administration, Alaska Fisheries Science Center. https://noaa.maps.arcgis.com/home/webmap/viewer.html?layers=2c6ca3e595024d3990127bfe061d7ed3. Metadata at https://www.fisheries.noaa.gov/inport/item/26760

Lullfitz, Alison, Joe Dortch, Stephen D. Hopper, Carol Pettersen, Ron (Doc) Reynolds, and David Guilfoyle. 2017. Human Niche Construction: Noongar Evidence in Pre-Colonial Southwestern Australia. *Conservation and Society* 15(2):201–216. https://doi.org/10.4103/cs.cs_16_75

Lydersen, Christian, Philipp Assmy, Stig Falk-Petersen, Jack Kohler, Kit M. Kovacs, Marit Reigstad, Harald Steen, Hallvard Strøm, Arild Sundfjord, Øystein Varpe, Waldek Walczowski, Jan Marcin Weslawski, and Marek Zajaczkowski. 2014. The Importance of Tidewater Glaciers for Marine Mammals and Seabirds in Svalbard, Norway. *Journal of Marine Systems* 129:452–471. https://doi.org/10.1016/j.jmarsys.2013.09.006

Lyman, R. L. 1987. On the Analysis of Vertebrate Mortality Profiles: Sample Size, Mortality Type, and Hunting Pressure. *American Antiquity* 52(1):125–142.

Maio, Christopher V., Aron L. Crowell, Richard M. Sullivan, Richard M. Buzard, Matthew A. Whitley, Reyce C. Bogardus, and Cary W. de Wit. 2019. Examining Coastal Dynamics and Archaeological Site Evidence at a Drowned Cirque Basin Influenced by Earthquakes and Little Ice Age Glaciation. *Journal of Coastal Research* 35(4):814–834. https://doi.org/10.2112/JCOASTRES-D-18-00074.1

Mann, Daniel H., and Thomas L. Hamilton. 1995. Late Pleistocene and Holocene Paleoenvironments of the North Pacific Coast. *Quaternary Science Reviews* 14:449–471. https://doi.org/10.1016/0277-3791(95)00016-I

Mann, Daniel H., Thomas D. Hamilton, Aron L. Crowell, and Bruce P. Finney. 1998. Climatic Changes, Sea-Level Changes, and Geological Disturbances in the Gulf of Alaska Region during the Holocene. *Arctic Anthropology* 35(1):112–131.

Mann, Daniel H., and Gregory P. Streveler. 2008. Post-Glacial Relative Sea Level, Isostasy, and Glacial History in Icy Strait, Southeast Alaska, USA. *Quaternary Research* 69:210–216.

Mann, M. E., and P. D. Jones. 2003. Global Surface Temperatures over the Past Two Millennia. *Geophysical Research Letters* 30:1820–1823. https://doi.org/10.1016/j.yqres.2007.12.005

Marsden, Susan. 2001. Defending the Mouth of the Skeena: Perspectives on Tsimshian Tlingit Relations. In *Perspectives on Northern Northwest Coast Prehistory*, ed. Jerome S. Cybulski, pp. 61–106. Mercury Series Paper 160. Hull, QC: Canadian Museum of Civilization, Archaeological Survey of Canada. https://doi.org/10.2307/j.ctt22zmcv8.8

Martindale, Andrew. 2006. Methodological Issues in the Use of Tsimshian Oral Traditions (*Adawx*) in Archaeology. *Canadian Journal of Archaeology* 30:158–192.

Maschner, Herbert D. G., Matthew W. Betts, K. L. Reedy-Maschner, and A. W. Trites. 2008. A 4500-Year Time Series of Pacific Cod (*Gadus Microcephalus*) Abundance: Archaeology, Oceanic Regime Shifts, and Sustainable Fisheries. *Fisheries Bulletin* 106:386–394.

Mathews, J. A. 1992. *The Ecology of Recently Deglaciated Terrain*. Cambridge, U.K.: Cambridge University Press.

Matson, R. G., and Gary Coupland. 1995. *The Prehistory of the Northwest Coast*. San Diego: Academic Press.

Mayo, Lawrence R. 1988. Advance of Hubbard Glacier and Closure of Russell Fiord, Alaska—Environmental Effects and Hazards in the Yakutat area. In *Geologic Studies in Alaska by the U.S. Geological Survey during 1987*, ed. J. P. Galloway and T. D. Hamilton. *U.S. Geological Survey Circular* 1016:4–16.

