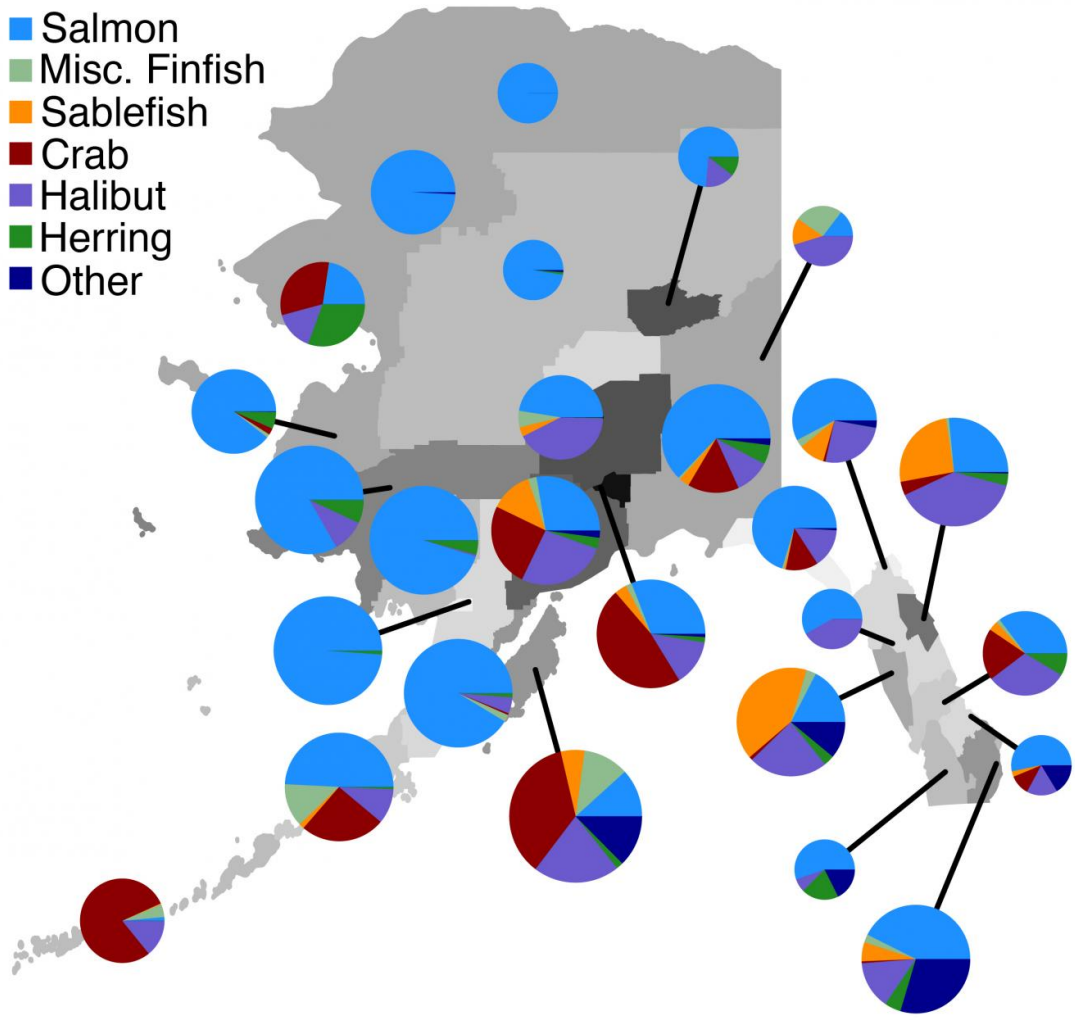
Diversification key to resilient fishing communities

January 14 2017



The average revenues from major fishing types in Alaska from 1980-2013, aggregated by census area or borough. Circle size reflects the average annual earnings from fishing. Credit: University of Washington

Fishing communities can survive—and even thrive—as fish abundance and market prices shift if they can catch a variety of species and nimbly move from one fishery to the next.

