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Blue Resilience: Is There A Need For An Alaskan Coastal Career Development Framework?

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Blue Resilience:

Is there a need for an Alaskan coastal career development framework?

Jared Fuller

**Submitted in Partial Fulfillment of the
Professional Science Master's Degree**

In Ocean Food Systems

**School of Marine and Environmental Programs
College of Arts and Sciences**

University of New England

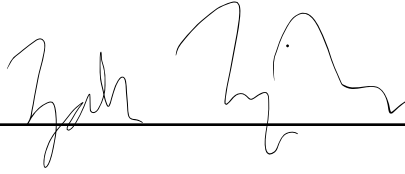
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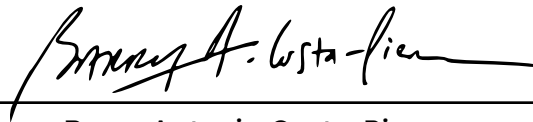
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"What to come, in yours and my discharge"

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Abstract

Youth career outmigration has increased in Alaska's coastal communities in the last few decades. The ocean and ocean-adjacent industries that comprise the blue economy make up the majority of the employment options in places have experienced declines within these regions which has been attributed to the outward movement of young people. The dynamic history of Alaska has had specific impacts with regards to Alaskan coastal communities, their ocean-resource economies, and thus, the potential for young people to find career paths within them. Potential economic-resource vulnerabilities could be mapped along with the complex systems to help build resilience within those communities. Moreover, Alaska's education and existing career programs both hint at gaps for workforce pathways. Iceland has created fisheries and aquaculture schools to help curtail these trends which could serve as an example for Alaska since they share many commonalities. The research conducted in this paper involves Alaskan community and industry subject matter experts, local businesses, and seniors in high school in coastal villages to garner insight into the potential creation of such a program. Information gathered from codified interviews and surveys of leaders and industry suggest there is a wide range of opinions regarding the current state of these communities; however all shared the belief that a youth-targeted career program would be a positive solution. The surveyed students demonstrated mixed feelings about whether or not they would participate, but do have interest in learning more about their options. Literature on Alaskan fisheries access career development suggests that generational influence and exposure may have an influence on the interest of young people which should be a key feature in program outreach. On the whole, there is a shared interest in an Alaskan "blue" career development program designed to assist young people learn more about job prospects in their coastal communities. The program should look at existing and growing opportunities, potential futures in a rapidly changing world, and meet students where they are.

1. - Project Objectives and Significance

Alaskan coastal communities suffer the outward migration, reduced accessibility to resources, and low participation in the blue economy among youth. Coastal communities around the world have experienced shifts in markets, technology, and the impending changes from the climate increase the vulnerability of these resource dependent places. In order to spur growth, the University of Akureyri, through partnerships with local industry, schools, and community leaders, has developed a set of “schools” in order to help prepare their youth for potential career paths related to fisheries and aquaculture/mariculture - although somewhat distinct, the latter terms are used interchangeably in this paper. Approaches to economic growth, starting at the development of the individual, are part of a wider need to help bolster coastal fishing communities experiencing economic stagnation or declines in youth participation. This Icelandic program focuses on exposing local youth to the blue economy, facilitation of local and global resources, and conversion of said resources into economic functions for the individual which then can translate to local benefits for the community. Topical literature suggests how career theory and a capabilities approach helps outline a framework for said work in the creation of educational means to facilitate economic and community growth, development, and resiliency.

The general purpose of this research project is to determine if there is a demand or need for a “blue” career development program designed to assist young people learn more about job prospects in their coastal communities, about their ability to participate within their communities, and to gain general knowledge about how economic-educational frameworks might assist communities going forward. Key informant interviews and surveys, and various community members and citizens, offered their insight and opinions to produce a dataset which was summarized and disseminated through the production of this research report. The data has been codified to find themes prevailing opinions from the communities in the study. Interest and willingness to create and participate in such an effort could help reduce outmigration, improve local economies, and improve wellbeing of youth by providing exposure, education, and potential work skills/opportunities.

2. - Background

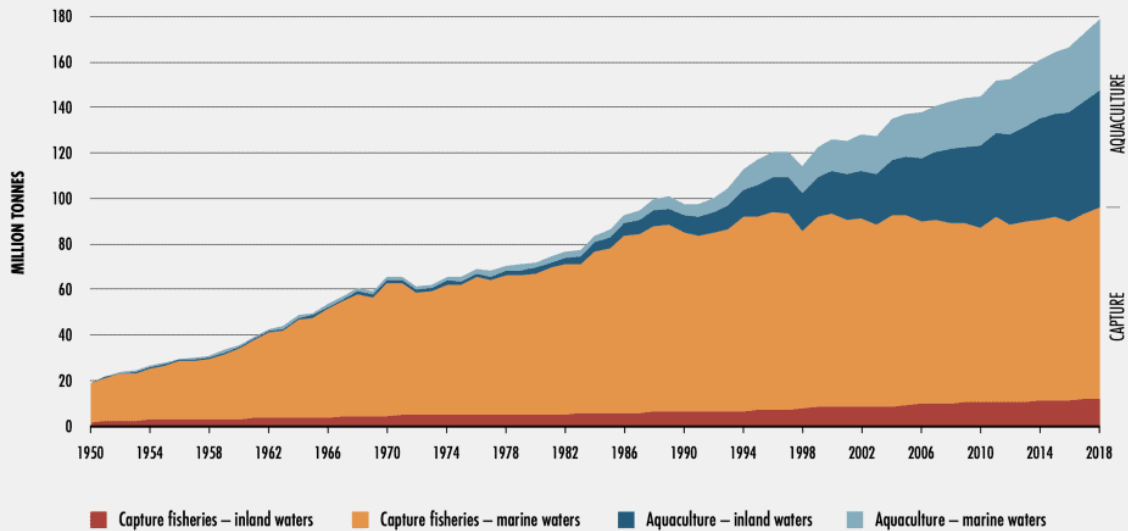
2.1 - Ocean Food Systems: Fisheries and People