Mayo, Lawrence R. 1989. Advance of Hubbard Glacier and 1986 Outburst of Russell Fiord, Alaska, U.S.A. *Annals of Glaciology* 13:189–194. https://doi.org/10.3189/S0260305500007874

McMillan, Alan D., and Ian Hutchinson. 2002. When the Mountain Dwarfs Danced: Aboriginal Traditions of Paleoseismic Events along the Cascadia Subduction Zone of Western North America. *Ethnohistory* 49:41–68. https://doi.org/10.1215/00141801-49-1-41

Meldgaard, Morten. 2004. *Ancient Harp Seal Hunters of Disko Bay: Subsistence and Settlement at the Saqqaq Culture Site Qeqertasussuk (2400–1400 BC), West Greenland*. Meddelelser om Grønland. Man and Society 30. Copenhagen: Museum Tusculanum.

Mills, David D., and Ann S. Firman. 1986. *Fish and Wildlife Use in Yakutat Alaska, Contemporary Patterns and Changes*. Technical Paper 131. Douglas, Alas.: Alaska Department of Fish and Game, Division of Subsistence.

Mills, Robin Owen. 1994. Radiocarbon Calibration of Archaeological Dates from the Central Gulf of Alaska. *Arctic Anthropology* 31(1):126–149.

Milner, Alexander M., Christopher L. Fastie, F. Stuart Chapin III, Daniel R. Engstrom, and Lewis C. Sharman. 2007. Interactions and Linkages among Ecosystems during Landscape Evolution. *BioScience* 57(3):237–247. https://doi.org/10.1641/B570307

Milner, Alexander M., E. E. Knudsen, C. Soiseth, A. L. Roberston, D. Schell, I. T. Phillips, and K. Magnusson. 2000. Colonization and Development of Stream Communities across a 200-year Gradient in Glacier Bay National Park, Alaska. *Canadian Journal of Fisheries and Aquatic Sciences* 57:2319–2335. https://doi.org/10.1139/f00-212

Milner, Alexander M., and Geoffrey E. Petts. 1994. Glacial Rivers: Physical Habitat and Ecology. *Freshwater Biology* 32:295–307. https://doi.org/10.1111/j.1365-2427.1994.tb01127.x

Misarti, Nicole, Bruce Finney, Herbert Maschner, and Matthew J. Wooller. 2009. Changes in Northeast Pacific Marine Ecosystems of the Last 4500 Years: Evidence from Stable Isotope Analysis of Bone Collagen from Archaeological Middens. *The Holocene* 19(8):1139–1151. https://doi.org/10.1177/0959683609345075

Moberg, A., D. M. Sonechkin, K. Holmgren, N. M. Datsenko, and W. Karlén. 2005. Highly Variable Northern Hemisphere Temperatures Reconstructed from Low- And High-Resolution Proxy Data. *Nature* 433:613–617. https://doi.org/10.1038/nature03265

Mobley, Charles M., and Morley Eldridge. 1992. Culturally Modified Trees in the Pacific Northwest. *Arctic Anthropology* 29(2):91–110.

Molnia, Bruce F. 1986. Glacial History of the Northeastern Gulf of Alaska—A Synthesis. In *Glaciation in Alaska: The Geological Record*, ed. Thomas D. Hamilton, Katherine M. Reed, and Robert M. Thorson, pp. 219–235. Anchorage: Alaska Geological Society.

Monteith, Daniel, Cathy Connor, Gregory P. Streveler, and Wayne Howell. 2007. Geology and Oral History—Complementary Views of a Former Glacier Bay Landscape. In *Proceedings of the Fourth Glacier Bay Science Symposium, October 26–28, 2004, Juneau, Alaska*, ed. John F. Piatt and Scott M. Gende, pp. 50–53. Scientific Investigations Report 2007-5047. Reston, Va.: U.S. Geological Survey.

Moodie, D. Wayne, Alan J. W. Catchpole, and Kerry Abel. 1992. Northern Athapaskan Oral Traditions and the White River Volcano. *Ethnohistory* 39:148–170. https://doi.org/10.2307/482391

Moss, Madonna. 1998. Northern Northwest Coast Regional Overview. *Arctic Anthropology* 35(1):88–111.

Moss, Madonna. 2004. The Status of Archaeology and Archaeological Practice in Southeast Alaska in Relation to the Larger Northwest Coast. *Arctic Anthropology* 41(2):177–198. https://doi.org/10.1353/arc.2011.0001

Moss, Madonna, and Jon M. Erlandson. 1992. Forts, Refuge Rocks, and Defensive Sites: The Antiquity of Warfare along the North Pacific Coast of North America. *Arctic Anthropology* 29(2):73–90.

