

Will Alaska's Fisheries Regime Prove Resilient? Kenai River Fishery Management as a Model for Adaptive Governance

James E. Powell, School of Arts and Sciences, University of Alaska Southeast, 10601 Horizon Drive, Juneau, AK 99801. E-mail: jepowell@alaska.edu

Mark S. Wipfli, U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit, Institute of Arctic Biology, University of Alaska Fairbanks, Fairbanks, AK

Keith R. Criddle, College of Fisheries and Ocean Sciences, University of Alaska Fairbanks, Juneau, AK

Erik R. Schoen, Alaska Cooperative Fish and Wildlife Research Unit, Institute of Arctic Biology, University of Alaska Fairbanks, Fairbanks, AK



Photo credit: Mark Kelley Photography

INTRODUCTION

Alaska's fisheries regulatory regime, one of the strongest, most science-based fisheries management systems in the world, is often held up as an example of fisheries management "done right" (Worm et al. 2011). Faced with a barrage of oncoming threats, ranging from budget cuts to climate change, will this system prove to be truly resilient? To answer this question, we examined the results of the research pertaining to governance from a larger 5-year social-ecological study of the Alaska Experimental Program to Stimulate Competitive Research's (AK-EPSCoR) *Alaska Adapting to Changing Environments* series (see Schoen et al. 2017).

The Kenai River salmon fishery is arguably the most intense fisheries system in Alaska. It supports world-renowned sport fisheries, Alaska's largest personal-use fishery, and Cook Inlet's largest commercial fishery. To better understand the resilience and adaptability of this social-ecological system, we conducted 42 semi-structured interviews of local elected officials, natural resource managers, and representatives of nongovernmental organizations during the summer of 2015. We used Brunner and Lynch's (2010) three-part adaptive governance concept to evaluate the degree to which Kenai River governance institutions possess the capacity to adapt to changing circumstances. Their indicators of adaptive governance are (1) decentralized decision making with strong social networks among actors with local knowledge and cultural traditions, (2) procedural policy with a polycentric regulatory framework promoting professional ethics, and (3) use of and reliance on science for decision making. Applying these criteria, we found management of the Kenai River fisheries to be illustrative of adaptive governance.

THE KENAI RIVER AS A SOCIAL-ECOLOGICAL SYSTEM

The Kenai River fishery, located approximately 150 road miles (241 km) south of Anchorage, Alaska, is home to one of the top commercial fishery landing ports in the United States. Commercial and sportfishing account for hundreds of jobs and hundreds of millions of dollars of income in the watershed. Evidence of the economic and cultural importance of the Kenai fisheries is readily found throughout the area's communities. Thousands of sport fishers from around the world can be seen standing shoulder to shoulder along the banks of the Kenai River engaged in "combat fishing" during the seasonal salmon runs, and hundreds of sportfishing charters and commercial fishing operations work the area.

Multiple drivers of environmental and social change are impacting the Kenai Peninsula and Kenai River, including changes in temperature and precipitation and variations in salmon populations (Schoen et al. 2017), declines in the economic value of commercial catch, and increasing numbers of tourists. In this study, we use the term "fishery" in a broad sense to include organizations and individuals engaged in fishing in fresh and salt water all across Alaska. The Kenai River fishery comprises a complex network of stakeholders engaged in all of the kinds of fishing done in Alaska, including commercial, personal-use, subsistence, and sport fisheries. Alaskan Native indigenous knowledge and practices have greatly contributed to fisheries practices. Approximately 40 species of resident and anadromous fish live within the waters of the Kenai River and estuary. With an average of 275,000 annual angler-days (one person fishing for any part of the day), the Kenai River is the most heavily sport-fished river in Alaska (ADFG 2015).

EVIDENCE OF ADAPTIVE GOVERNANCE IN KENAI RIVER FISHERY MANAGEMENT

Facing new and sweeping uncertainties as a result of drastically reduced oil revenues and a rapidly changing climate in Alaska, will governmental entities and regulatory processes be able to adapt so as to continue to sustain state fisheries like those supporting the Kenai River economy?