2.1.1 - Global Need

The historical-cultural significance of seafood as a place-based sustenance in Alaska contrasts its rise to a global commodity. The prominence of the seafood industry within the State relies on the huge international market for ocean food systems. An understanding of the big picture helps contextualize how, where, and, zooming in locally, why Alaskans rely on and play a pivotal role within these systems.

In the 20th century, a combination of growth, industrialization, and technology reshaped many quiet fishing villages around the world into high-volume terminals for export markets. Since 1950, the global harvest of fish has grown from an estimated 20 million metric tons, peaking in the 1990s at what had been suggested to be 86 million metric tons (MMT) (see Figure 1 below). Recent reconstructed models accounting for underreported harvesting put this number to be closer to 130 MMT (Pauly, 2016). Contextually, the population of our planet is expected to reach 10 billion humans by 2050, the abundance of people on Earth means we shall require some 470 million metric tons of annual food production to meet future needs. From this need rises the potential demand of 194MMT/yr (Costa-Pierce, 2016) in increased protein production to feed the peoples of many nations. Though growing demand for protein hungers for additional harvests, the maximum sustainable yield, the largest amount of catch able to be harvested under a set of given conditions, for the many of the world's fisheries has likely been met or surpassed. The United Nations Food and Agriculture Organization notes that 65.8% of fisheries are being harvested sustainably, while 34.2% of stocks represent overfished fisheries. On the whole 78.7% of landings come from sustainable or maximally sustainable fisheries. (FAO, 2020). The latter sets the outer sustainable boundary for many fisheries and their coupled economies.

**FIGURE 1
WORLD CAPTURE FISHERIES AND AQUACULTURE PRODUCTION**



NOTE: Excludes aquatic mammals, crocodiles, alligators and caimans, seaweeds and other aquatic plants.
SOURCE: FAO.

Figure 1 - Tons of foods produced by type. (Mossler, 2020)

The United Nations Food and Agricultural Organization’s Organization for Economic Cooperation Development (UN FAO OECD,) projects that global fish production is to reach 200 million metric tons - the majority of this potential harvest will come from aquacultural yields. The 2016 global production was estimated at 171Mt with aquaculture representing 47%, up nearly 25% from the year 2000 (FAO, 2018). These figures suggest areas of growth outside of wild-catch fisheries, which are an important piece of economic diversification and external market threat, which will be discussed later in this paper.

The joint fisheries and aquaculture food systems facilitate more than just the harvest of biomass, they represent a significant workforce in the global economy. Three sub-sectors comprise fisheries and aquaculture/mariculture ocean food systems: the primary sector, consisting of the active fishing or rearing; secondary, those engaged in the immediate pre or post-harvesting activities like processing, sales, and transit; and the tertiary sector, what might be considered ancillary tasks required to complete either the work of the primary or secondary. In the global fisheries and aquaculture production scheme, the FAO estimates 59.5 million people are, “directly engaged in the primary sector of capture fisheries and aquaculture (FAO - Climate Change, 2020.)”

2.1.2 - Local Participation

Meanwhile, the NOAA Fisheries Economics of the United States 2019 report puts the number of seafood-related jobs at 1,223,915 comprising the commercial sectors as harvesters, processors, distributors, importers, and retail. In Alaska, the report indicates 52,702 workers, both resident and non-resident to Alaska (it is estimated 3/4ths of processing jobs are non-resident), were employed within those job sectors - it ranks 5th (see Figure 2) in the US for the number of jobs it supports (NOAA, 2022). Within Alaska, Kodiak boasts the highest level of resident seafood processing workers at some 56%, whereas industry-wide in Alaska this is only 20% and only 6% resident workers in the Aleutians East Borough (Alaska Labor Statistic, 2022). The labor-intensive processing sector has struggled to fill all positions with the reasoning most heard throughout the state is that there simply are not enough willing workers in Alaska to fulfill these roles. As a result, many hire H2-B visa employees, but additional research as to why these roles are not filled locally may be worthwhile. Although Kodiak boasts a substantial portion of localized economic participants, it does not tell the full, current, and future story of all coastal regions.