Munsell Color. n.d. *Munsell Book of Color: Glossy Collection*. New Windsor, N.Y.: Munsell Color.

Murton, Thomas O. 1965. The Administration of Criminal Justice in Alaska, 1867–1902. Master's thesis, School of Criminology, University of California, Berkeley.

Muto, Marcia M., Van T. Helker, Robyn P. Angliss, Brian A. Allen, Peter L. Boveng, Jeffrey M. Breiwick, Michael F. Cameron, Phil J. Clapham, Shawn P. Dahle, Marilyn E. Dahlheim, Brian S. Fadely, Megan C. Ferguson, Lowell W. Fritz, Roderick C. Hobbs, Yulia V. Ivashchenko, Amy S. Kennedy, Josh M. London, Sally A. Mizroch, Rolf R. Ream, Erin L. Richmond, Kim E. W. Shelden, Rodney G. Towell, Paul R. Wade, Janice M. Waite, and Alexandre R. Zerbini. 2016. *Alaska Marine Mammal Stock Assessments, 2015*. NOAA Technical Memorandum NMFS-AFSC-323. Seattle: National Oceanic and Atmospheric Administration, National Marine Mammal Laboratory, Alaska Fisheries Science Center.

Naiman, Robert J., Robert E. Bilby, Daniel E. Schindler, and James M. Helfield. 2002. Pacific Salmon, Nutrients, and Dynamics of Freshwater and Riparian Ecosystems. *Ecosystems* 5:399–417. https://doi.org/10.1007/s10021-001-0083-3

National Oceanographic and Atmospheric Administration (NOAA). 1997. Changes in Land Cover in the Yakutat Bay, Alaska Region: 1986–1993. C-CAP Coastal Change Analysis Program. Electronic resource (CD-ROM GIS data). Charleston, S.C.: NOAA Coastal Services Center.

National Oceanographic and Atmospheric Administration (NOAA). 2006. Southeast Alaska Environmental Sensitivity Index (ESI). NOAA Office of Response and Restoration. Sensitive Biological Resources Map and Index. https://response.restoration.noaa.gov/esi_downloading#Alaska (accessed 14 January 2020).

National Science Foundation, National Park Service, U.S. Forest Service, Alaska State Historic Preservation Officer, Sealaska Corporation, and Yakutat Tlingit Tribe. 2014. Memorandum of Agreement Regarding Data Recovery in the Yakutat Bay Area, Alaska. Washington, D.C.: National Science Foundation.

Niblack, Albert P. 1890. The Coast Indians of Southern Alaska and Northern British Columbia. In *Annual Report of the Board of Regents of the Smithsonian Institution for the Year Ending June 30, 1888*. Washington, D.C.: U.S. Government Printing Office. https://doi.org/10.5962/bhl.title.35856

Noacki, Greg, Page Spencer, Terry Brock, Michael Fleming, and Torre Jorgenson. 2001. *Ecoregions of Alaska and Neighboring Territory*. U.S. Geological Survey Open-File Report 02-297 (map).

O'Corry-Crowe, Gregory M., Karen K. Mertien, and Barbara L. Taylor. 2003. The Analysis of Population Genetic Structure in Alaska Harbor Seals, *Phoca vitulina*, as a Framework for the Identification of Management Stocks. Administrative Report LJ-03-08. La Jolla, Calif.: National Marine Fisheries Service, Southwest Fisheries Science Center.

Odling-Smee, John, Douglas H. Erwin, Eric P. Palkovacs, Marcus W. Feldman, and Kevin N. Laland. 2013. Niche Construction Theory: A Practical Guide for Ecologists. *Quarterly Review of Biology* 88(1):3–28. https://doi.org/10.1086/669266

Odling-Smee, John, Kevin Laland, and Marcus Feldman. 2003. *Niche Construction*. Monographs in Population Biology No. 37. Princeton, N.J.: Princeton University Press.

Oh, Leslie Hsu. 2014. Sít' Tlein: The Story of Hubbard Glacier's Spirit and Indigenous Knowledge of Tlingit Seal-Hunting Practices. *First Alaskans* (Summer 2014):32–27.

Olson, Ronald L. 1967. *Social Structure and Social Life of the Tlingit in Alaska*. Berkeley: University of California Press.

Olson, Wallace. 2002. *Through Spanish Eyes: The Spanish Voyages to Alaska, 1774–1792*. Auke Bay, Alas.: Heritage Research.