Adaptive governance is a term used to explain the degree to which formal institutions, such as the fisheries and land management agencies and community-based participants involved in agency decision making, possess the ability to adjust to developing circumstances. Other hallmarks of an adaptive governance system include its capacity for learning through iteration, policy experiment, reflection and refinement within a scientifically based regulatory system, and cultural awareness.

The term "governance" differs from "government" in its inclusion of a wide range of institutions, actors, and organizations when producing environmental policy and management outcomes (Chaffin and Gunderson 2016). These hallmarks, taken together with Brunner and Lynch's (2010) criteria, listed above, relate adaptive capacity to two general variables our study found to be integral to governance of the Kenai River fishery: (1) decentralized decision making involving strong social networks of actors with local knowledge, history, and cultural traditions; and (2) a polycentric regulatory framework coordinated by professionals with strong professional ethics and a commitment to intensive science.

A DIVERSE AND DECENTRALIZED DECISION-MAKING MATRIX

Based on archival review, focus groups, and interviews with 47 stakeholders from local, state, federal agencies, nonprofit interest groups, user groups, and local elected officials, we found nearly 50 federal, state, local, and nonprofit groups to be influencing the Kenai River fishery's political, ecological, and social structure (Krupa 2016). A social network analysis of the stakeholders revealed tight intra-network connectivity, which serves as a robust conduit for efficient information transfer. Moreover, the importance of economic and cultural contributions of Kenai fisheries has resulted in a diverse assortment of stakeholders—from scientists to politicians to agency personnel—who possess a high degree of local knowledge about the fishery and who actively engage in its governance. Although not without conflict and very time consuming public processes, on balance, Kenai's diverse and decentralized decision making has proven to be more effective than the centralized command and control structure that dominated fisheries management before statehood.

It has been found that effects of rapid change can be mitigated by integrating local knowledge with fisheries best management practices. Information from subsistence harvesters can be used to adjust raw data to obtain unbiased estimates of the size and demographics of a harvested population (Criddle 2011). Local knowledge can also support adaptive governance by contributing to goal setting and policy making, assisting bureaucrats in gaining a better understanding of specific climate-induced changes and long-time patterns and processes affecting fish and wildlife, and sharing observed effects of climate change on subsistence foods and consequent changes in patterns of resource use (Criddle 2011).

Self-organized fishery user groups and the Kenai River Special Management Area Board represent two more examples of innovations that ensure the involvement of a diversity of users in monitoring the fishery and helping to steer agencies toward sustainable management. Enfranchisement of this

broad, diverse, and decentralized array of stakeholders indicates strong potential for adaptive governance.

Alaska's newspapers routinely report on conflict over commercial and sportfishing allocations (see, e.g., McChesney 2014). We suggest that this intense competition coupled with the uncertainty created by rapid environmental change energizes the social network and perpetuates local knowledge sharing. Identification and awareness alone does not lead to action and adaptation, however. Two paired components—vision/leadership and incentives/transformation—must also be present (Lambin 2005). Some activities that produce the collaboration and conflict include fishery harvest levels, fishery allocation, regulatory compliance, habitat protection, and land use management. The restriction of outboard motor regulations to four-stroke or direct fuel injection two-stroke engines for all boat motors on the Kenai River in 2008 is an example of collaboration among fishers, industry, and regulators (ADNR 2016). Moratoriums that restrict sport or commercial fishing requirements are examples of conflict. An example of leadership mentioned during the focus group discussions concerned the reaffirmation of the 50-foot habitat setback to protect Kenai River riparian areas. Another “leadership and vision” indicator revealed by the focus groups was establishing the innovative Kenai River Center, a facility that co-locates local, state, and federal employees to promote education and provide efficient land use permits and planning.

Governmental agencies responsible for natural resource management on the Central Kenai Peninsula are currently coping with uncertainties and rapid environmental changes

by adapting their day-to-day activities without the benefit of formal training in ecological tipping points, planning, or mandates. Institutional adaptations are diffused and fragmented (Stern 2007). For example, local, state, and federal governments respond to increased flooding, saltwater intrusion, and increased fires on a case-by-case basis. Considering the economic and cultural contribution the Kenai fishery make to the region, a diverse array of stakeholders may be expected to be motivated to learn about and to work to sustain the surrounding social-ecological system, as was found to be true in our study.