These job numbers substantiate some 2.4 billion dollars in value added impacts (contribution to an area's GDP), yet only represent commercial fisheries and a small subset of secondary industries. Additionally, recreational fisheries generated approximately 5300 jobs and saltwater anglers spent over \$406 million in 2009 (NOAA, 2022). Those businesses and people rely on the production of fish, and in turn the community may be resting upon a small set of resources. Aquaculture in Alaska is largely considered to be a nascent industry having jumped from 350 acres in production in 2016 to nearly 3,000 in 2021. This mostly represents sea greens and shellfish since salmon farming is prohibited. Revenue in 2018 was placed at \$1,653,000 within the State (AMTF, 2021), and has the great potential to add to the blue economy.

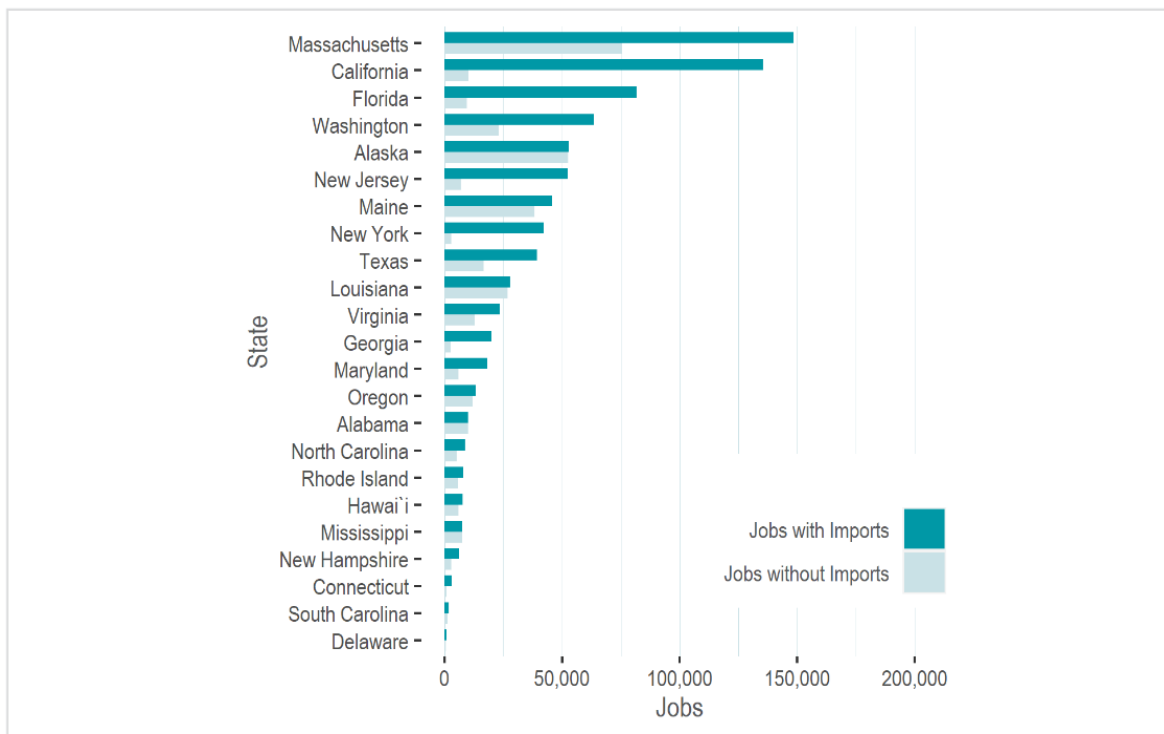


Figure 2 - Seafood related jobs by state. (NOAA, 2022)

Jobs sectors that are not accounted for include the speciality trades and vocations, manufacturing, construction, information and communications, and the highly significant transportation and logistics sector. The state of the ocean food economy and its workforce demonstrates the sheer size, strength, growth potential within ocean food systems - especially the untapped potential in mariculture. There are a wide range of career types available within these sectors, yet there appear to be trends in Alaskan coastal communities of low youth participation, stagnation, and outmigration. The following sections look at historical context, concerns and vulnerabilities, and options to examine this conundrum.

2.2 - Harvesting: Change, Management, and Three Tragedies

2.2.1 - History and the Commons

Alaska's great abundance has not meant it has been free from the threat of depletion or exhaustion, and growing Alaskan populations have reacted in ways to protect and constrain common pool resources. These efforts to maintain their fisheries is one that is not without contention. Stakeholders, local users, and first rights holders have historically expressed concerns about who and how conservation procedures would be applied, and whether or not the resource was under threat prior to the institutional influence deeming management necessary.