These findings, published Jan. 14 in *Nature Communications*, draw upon 34 years of data collected in more than 100 fishing communities in Alaska that depend on fishing for livelihoods, cultural traditions and daily subsistence. The University of Washington researchers found that communities that fished for many different species and had the ability to shift what they harvested, and when, were more resilient to unpredictable downturns in fish abundance and market prices than communities that put all their effort into only a few fisheries.

"This study is about starting the conversation about how communities can buffer themselves against unpredictable ecosystem changes in the future," said lead author Timothy Cline, a doctoral student in the UW's School of Aquatic and Fishery Sciences. "There is no reason why any community in the world that depends on renewable resources could not benefit from this approach."

In their analysis, the researchers used common financial principles to illustrate how fishing communities can buffer against market and ecosystem shifts. Maintaining a diverse portfolio of fishing permits, for example, ensures that a community can switch to halibut or Dungeness crab if salmon take a turn for the worse. Just like with financial stocks, each fishery might not deliver at the same time, but that diversity allows for stability in the long run.

"Human systems can collapse if they have no ability to roll with the punches and adapt when ecosystems re-express themselves," said co-author Daniel Schindler, a UW professor of aquatic and fishery sciences.

"This analysis shows that the communities that did not suffer from oceanic regime shifts were those that could adapt to changes in the quantity and composition of natural resources."

The researchers looked specifically at the average fishing revenue in 106 Alaskan communities for 10 years before and after 1989, a year when the North Pacific Ocean experienced a significant shift in productivity and abrupt changes in the composition of marine food webs, while at the same time the global price for salmon dropped because of competition from farm-raised fish.

Commercial fishing in Alaska provides $1.3 billion in annual income from harvest alone, and in some remote areas fishing is the only major industry.

Many Alaskan communities lost more than half of their revenue following 1989. However, the researchers found that communities with the highest level of diversity in what they fished for saw little or no change in revenue. Specifically, communities that had high diversity were able to shift to different fisheries after 1989, and some even increased their revenue streams by leveraging new and emerging fish markets.

Fishing boats in Juno, Alaska. Credit: Unsplash

"We found that well-diversified communities also had higher turnover, or the ability to go out and fish for species that are more abundant while relying less on those that declined," Cline said. "If you are diversified, it's just a matter of focusing on fisheries that are more abundant or more valuable, and if you're not diversified, that means adapting your portfolio by selling what you had and buying something new."

The authors recognize this can be difficult for individual fishermen - fishing permits are expensive and can be hard to obtain. When dispersed across the community level, however, individuals could still specialize, but differently from their neighbor. For example, one subset could fish

for pink salmon, while another tackles halibut or Dungeness crab. Revenues from these efforts are felt throughout the community.

Additionally, this approach promotes a powerful shared identity, the authors explain.

"There's intrinsic value in the identity of being a fishing community," Schindler said. "That sense of community identity is basically reinforced by the fact that the community is adapting to the ecosystem, which is always changing."

The rich dataset used in this analysis, provided by the Alaska Commercial Fisheries Entry Commission, was invaluable in allowing the researchers to test concepts of diversification and turnover—switching to catch more abundant fish—which have been put forth in other papers as ways of managing human interactions with natural resources.

These principles could be applied to fisheries around the world, and many small fishing communities already diversify naturally, the authors explained. Traditional science tends to emphasize gathering data to make better predictions of how natural resources will fare, but perhaps that isn't the best approach when managing resources in a highly variable and unpredictable environment, they argue.

"With ongoing climate change, population growth and ocean acidification, the question is, what's the future going to look like? We should expect the unexpected," Schindler said. "Then the question becomes, what can we do to develop resilient communities for what is guaranteed to be an unexpected new future?"

"While 40 years ago most fishermen were generalists, and switched between fish stocks as they fluctuated, the efforts to reduce overall fishing effort has generally forced fishermen to specialize in a small

number of fisheries, said co-author Ray Hilborn, a UW professor in aquatic and fishery sciences. "We need to explore ways to allow flexibility while still restraining the total catch."

More information: *Nature Communications*, DOI: 10.1038/NCOMMS14042

Provided by University of Washington