O'Neel, Shad, Eran Hood, Allison L. Bidlack, Sean W. Fleming, Mayumi L. Arimitsu, Anthony Arendt, Evan Burgess, Christopher J. Sergeant, Anne H. Beaudreau, Kristin Timm, Gregory D. Hayward, Joel H. Reynolds, and Sanjay Pyare. 2015. Icefield-to-Ocean Linkages across the Northern Pacific Coastal Temperate Rainforest Ecosystem. *BioScience* 65(5):499–512. https://doi.org/10.1093/biosci/biv027

O'Neill, Sean. 2014. Exploring Hunter–Gatherer–Fisher Complexity on the Pacific Coast of North America. In *The Oxford Handbook of the Archaeology and Anthropology of Hunter–Gatherers*, ed. Vicki Cummings, Peter Jordan, and Mark Zvelebil, pp. 991–1009. Oxford, U.K.: Oxford University Press.

Oetelaar, Gerald A., and D. Joy Oetelaar. 2007. The New Ecology and Landscape Archaeology: Incorporating the Anthropogenic Factor in Models of Settlement Systems in the Canadian Prairie Ecozone. *Canadian Journal of Archaeology / Journal Canadien d'Archéologie,* 31(3):65–92.

Oswalt, Wendell. 1980. *Kolmakovskiy Redoubt: The Ethnoarchaeology of a Russian Fort in Alaska*. Monumenta Archaeologica 8. Los Angeles: Institute of Archaeology, University of California.

Paige, Amy W. 1993. History of the Hair Seal Bounty and Predator Control Programs in Alaska. In *The Subsistence Harvest of Harbor Seal and Sea Lion by Alaska Natives in 1992*, ed. Robert J. Wolfe and Craig Mishler. Addendum B1–B8. Technical Paper No. 229, Part 1. Juneau: Alaska Department of Fish and Game, Subsistence Division.

Petroff, Ivan. 1884. *Report on the Population, Industries, and Resources of Alaska*. Department of the Interior, Census Office. Washington, D.C.: U.S. Government Printing Office.

Pitcher, Kenneth W., and Donald G. Calkins. 1979. *Biology of the Harbor Seal* (Phoca vitulina richardsi*), in the Gulf of Alaska*. Washington, D.C.: U.S. Department of Commerce, National Oceanographic and Atmospheric Administration.

Plafker, George, and Don J. Miller. 1958. Glacial Features and Surficial Deposits of the Malaspina District, Alaska. *U.S. Geological Survey Miscellaneous Geological Investigations* 271. https://doi.org/10.3133/ofr5791

Porter, John Biddle. 1911. *The Military Laws of the United States*. Washington, D.C.: U.S. Government Printing Office.

Post, Austin. 1975. Preliminary Hydrography and Historical Terminal Changes of Columbia Glacier, Alaska. *U.S. Geological Survey Hydrologic Investigations Atlas* HA-559. https://doi.org/10.3133/ofr75491

Pratt, Kenneth, and Scott Heyes, eds. 2022. *Memory and Landscape: Indigenous Responses to a Changing North*. Edmonton, AB: Athabasca University Press. https://doi.org/10.15215/aupress/9781771993159.01

Proue, Molly, Justin M. Hays, Jeffrey T. Rasic, and Joshua D. Reuther. 2011. The Hayfield Site: A New Look at the 1949 Collection. *Alaska Journal of Anthropology* 9(1):97–114.

Rainey, Froelich. 1939. Archaeology in Central Alaska. *Anthropological Papers of the American Museum of Natural History* 36(55):351–405.

Ramos, Judith (Daxootsú). 2013. A Comparison of Tlingit, Eyak, and Sugpiat Place Names to Hubbard Glacier Recession. Unpublished paper, Indigenous Studies Program, University of Alaska Fairbanks. Copy in possession of author.

Ramos, Judith (Daxootsú). 2020. Tlingit Hunting along the Edge: Ice Floe Harbor Seal Hunting in Yakutat Bay, Alaska. In *Arctic Crashes: People and Animals in the Changing North*, ed. Igor Krupnik and Aron L. Crowell, pp. 139–151. Washington, D.C: Smithsonian Institution Scholarly Press.

Ramos, Judith, and Rachel Mason. 2004. *Traditional Ecological Knowledge of Tlingit People Concerning the Sockeye Salmon Fishery in the Dry Bay Area*. Yakutat, Alas.: Yakutat Tlingit Tribe, National Park Service, and Wrangell–St. Elias National Park and Preserve. Yakutat.

Ramos, Judith, and Robert Schroder. 2001. Yakutat Subsistence Survey. Unpublished manuscript. Yakutat, Alas.: Yakutat Tlingit Tribe.