Application of Tragedy of the Commons to fisheries has been explored and expanded upon in a variety of works to justify the need for regulatory action; however, a set of examples suggests that perhaps the tragedy, over-exploitation of resources, came after the implementation of new regulatory mechanisms (Berkes, 1985). The primary conclusion of this tragedy posits that all shared resources that remain unregulated will be over-exploited and lead to the collapse, or tragedy, of the resource in question (Hobart, 1968). The paradigm's base assumptions are that in an extraction scenario with no oversight that a) all fishers are rational actors working for their individual benefit, b) the resources are being extracted at a rate higher than they can be replenished, and c) that the resource is open, common property (Stillman, 1975). In a presumably steady state it might very well be that the tragedy may befall the fishery and their people; yet, the set of these initial assumptions does not account for traditional (historical, pre-industrialized/colonial) mechanisms that operated through communal agreement and dissent (Berkes, 1985). Elinor Ostrom examines a number of studies from Canada to Micronesia where small-scale fisheries maintained non-declining fisheries practices. It supports the notion modernized regulatory bodies are not required to produce viable practices, but rather through cultural, environmental, and societal pressures these fisheries did not require Western intervention in the form of regulatory management and were self-sustaining. He notes conditions that disrupt these traditional practices may include: loss of community control (ex. Indigenous rights losses in the US northwest), abrupt commercialization (ex. Large capitalization of salmon in British Columbia), rapid population growth (ex. Influx of people into the artisanal fisheries in Micronesia), and rapid technology changes (ex. Mechanical advantages in the Great Lakes fisheries). Immigration of non-Indigenous peoples coupled with the mechanical enhancement of the Industrial Revolution would bring about nearly all of these conditions to Alaska in the late 19th and during the 20th century. A profound study in common pool work examined Swiss farmers making use of private crop plots and shared cow grazing pastures, where a set of socio-political understanding helped ensure, balance, and rectify group

use of the meadow rebutting the archetypal tragedy of the commons (Ostrom, 1990). Nobel Prize-winning economist, Elinor Ostrom, also questioned the inevitability of Tragedy of the Commons noting that polycentric governance (multiple, overlapping yet independent decision-making stakeholders) supports the notion that individual stakes in common pool resources can help prevent tragedy of the commons for “unmanaged” resources. Overarching is that rational and individually interested actors act for themselves and within multiple group constructs. A larger meta-analysis examined a host of local and distant management resource strategies. The paper also looks at defining the role of the individual and problems in managing common pool resources that could provide structure to assist in successes (Ostrom, 2010). The body of Ostrom’s work provides design principles for the “bottom-up” vs. “top-down” political economy of communal resources to function ideally: user and resource boundaries, rules that follow local resource and social conditions, individuals participating can partake in rule-decisions, external agencies recognize local rights, self-monitoring of users and resources (and trust), graduated sanctions for violations, conflict resolution mechanisms, and nested enterprises (tiered structure of management) (Ostrom, 1990). These conditions are notably lacking in the early management within the state.

The Alaska Purchase was completed from Russia to the United States in 1867, and the newly acquired territory received an eager influx of fur traders, loggers, and fishers. The first American oversight of Alaskan fishing by the US Fisheries Commission, a spiritual predecessor to National Oceanographic and Atmospheric Administration (NOAA) Fisheries, opened to salmon in Klawok in 1877 (Hobart, 1996; Andrews, 1918). In 1896 early regulatory restrictions to fishing practices came by way of gear type, escapement numbers, and temporal and spatial closures. These early mitigation strategies were difficult to enforce, and with commercial interest abroad, demand for salmon encouraged heavy fishing. By 1906 concerns about declining salmon numbers, caused primarily by overuse of set nets - fishing nets fixed or anchored to the sea floor - led to research into conservation methods (Hobart, 1996). In writing on the status of salmon in 1918, Clarence Anderews noted the grave concern for the stock as, “It is at the climax of its prosperity, and its future depends on wise management. It may be made to yield millions of revenue for all future time, or it may be practically destroyed in a few years.”

Industrial fishing, emboldened by engine-powered vessels, was an international affair even in the cold North. Historical customs of the high seas felt upheaval after the second World War when, in 1948, President Truman’s executive order swept the continental shelf into federal purview. This movement, poised initially to protect the natural resources growing more available due to newer technologies, was echoed by other coastal nations and led to extended diplomatic and foreign policy efforts across multiple US departments (Holick, 1976). The surge of increasing international trade and resource exploitation and exploration of the 1960s and 1970s would continue to bring about changes and tests to domestic and international law, challenges to fisheries, resulting in a call for a broader and comprehensive resources protective mechanisms for US fisheries. These included the Marine Mammal Protection Act, The Ocean Dumping Act, Coastal Zone Management Act, Marine Sanctuary Protection Act, National Advisory Committee to Oceans and Atmosphere, Outer Continental Shelf Lands Act Amendments, Port and Waterway Safety Act, and the Deep Water Ports Act.

By the mid 1970s, a considerable amount of conversation and domestic pressure requesting new legislation to protect US fisheries had been received. The waning fisheries populations caused by the culmination of a highly mechanized and eager international fleet,

pressure from competing state fisheries, and habitat loss were cited as the reasons for the Fisheries Conservation and Management Act, also known as the Magnuson-Stevens Act (MSA) - one of the largest and influential set of legislation written (MSA, 2007). The MSA utilizes the 200 mile Economic Exclusion Zone (EEZ) set forth by Presidential Proclamation 5030 which together helps set the legal basis for modern fisheries domestication and management by the federal government. The MSA sought to ease the concerns and put conservation efforts into the hands of regional councils to provide more localized oversight.