HISTORICAL EVENTS LEADING UP TO ALASKA'S POLYCENTRIC APPROACH

Alaska took the time leading up to its inauguration as the nation's 49th state not only to study and borrow from other states' constitutions but to develop its own unique constitutional provisions to ensure its natural resources, including fish, would be sustainably managed for the benefit of all Alaskans. A brief look at the history of fisheries management in Alaska reveals the source of the state's longstanding devotion to the kind of polycentric fisheries regulatory framework used to manage the Kenai River fishery.

Federal/Industry Collusion in Territorial Days

For centuries before Alaska became a territory, fish played a central role in the physical and cultural sustenance of the vast region's indigenous peoples. The first outsiders arrived in the 18th century, but the region's fish were not commercially exploited until after the United States purchased the territory



Photo credit: Mark Kelley Photography

from Russia in 1867. In 1868, the first salmon saltery was established; a year later came the first cannery (Clark et al. 2006). As nonnatives filtered into the state's coastal villages and the great abundance of Alaska's fisheries became known to the outside world, commercial fishers arrived in droves. By the late 1800s, commercial salt-cod fisheries in the Gulf of Alaska and Aleutian Islands had gotten underway. Soon thereafter, cannery-based salmon fisheries expanded to nearly every mouth of every major spawning stream, from southeast to western Alaska (Criddle and Shimizu 2014).

In this early era, the federal Fisheries Commission conducted some research, but there was no serious attempt to manage the industry. One treasury agent and an assistant enforced the law and monitored salmon fishing along the entire 34,000-mile Alaska coastline (Pennoyer 1988).

In 1884, Congress passed the first Organic Act for Alaska, which granted Alaskans limited self-government under a federally appointed governor. The act did not, however, transfer jurisdiction for fisheries management to the new territorial government (Clark et al. 2006). From 1884 to 1924, federal bureaucrats tried several fishery management measures, such as prohibiting building of dams for impeding salmon migration, banning fishing above tidewater, and imposing weekly closures. Several hatcheries were also established with federal funding (Clark et al. 2006). None of these actions were based on scientific studies.

Great concern over Alaska's fisheries began to reach the U.S. Congress, with 42 fisheries-related bills introduced between 1906 and 1924—all defeated or weakened by the lobbying efforts of the salmon canning industry (Regnart 1993).

Commercial canned salmon was the first and largest Alaskan industry. Salmon production peaked in 1936 when 130 million salmon were caught, generating 80 percent of the territory's annual tax revenue (ADFG 2009). While, under the American system of federalism, states have the power to regulate fisheries within their jurisdictions, as a territory, Alaska lacked that authority and its federal stewards explicitly forbade the Territorial Legislature from exerting any jurisdiction over fish (MacBeath 2011).

Federal law at the time required half of all runs to be allowed to escape upriver, but no one really counted (ADFG 2009). Salmon runs began to decline around 1936 and continued to decline into the 1950s, when President Eisenhower declared a federal disaster. In an attempt to give locals a greater say in fisheries management, the Territorial Government in 1949 established the first Board of Fish and Game—a purely advisory body. In territorial days, fishing regulations were most often made far away, in closed-door meetings between federal regulators and salmon packers (ADFG 2009). Not until after Alaska became a state was it granted authority to manage its own fisheries.

Prohibition of Fish Traps: A Turning Point

Alaska's constitutional convention met during the winter of 1955–56. With stocks running low, delegates from Southeast Alaska pushed to prohibit the use of commercial fish traps. Fish traps were large machines constructed from wood piling and steel wire fencing and placed in streams and rivers. Local opposition had provided political fuel for the statehood movement. Territorial Governor Ernest Gruening expressed the sentiment of many, when he declared, “Colonialism has preferred to conserve the power and prerequisites of the distant bureaucracy and the control and special privileges—the fish traps of a politically potent absentee

industry” (ADFG 2009). Then, as now, Alaska's sovereignty was bound up with control of fisheries management. At the state's constitutional convention, an advisory vote on the banning of fish traps was placed on the same ballot with the constitution and passed.