Reide, Felix. 2011. Adaptation and Niche Construction in Human Prehistory: A Case Study from the Southern Scandinavian Late Glacial. *Philosophical Transactions: Biological Sciences* 366(1566):793–808. https://doi.org/10.1098/rstb.2010.0266

Renner, Martin, Mayumi L. Arimitsu, and John F. Piatt. 2012. Structure of Marine Predator and Prey Communities along Environmental Gradients in a Glaciated Fjord. *Canadian Journal of Fisheries and Aquatic Sciences* 69:2029–2045. https://doi.org/10.1139/f2012-117

Rick, Torben C., Todd J. Braje, and Robert L. DeLong. 2011. People, Pinnipeds, and Sea Otters of the North Pacific. In *Human Impacts on Seals, Sea Lions, and Sea Otters: Integrating Archaeology and Ecology in the Northeast Pacific*, ed. Todd G. Braje and Torben C. Rick, pp. 1–18. Berkeley: University of California Press. https://doi.org/10.1525/california/9780520267268.003.0001

Rowley-Conwy, Peter, and Robert Layton. 2011. Foraging and Farming as Niche Construction: Stable and Unstable Adaptations. *Philosophical Transactions: Biological Sciences* 366(1566):849–862. https://doi.org/10.1098/rstb.2010.0307

Russell, Israel C. 1891. An Expedition to Mount St. Elias, Alaska. *National Geographic Magazine* 3:53–204.

Sambrotto, Raymond N., and Carl J. Lorenzen. 1986. Phytoplankton and Primary Production. In *The Gulf of Alaska: Physical and Biological Resources*, ed. Donald W. Hood and Steven T. Zimmerman, pp. 249–284. National Oceanic and Atmospheric Administration, Ocean Assessments Division, Alaska Office. Washington, D.C: U.S. Government Printing Office.

Schoen, Sarah K., Michelle L. Kissling, Nicholas R. Hatch, Colin S. Shanley, Shawn W. Stephensen, John K. Jansen, Nathaniel T. Catterson, and Susan A. Oehlers. 2013. Marine Birds of Yakutat Bay, Alaska: Evaluating Summer Distribution, Abundance, and Threats at Sea. *Marine Ornithology* 41:55–61.

Sealaska Corporation. 1975. *Native Cemetery and Historic Sites of Southeast Alaska*. Preliminary Report. Seattle: Wiley and Ham.

Sealaska Corporation. 1982. *Sealaska Corporation Resource Atlas*. Volume 2: *Yakutat, Hoonah, Angoon, Kake*. Juneau: Sealaska Natural Resources Department.

Seton Karr, Haywood W. 1887. *Shores and Alps of Alaska*. London: Sampson, Low, Marston, Searle, and Rivington.

Sharp, Robert P. 1958. The Latest Major Advance of Malaspina Glacier, Alaska. *Geographical Review* 48(1):16–26. https://doi.org/10.2307/211699

Shelikhov, Grigorii I. 1981. *A Voyage to America 1783–1786*. Trans. Marina Ramsay; ed. with introduction by Richard A. Pierce. Alaska History No. 19. Kingston, ON: Limestone Press.

Shepard, Michael E. 1995. *Plant Community Ecology and Classification of the Yakutat Foreland, Alaska*. Anchorage: Alaska Natural Heritage Program, Environment and Natural Resources Institute.

Shinkwin, Anne D. 1979. *Dakah De'nin's Village and the Dixthada Site: A Contribution to Northern Athapaskan Prehistory*. Archaeological Survey of Canada Paper No. 91, National Museum of Man Mercury Series. Ottawa: National Museums of Canada. https://doi.org/10.2307/j.ctv16rfs

Sill, Lauren A., Joshua T. Ream, and Margaret Cunningham. 2017. *Harvest and Use of Wild Resources in Yakutat, Alaska, 2015*. Technical Paper 432. Anchorage: Alaska Department of Fish and Game, Division of Subsistence.

Skidmore, Eliza Ruhamah. 1893. The First District of Alaska from Prince Frederick Sound to Yakutat Bay. In *Report on Population and Resources at the Eleventh Census: 1890*, pp. 43–53. U.S. Department of the Interior, Census Office. Washington, D.C.: U.S. Government Printing Office.