Meanwhile, in the time following Alaska's 1959 statehood into the US, the volume of fishing increased dramatically, aligning with declining stocks, and falling ex-vessel prices - value paid to the boat for fish - and incomes (Homan, 2005). Concerns about management grew as increasing fishing pressure amounted, much from outside of Alaska. The State responded to this set of challenges first in 1971 with the Division of Fisheries Rehabilitation, Enhancement and Development. In the following year, 1972, a constitutional amendment was written to allow legal control of fisheries access within the state which then became actionable in 1973 in the form of the Limited Entry Act. The Act created the Commercial Fisheries Entry Commission, the CFEC, tasked with promoting conservation and sustainable management, economic health and stability, and limited entry regulation in the public trust (Homan, 2005; Alaska Constitution VIII:15). It would do so by developing an application process for access rights through permits, and help usher in a strong entitlement mechanism for preserving fisheries stocks and generating one degree of sustainability within Alaska's blue economy, but these policy decisions would have impacts to coastal fishing communities.

2.2.2 - Effects of Management and Commercialization: The Commodity, The Margins

There are several entitlement tools for allocating quota within the state, but as examples of access rights mechanisms, the MSA and Alaska's limited entry program aim to resolve over-harvesting with a mixed-management strategy focused on providing a fixed number of participants and a set allocation for harvesting. However ideal the intent of these tools, a set of additional consequences that affect the communities arises from the methods by which entry was granted, the subsequent changes in production incentives, and, by virtue of its design, restrictive entry for new, potential fishermen (Homan, 2005). In order to implement the limited permit system, an approach was chosen by the CFEC to attempt to reconcile past participation, hardship, and dependence to generate access to a transferable quota system. The quantitative fishing rights system was primarily based on historical landings information. The mechanism, while attempting to help local, rural Alaskans inadvertently put into place a system that would ultimately disproportionately favor non-rural and sometimes non-Alaskan residents. Many rural and Indigenous people did not have written records, may not have fished during the two year apportionment period, were unable to complete the necessary set of forms for consideration, or were not able to be reached during the apportionment period (Donkersloot, 2021). As a consequence, this led to many peoples being left out, ineligible for quota under this new management.

The permit and quota systems, specifically individual fishing quotas (IFQ), shifted away from the previous system that may have allowed for selective harvesting periods in favor of maximization of resource extraction. The initial reform mechanism designed to help rural communities subsequently created one that benefited larger non-place based entities in ways

that emphasized privatization at the detriment of fisheries access for rural Alaskans (Carothers, 2010). The concept of Tragedy of Commodification, the movement of localized emphasis and utility to parties outside of the direct benefactors, describes the process of this loss (Greensberg, 1996). Clarence L. Andrews writing on the national significance of the salmon illustrated his concern in 1918 with regards to external, distant management, “To get a correct understanding of the conditions in a legislative body so far from the scene of action is a difficult matter, and the whole body of the nation is less interested in the resources of a territory than are ‘the residents of that territory.’”

As a result of non-local focused management, diversified or opportunistic practices were disadvantaged towards more efficient harvesting methodologies. In situ, this meant a more costly barrier to entry and competition that favored or necessitated greater access to capital (Donkersloot, 2021). Rural communities often lacked the depth of credit and financial resources that were better suited under this new system. Larger institutions were better able to absorb disruptions in fishing seasons, gear failure, and able to take advantage of diversification quota outside of place-based locations to favor their investments that individual owner-operators are less able to participate in (Cullenberg et al. 2017; Knapp , 2011). This combination of effects would lead to permit holdings leaving coastal communities to larger cities and organizations, many outside of Alaska.

Salmon fisheries are an interesting proxy for local access, and it provides a quantifiable backdrop to observe local permit loss. Over the period of 43 years, 1975-2018, rural fishing communities would see a net loss of 2,459 permits. In the Bristol Bay salmon fishery, 42% of the local permits would leave the residence area. Figure 3 illustrates the movement of transfers out of the region. In the southeast of Alaska, primarily native ownership would drop more than 50% each for the villages of Angoon, Kake, Hydaburg, Metlakatla (Donkersloot, 2022).