Constitutional “Sustained Yield” and “Common Use” Mandates

Article 8 of the Alaska state constitution includes two provisions unique to Alaska mandating responsible management of the state's resources: the “sustained yield” provision in section 4 and “common use” provision in sections 3, 15, and 17. The sustained yield provision holds managers responsible for ensuring that the productivity of Alaska's fisheries is not degraded. The common use provision elevates the public trust doctrine from common law to constitution, thereby reinforcing the primacy of Alaska's people as owners of her natural resources while relegating Alaska's government to the role of trustee. These two provisions all but mandate stakeholder involvement in fisheries management decisions and pave the way for the kind of polycentric approach at work today in the Kenai River Fishery management system.

TODAY'S BOARD OF FISH:

“A MINI-LEGISLATURE DEVOTED TO ONE SUBJECT”

Since Alaska became a state, fishing methods and the number of entities managing the fisheries have continuously expanded. But the most significant change occurred shortly after statehood, when the Board of Fish switched from the purely advisory role it filled under territorial government to its present role as a fully vested entity that sets fishing regulations and often makes decisions regarding catch allocations. According to former Alaska Attorney General Avrum Gross (personal interview, October 4, 2017), in the board's early days, “the only thing that mattered ... was commercial fish, and, consequently, the only discussion was about commercial fish and their issues.” Over the past few decades, the board's work has become increasingly complex to include sport, personal-use, and subsistence fisheries. It now makes allocation decisions and regulates fishing gear and openings and emergency closures. Gross calls the Board of Fish “a mini-legislature devoted to one subject.” Though its work is the source of continuous controversy and the governor's appointments to it are oftentimes in dispute, the board continues to provide a forum for the public to have its concerns heard about their fisheries and continues to act timely, based on science and escapement data, to make allocations and management decisions that support sustained yield.

There have, of course, been other changes to Alaska's fishery governance over the years since statehood in response to economic and ecological change. The limited entry system, requiring permits that are specific to the taxa, gear, and area fished has helped to reduce problems associated with too many boats racing to catch a limited number of fish, and some think that now there should be flexibility to target diverse stocks (Sethi et al. 2014).

UNCERTAINTIES OF RAPID ENVIRONMENTAL CHANGE

Climate and landscape change are occurring worldwide at unprecedented rates, and a high-latitude region like Alaska is especially vulnerable to climate change and its uncertain long-term effects (Chapin et al. 2014). The expectations of longer and warmer growing seasons and wetter autumns and winters are already occurring, with signs of habitat changes clearly

evident within the Kenai watershed and other parts of Alaska (Schoen et al. 2017). For example, some lowland habitats are becoming warmer and drier, increasing the risk of mortality for pre-spawning adult salmon and rearing juvenile salmon. Conversely, as glaciers retreat, some glacially influenced habitats are becoming more hospitable to salmon. Marine waters are also warming, which could lead to a loss of ocean habitat suitable for salmon (Abdul-Aziz et al. 2011). Together, these changes are likely to drive large-scale shifts in the productivity of Alaska salmon stocks over the next century, and the consequences are uncertain.

CONCLUSION

The Kenai River fishery has continued to sustain its stocks, benefiting from the engagement of diverse actors working within a polycentric regulatory framework built on Alaska's long history of managing for sustained yield. Although climate change and ocean acidification could overwhelm every other factor affecting Alaska's fisheries management, many variables are working toward sustaining a resilient and adaptive fisheries governance system in the state. The Kenai River Fishery study provides a valuable model for how a broad array of commercial interests, government agencies, and public stakeholders can work together to navigate upcoming systems-level challenges to local fisheries management in Alaska.

ACKNOWLEDGMENTS

The study was funded by Alaska EPSCoR National Science Foundation Award # OIA 1208927 with matching funds from the state of Alaska.