Smith, Bruce D. 2007. Niche Construction and the Behavioral Context of Plant and Animal Domestication. *Evolutionary Anthropology* 16:188–199. https://doi.org/10.1002/evan.20135

Smith, Bruce D. 2011. General Patterns of Niche Construction and the Management of 'Wild' Plant and Animal Resources by Small-Scale Pre-Industrial Societies. *Philosophical Transactions: Biological Sciences* 366(1566):836–848. https://doi.org/10.1098/rstb.2010.0253

Smithsonian Institution. 2009. Research Involving Human Subjects. Smithsonian Directive 606 (June 30, 2009). Washington, D.C.: Smithsonian Institution.

Smithsonian Institution Human Subjects Institutional Review Board. 2011. Determination Regarding Oral History Projects. Memorandum to Aron Crowell re: Yakutat Tlingit Sealing Camps: Investigating the Relationships among Language, Indigenous Knowledge, and Glacial Movement, Protocol Number HS11014. Washington, D.C.: Smithsonian Institution.

Spengler, Robert N. 2014. Niche Dwelling vs. Niche Construction: Landscape Modification in the Bronze and Iron Ages of Central Asia. *Human Ecology* 42:813–821. https://doi.org/10.1007/s10745-014-9697-x

Spies, R. B., T. Cooney, A. M. Springer, T. Weingartner, and G. H. Kruse. 2007. Long-Term Changes in the GOA: Properties and Causes. In *Long-Term Ecological Change in the Northern Gulf of Alaska*, ed. Robert B. Spies, pp. 521–560. Amsterdam: Elsevier. https://doi.org/10.1016/B978-044452960-2/50007-2

Spies, Robert P., ed. 2007. *Long-Term Ecological Change in the Northern Gulf of Alaska*. Amsterdam: Elsevier.

Springer, A. M., J. A. Estes, G. B. Van Vliet, T. M. Williams, D. F. Doak, E. M. Danner, K. A. Forney, and B. Pfister. 2003. Sequential Megafaunal Collapse in the North Pacific Ocean: An Ongoing Legacy of Industrial Whaling? *Proceedings of the National Academy of Sciences of the USA* 100:12223–12228. https://doi.org/10.1073/pnas.1635156100

Springer, Alan M., Sara J. Iverson, and James L. Bodkin. 2007. Marine Mammal Harvest and Fishing. In *Long-Term Ecological Change in the Northern Gulf of Alaska*, ed. Robert B. Spies, pp. 352–378. Amsterdam: Elsevier.

Stearns, L. A., G. S. Hamilton, C. J. van der Veen. D. C. Finnegan, S. O'Neel, J. B. Scheick, and D. E. Lawson. 2015. Glaciological and Marine Geological Controls on Terminus Dynamics of Hubbard Glacier, Southeast Alaska. *Journal of Geophysical Research: Earth Surface* 120:1065–1081. https://doi.org/10.1002/2014JF003341

Stempniewicz, Lech, Michael Goc, Dorota Kidawa, Jacek Urbanski, Magdalena Hadwiczak, and Adrian Zwolicki. 2017. Marine Birds and Mammals Foraging in the Rapidly Deglaciating Arctic Fjord—Numbers, Distribution and Habitat Preferences. *Climatic Change* 140:533–548. https://doi.org/10.1007/s10584-016-1853-4

Stephensen, Shawn W., and Brad A. Andres. 2001. Marine Bird and Mammal Survey of Yakutat Bay, Disenchantment Bay, Russell Fiord, and Nunatak Fiord, Alaska. Anchorage: U.S. Fish and Wildlife Service, Nongame Migratory Bird Management.

Storå, Jan. 2000. Skeletal Development in the Grey Seal *Halichoerus grypus*, the Ringed Seal *Phoca hispida botnica*, the Harbour Seal *Phoca vitulina vitulina*, and the Harp Seal *Phoca groenlandica*. Epiphyseal Fusion and Life History. *Archaeozoologia* 11:199–222.

Strobridge, Truman R., and Dennis L. Noble. 1999. *Alaska and the U.S. Revenue Cutter Service 1867–1915*. Annapolis, Md.: Naval Institute Press.

Swanton, John R. 1909. *Tlingit Myths and Texts*. Washington, D.C.: U.S. Government Printing Office.

Tarr, Ralph S. 1909. *The Yakutat Bay Region, Alaska. Part 1: Physiography and Glacial Geology*. U.S. Geological Survey Professional Paper 64:11–144. Washington, D.C. U.S. Government Printing Office. https://doi.org/10.3133/pp64

Tarr, Ralph S., and Lawrence Martin. 1912. *The Earthquakes at Yakutat Bay, Alaska in September 1899*. Washington, D.C.: U.S. Government Printing Office.