TABLE I. CHANGE IN ALASKA RURAL LOCAL (ARL) PERMIT HOLDINGS IN SELECT SALMON FISHERIES IN ALASKA, 1975-2018

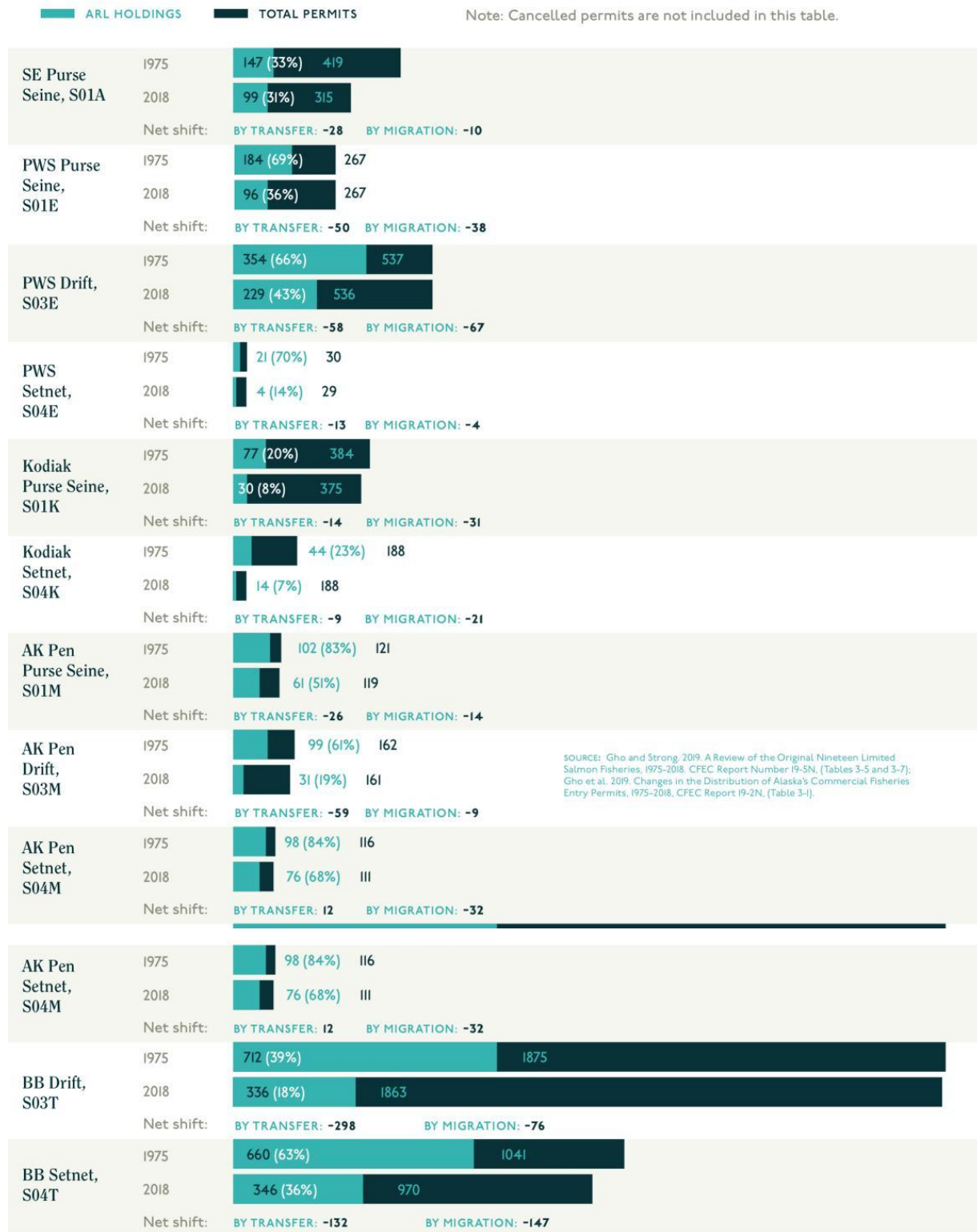


Figure 3 - Change in Alaska Rural Local (ARL) permit holdings in select Alaska salmon fisheries as a result of permit transfers and the out-migration of permit holders, 1975-2018. (Donkersloot, 2022)

Rural and Indigenous loss of access rights has seen comparisons to Tragedy of the Margins, and of the Commons, referencing the displacement of peoples from historic resource rights (Carothers, 2010). Kleinen (2009), writes about the marginalization of inhabitants of poorer fullivial areas in Vietnam being further removed from their ability to work previously communal lands as rapid economic development favored those with greater influence and wealth seeking financial growth from the area they had previously dwelled. The unintended consequence of the shift in policies, designed to preserve the fisheries, moved access out of the original communities and have taken away their most local means of work. With many Alaskans having lost rights to access, their political voices and influence would wean as well. The loss of multi-generational tenure on the water would have cascading effects resulting in an atrophied ocean economy for young people. Although there are fewer barriers to entry for most vocational and specialty trades, this research did not cover whether or not multi-generational engagement in ancillary fishing industries has an effect on youth involvement.

2.2.3 - Today, Stability but Few Youth Entrants

Despite the changes in permit structure and decline in rural participation, overall landings, promoted manageability and sustainability, and ex-vessel value of fish have all increased on average over time (Sethi, 2013). Employment overall has also, on average, increased in the last 10 years based on the number from the fisheries economic reports (NOAA, 2022; NOAA 2012.) The request for an increased number of H-2B visas from the State's employers suggests that there is a weakness in local recruitment for some subset of industry positions. In 2016, 971 H-2B visas were issued for one seafood company alone (Seafood Source, 2017). Their need continues in 2022 where additional visas are being released as they are, "allowing businesses to hire workers from other countries for positions and jobs they otherwise cannot fill, despite their best efforts to recruit Alaskans and Americans to fill their vacancies" according to Alaska Senator Lisa Murkowski's office (Murkowski, 2022). On the whole, resident processor workers make up some 26% percent of the total processing workforce (see figure 4).