REFERENCES

- Abdul-Aziz, O. I., N. J. Mantua, and K. W. Myers. 2011. Potential climate change impacts on thermal habitats of Pacific salmon (*Oncorhynchus* spp.) in the North Pacific Ocean and adjacent seas. *Canadian Journal of Fisheries and Aquatic Sciences* 68(9):1660–1680.
- ADFG (Alaska Department of Fish and Game). 2009. Sustaining Alaska's fisheries: fifty years of statehood. Juneau, Alaska.
- ADFG (Alaska Department of Fish and Game). 2015. The Kenai River recreational fishing series. Division of Sport Fish, Southcentral Region, Anchorage, Alaska.
- ADNR (Alaska Department of Natural Resources). 2016. Motor Regulations Kenai River Special Management Area. April, 2016. Available: <http://dnr.alaska.gov/Assets/uploads/DNRPublic/parks/units/krsmanewmotorfs.pdf> (September 2016).
- Brunner, R. D., and A. H. Lynch. 2010. Adaptive governance and climate change. American Meteorological Society, Boston.
- Chaffin, B. C., and L. H. Gunderson. 2016. Emergence, institutionalization and renewal: rhythms of adaptive governance in complex social ecological systems. *Journal of Environmental Management* 165:81–87.
- Chapin, F. S. I., S. F. Trainor, P. Cochran, H. Huntington, C. J. Markon, M. McCammon, A. D. McGuire, and M. Serreze. 2014. Alaska. Pages 514–536 in J. M. Melillo, T. Richmond, and G. W. Yohe, editors. Climate change impacts in the United States: the third national climate assessment. U.S. Global Change Research Program, Washington, D.C.
- Clark, J. H., A. McGregor, R. D. Mecum, P. Krasnowski, and A. Carroll. 2006. The commercial salmon fishery in Alaska. Alaska Department of Fish and Game, Alaska Fishery Research Bulletin 12(1):1–146.
- Criddle, K. R. 2011. Management of living marine resources. Pages 301–303 in A. L. Lovecraft and H. Eicken, editors. North by 2020: perspectives on Alaska's changing social-ecological systems. University of Alaska Press, Fairbanks.
- Criddle, K. R., and I. Shimizu. 2014. Economic importance of wild salmon. Pages 269–306 in P. T. K. Woo and D. Noakes, editors. Salmon: biology, ecological impacts, and economic importance. Nova Publishers, New York.
- Krupa, M. 2016. Who's who in the Kenai River Fishery SES: a streamlined method for stakeholder identification and investment analysis. *Marine Policy* 71:194–200.
- Lambin, E. F. 2005. Conditions for sustainability of human-environmental systems: information, motivation and capacity. *Global Environmental Change A* 15:177–180.
- MacBeath, G. A. 2011. The Alaska state constitution. Oxford University Press, New York.
- McChesney, R. 2014. Fisheries panel brings fishers from all user groups to the table. *Peninsula Clarion*. January 22, 2014.
- Pennoyer, S. 1988. Early management of Alaskan fisheries. *Marine Fisheries Review* 50:194–197.
- Regnart, R. 1993. Contemporary fishery issues in dual state and federal management of fish and wildlife harvests; examples of problems and related issues. Alaska Department of Fish and Game, Anchorage.
- Schoen, E., M. Wipfli, J. Trammel, D. Rinella, A. Floyd, J. Grunblatt, M. McCarthy, B. Meyer, J. Morton, J. Powell, A. Prakash, M. Reimer, S. Stuefer, H. Toniolo, B. Wells, and F. Witmer. 2017. Future of Pacific salmon in the face of environmental change: lessons from one of the world's remaining productive salmon regions. *Fisheries* 42:538–553.
- Sethi, S. A., M. Reimer, and G. Knapp. 2014. Alaskan fishing community revenues and the stabilizing role of fishing portfolios. *Marine Policy* 48:134–141.
- Stern, N. H. 2007. The economics of climate: The Stern review. Cambridge University Press, Cambridge, UK.
- Worm, B., R. Hilborn, J. K. Baum, T. A. Branch, J. S. Collie, C. Costello, and M. J. Fogarty. 2011. Rebuilding global fisheries. *Science* 325:578–585. 