Tarr, Ralph S., and Lawrence Martin. 1914. *Alaskan Glacier Studies of the National Geographic Society in the Yakutat Bay, Prince William Sound, and Lower Copper River Regions*. Washington, D.C.: National Geographic Society.

Teben'kov, Mikhail D. 1981. *Atlas of the Northwest Coasts of America from Bering Strait and the Aleutian Islands with Several Sheets on the Northeast Coast of Asia*. Compiled in 1852; trans., ed. R. A. Pierce. Kingston, ON: Limestone Press.

Thom, Brian. 2003. The Anthropology of Northwest Coast Oral Traditions. *Arctic Anthropology* 40(1):1–28. https://doi.org/10.1353/arc.2011.0035

Thornton, Thomas F. 2008. *Being and Place among the Tlingit*. Seattle: University of Washington Press, and Juneau: Sealaska Heritage Institute.

Thornton, Thomas F., ed. 2012. *Haa Léelk'w Hás Aaní Saax'ú: Our Grandparents' Names on the Land*. Seattle: University of Washington Press, and Juneau: Sealaska Heritage Institute.

Topham, Harold W. 1889. A Visit to the Glaciers of Alaska and Mt. St. Elias. *Proceedings of the Royal Geographical Society and Monthly Record of Geography* 11(7):424–435. https://doi.org/10.2307/1801291

Townsend, Joan. 1980. Ranked Societies of the Alaska Pacific Rim. In *Alaska Native Cultures and History*, ed. Yoshinobu Kotani and William B. Workman, pp. 123–156. Senri Ethnological Studies 4. Osaka: National Museum of Ethnology.

Trabant, Dennis C., Robert M. Krimmel, Keith A. Echelmeyer, Sandra L. Zirnheld, and Daniel H. Elsberg. 2003a. The Slow Advance of a Calving Glacier; Hubbard Glacier, Alaska U.S.A. *Annals of Glaciology* 36:45–50. https://doi.org/10.3189/172756403781816400

Trabant, Dennis C., Rod S. March, and Donald S. Thomas. 2003b. Hubbard Glacier, Alaska: Growing and Advancing in Spite of Global Climate Change and the 1986 and 2002 Russell Lake Outburst Floods. *U.S. Geological Survey Fact Sheet* FS-001-03. https://doi.org/10.3133/fs00103

U.S. Bureau of the Census. 1893. *Report on the Population and Resources of Alaska at the Eleventh Census: 1890*. Washington, D.C.: U.S. Government Printing Office.

U.S. Bureau of the Census. 1901. *Twelfth Census of the United States Taken in the Year 1900*. Washington, D.C.: U.S. Government Printing Office.

U.S. Bureau of the Census. 1913. *Thirteenth Census of the United States Taken in the Year 1910*. Washington, D.C.: U.S. Government Printing Office.

U.S. Bureau of the Census. 1921. *Fourteenth Census of the United States Taken in the Year 1920*. Washington, D.C.: U.S. Government Printing Office.

U.S. Department of the Interior. 1993. Appeal from a Decision of the Alaska State Office, Bureau of Land Management, Rejecting Historical Place Selection Application AA10529. Office of Hearings and Appeals, Interior Board of Land Appeals, Arlington, Va., July 20, 1993.

Urbanski, Jacek Andrzej, Lech Stempniewicz, Jan Marcin Węsławski, Katarzyna Dragańska-Deja, Agnieszka Wochna, Michał Goc, and Lech Iliszko. 2017. Subglacial Discharges Create Fluctuating Foraging Hotspots for Sea Birds in Tidewater Glacier Bays. *Scientific Reports* 7:43999. https://doi.org/10.1038/srep43999

Vansina, Jan. 1985. *Oral Tradition as History*. Madison: University of Wisconsin Press.

VanStone, James W. 1955. Exploring the Copper River Country. *Pacific Northwest Quarterly* 46(4):115–123.

VanStone, James W. 1968. Tikchik Village, A Nineteenth Century Riverine Community in Southwestern Alaska. *Fieldiana: Anthropology* 56(3):213–368. https://doi.org/10.5962/bhl.title.5233

VanStone, James W. 1970. Kijik: An Historic Tanaina Indian Settlement. *Fieldiana: Anthropology* 59:1–202.

Veakis, Emil. 1979. Archaeometric Study of Native Copper in Prehistoric North America. PhD diss., University of Michigan, Ann Arbor.

Veniaminov, Ivan. 1984. *Notes on the Islands of the Unalashka District*. Trans. Lydia T. Black; ed. Richard H. Geoghegan; introduction by Richard A. Pierce. Fairbanks: Elmer E. Rasmuson Library, University of Alaska, and Kingston, ON: Limestone Press.