Seafood processors and their nonresident percentages by region in 2018

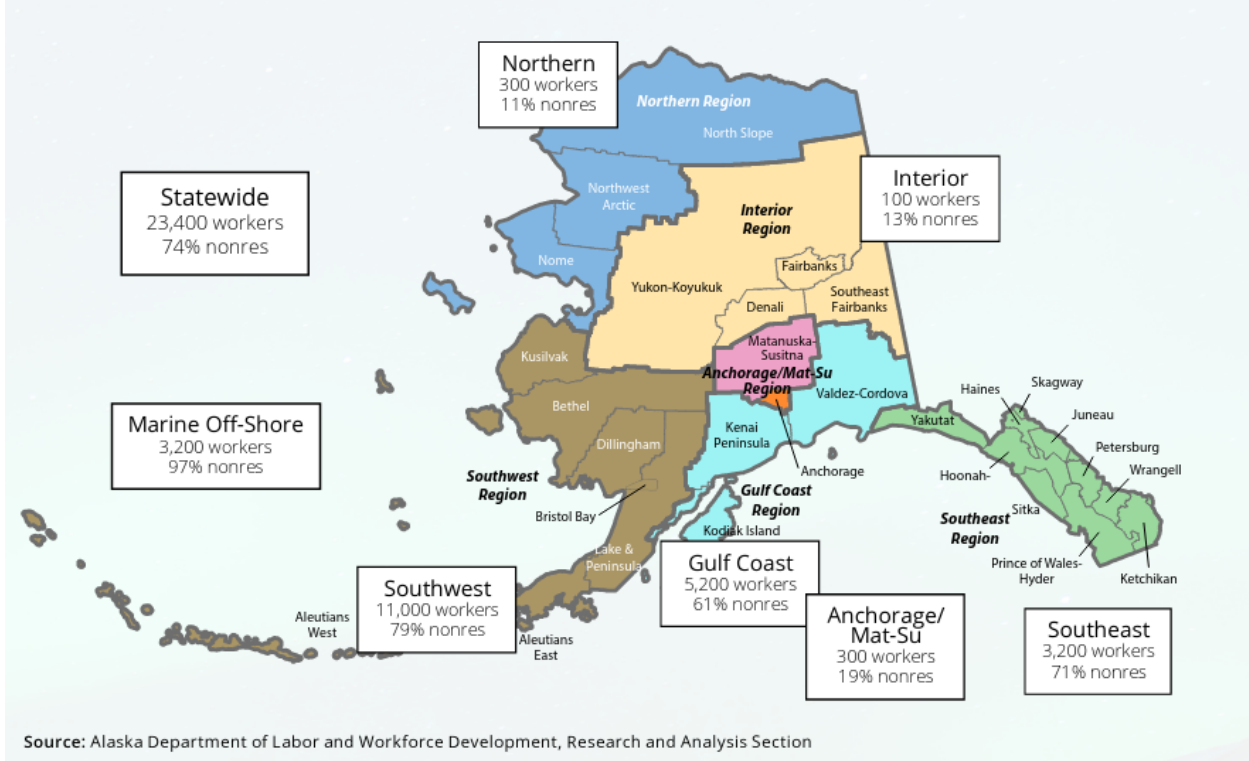


Figure 4 - Non-resident processing workforce makeup. (Wiebold, 2020)

While the change in policies may have been set to help optimize available resources in a world with limited resources, the ability for young people to participate has been hindered. A number of papers have detailed the “graying out of the fleet” (Cullenberg, 2017) where the age demographics of the direct fishing industry are weighted towards an older crowd of retiring individuals with few younger members taking place. The paper and others describe some youth attitudes towards fishing come from a place related to cultural exposure, financial prospects and family reliance/perception, youth experience and training, value on higher education, and access to pipelines to fishery career growth as the primary reasons youth are not joining the fishing industry (Cullenberg, 2017; Coleman et al., 2019). This does not necessarily provide context to youth participation in blue secondary or tertiary industries, but may share similarities in terms of prior knowledge, perspectives, and potential outlook.

With the understanding that youth participation is low, remedies are needed. Exposure and youth education programs may provide an on-ramp into learning about fisheries, and proposed mechanisms for increasing access have been suggested: communal quotas, young entrant sectors, and financial incentives (Donkersloot, 2021; Coleman et al., 2019). The latter set of mechanisms, however, are policy issues that may take a considerable amount of time, discussion, and political force to move them forward.

2.3 - Threats: Vulnerabilities and Climate Change

2.3.1 - Vulnerabilities

Though regulatory action may provide some ecological stability, there remains a number of threats to the coastal fishing communities in Alaska which further stress the opportunity for work. Measuring vulnerabilities offer an assessment about the economic robustness of a particular region. Whether or not the community is able to weather transitory disruptions, localized changes, or global shifts can be examined by looking at vulnerabilities, and such a metric may help understand the needs of coastal Alaskan communities.

The Organization for Economic Cooperation and Development (OECD) uses a set of indices to outline how institutional financial positions and imbalances may determine the ability to handle shocks (OECD, 2015); however, these financial institutions are only relevant insofar as they provide the ability for these communities to gain access to capital. Still, the ability to implement or influence broader financial decisions, policy, and controls tends to lie beyond the local fishing community level due to marginalization. This paper looks at more of the global human threats background in the Resiliency section. Because Alaska's most rapidly approaching concern is the threat to its environment, this section examines climate change.

The UN's working definition for its list of Least Developed Countries utilizes, "population size, remoteness, merchandise export concentration - share of agriculture, forestry and fisheries in gross domestic product -, homelessness owing to natural disasters, instability of agricultural production, instability of exports of goods and services, and the share of population living in low elevated coastal zone." The latter definition helps denote a set of indices that does apply to rural fishing communities, and its application already suggests a degree of impact - population, remoteness, and reliance. Using rural fishing communities as context frames, we can look to the Intergovernmental Panel on Climate Change (IPCC) for an applicable definition that encompasses both the socio-economic and biological threats. Their Impacts, Adaptation and Vulnerability work has helped define vulnerabilities as "the degree to which geophysical, biological and socio-economic systems are susceptible to, or unable to cope with adverse effects of climate change" (IPCC, 2007).