Wagner, Henry R. 1936. Journal of Tomas de Suria of His Voyage with Malaspina to the Northwest Coast of America in 1791. *Pacific Historical Review* 5(3):234–276. https://doi.org/10.2307/3634028

Welschmeyer, N. A., S. Strom, R. Goericke, G. DiTullio, M. Belvin, and W. Petersen. 1993. Primary Production in the Subarctic Pacific Ocean: Project SUPER. *Progress in Oceanography* 32:1267–1278. https://doi.org/10.1016/0079-6611(93)90010-B

Whitely, Peter M. 2002. Archaeology and Oral Tradition: The Scientific Importance of Dialogue. *American Antiquity* 67(3):405–415. https://doi.org/10.2307/1593819

Wiles, Gregory C., David J. Barclay, Parker E. Calkin, and Thomas V. Lowell. 2008. Century to Millennial-Scale Temperature Variations for the Last Two Thousand Years Indicated from Glacial Geologic Records of Southern Alaska. *Global and Planetary Change* 60:115–125. https://doi.org/10.1016/j.gloplacha.2006.07.036

Wiles, Gregory C., Roseanne D. D'Arrigo, David J. Barclay, Rob S. Wilson, Stephanie K. Jarvis, Lauren Vargo, and David Frank. 2014. Surface Air Temperature Variability Reconstructed with Tree Rings for the Gulf of Alaska over the Past 1,200 years. *The Holocene* 24(2):198–208.

Wiles, Gregory C., Roseanne D. D'Arrigo, and Gordon C. Jacoby. 1996. Temperature Changes along the Gulf of Alaska and the Pacific Northwest Coast Modeled from Coastal Tree Rings. *Canadian Journal of Forestry Research* 26:474–481. https://doi.org/10.1016/j.gloplacha.2006.07.036

Winkler, Gary R. 2000. *A Geologic Guide to Wrangell–St. Elias National Park and Preserve: A Tectonic Collage of Northbound Terranes*. U.S. Geological Survey Professional Paper 1616. Denver, Colo: U.S. Geological Survey Information Services. https://doi.org/10.3133/pp1616

Wolfe, Robert J., James A. Fall, and Monica Riedel. 2009. *The Subsistence Harvest of Harbor Seals and Sea Lions by Alaska Natives in 2008*. Technical Paper No. 347. Juneau: Alaska Department of Fish and Game, Division of Subsistence, and the Alaska Native Harbor Seal Commission.

Womble, Jamie N., Grey W. Pendleton, Elizabeth A. Mathews, Gail M. Blundell, Natalie M. Bool, and Scott M. Gende. 2010. Harbor Seal (*Phoca vitulina richardii*) Decline Continues in the Rapidly Changing Landscape of Glacier Bay National Park, Alaska 1992–2008. *Marine Mammal Science* 26(3):686–697. https://doi.org/10.1111/j.1748-7692.2009.00360.x

Workman, William B. 1977. Ahtna Archaeology: A Preliminary Statement. In *Problems in the Prehistory of the North American Subarctic: The Athapaskan Question*, ed. J. W. Helmer, S. VanDyke, and F. J Kense, pp. 22–39. Calgary, AB: Archaeological Association, Department of Archaeology, University of Calgary.

Worl, Rosita. 2010. Tlingit. In *Living Our Cultures, Sharing Our Heritage: The First Peoples of Alaska*, ed. Aron L. Crowell, Rosita Worl, Paul C. Ongtooguk, and Dawn D. Biddison, pp. 200–225. Washington, D.C.: Smithsonian Books.

Yarborough, Michael R., and Linda Finn Yarborough. 1998. Prehistoric Maritime Adaptations of Prince William Sound and the Pacific Coast of the Kenai Peninsula. *Arctic Anthropology* 35(1):132–145.

Yehle, Lynn A. 1979. *Reconnaissance Engineering Geology of the Yakutat Area, Alaska with Emphasis on Evaluation of Earthquake and other Geologic Hazards*. U.S. Geological Survey Professional Paper 1074. Washington, D.C.: U.S. Government Printing Office. https://doi.org/10.3133/pp1074

Zurbechen, Julie M., Sean P. S. Gulick, Maureen A. L. Walton, and John A. Goff. 2015. Imaging Evidence for Hubbard Glacier Advances and Retreats since the Last Glacial Maximum in Yakutat and Disenchantment Bays, Alaska. *Geochemistry, Geophysics, and Geosystems* 16:1962–1974. https://doi.org/10.1002/2015GC005815.

Index