At the community level this takes on a new meaning since multiple systems interact within the social, economic, and biological aspects. Himes-Cornell and Kasperski (2015) examine exposure to the physical effects of climate change, dependence on resources that will be affected by climate change, and a community's adaptive capacity to offset negative impacts of climate change.

Selection of normalized community component scores and rankings.

Community	Exposure		Resource dependence		Adaptive capacity	
	Index score	Rank	Index score	Rank	Index score	Rank
Akutan	-1.097	306	2.290	11	5.534	1
Anchorage	-0.473	208	3.837	4	1.215	29
Barrow	2.688	5	-0.733	234	0.349	110
Brevig Mission	6.416	2	-0.295	158	0.521	82
Fairbanks	-0.010	102	1.754	21	0.083	148
Gambell	0.475	60	1.266	33	0.391	101
Juneau	0.408	61	0.809	55	-0.354	205
Kivalina	3.336	4	3.827	5	0.715	62
Kodiak	-0.784	272	4.298	3	0.631	71
Koyukuk	1.734	17	-0.073	112	1.365	25
Nome	0.893	43	-0.101	115	-0.497	223
Red Devil	5.189	3	-0.019	102	-0.433	212
Shaktoolik	2.551	6	0.328	82	0.071	150
St. Paul	-0.551	235	0.187	87	2.456	4
Teller	7.303	1	-0.236	144	0.405	98
Togiak	-0.165	153	0.434	74	0.262	126
Unalaska	-0.933	299	4.446	2	1.765	16
<i>N</i>		315		315		315
<i>Theta</i>		0.817		0.853		0.917
<i>Variables</i>		14		35		28

Table 1 - Selection of normalized community component scores and rankings. (Himes-Cornell and Kasperski, 2015)

The indicators index and rank perceived exposure to climate change using ice coverage, permafrost, and latitude as a proxy; utilizes an economic dependency based on percentage of the resources that comprise the local economy; and evaluate adaptive capacity utilizing community income, education, diversity in work makeup, and quantity of dependents within the population (Himes-Cornell and Kasperski, 2015). As seen in Table 1, the ranking number shows position relative to the other communities within Alaska, where 1 is the lowest rank. From the table, Akutan, given its relative southerly position, heavy dependence on marine resources, and a homogenous economy that is sourced with a highly transient worker population is positioned 306 for exposure, 11 for resource dependence, and 1 for adaptivity. Kodiak shares a similar exposure and resource dependence ranking, but due to a more diversified set of economic opportunities fares better in terms of adaptability. Similar work was done comparing indices in order to “ground truth” these systems that indicates much overlap (Lavoie et al., 2000). The same vulnerabilities presented by climate change can be used to understand threats from changes in overfishing, technology, fuel/transit costs, and global markets. This kind of analysis can help identify how vulnerable an area may be, why it might be so, and help encourage discussions on how to address vulnerabilities. In Alaska, these vulnerability assessments may provide a list of stakeholders and the risks they could potentially face, which would allow them to take part in larger discussions on their desire to participate in a blue educational program for their youth.

2.3.2 - Climate Change

Even with the best cooperation of political, economic, and fisheries science practices, the set of anthropogenic impacts from all other human processes are dynamically altering the oceans. The livelihoods of those living in rural fishing communities is inextricably linked to the impacts of climate change. As the planet warms, the ability for the oceans to provide economic resources falls into instability, and regardless of actions taken to mitigate the human-directed impact on the climate, the implications are critical to actions that will need to be taken by the communities to react. Because this paper is intended to gather an audience from many

disciplines that may not include the sciences, *this section is a primer* on how direct the threat truly is to Alaska's coastal regions and well being.

The Intergovernmental Panel on Climate Change (IPCC) has done some of the most comprehensive work in documenting the science, potential outcomes, and mitigation strategies for dealing with the warming of the planet. The most recent set of publications, Sixth Assessment (AR6, 2021), builds on the five prior meetings and is still in progress, and provides increased clarity with regard to how the oceans are warming, behaving as carbon sinks, showing growing stratification, experiencing oxygen loss, and outlines the historic baselines for which these changes are disrupting (IPCC, 2021). The predominant outlook in the report suggests the anthropogenic changes have exceeded initial projections, and that immediate mitigation strategies will be essential in order to prevent ecosystem shocks with cascading effects. Understanding, mitigating, and adapting to climate change will be required for the viability of rural fishing communities.

How Climate Change Affects Oceans: With more than 70% of the world covered in oceans, climate change is largely an oceanic occurrence. The ocean ecosystems are tied from pole to pole, with impacts in one human-defined region overlapping into the next. Of note, the AR6 notes the *virtual certainty* of the warming of the global upper ocean (0-700m) since the 1970s and the subsequent *high confidence* in the drop in oxygen levels in the upper ocean (IPCC, 2021). A combination of temperature, salinity, dissolved oxygen, and pH are key to understanding the interplay between chemistry and how it affects the life cycles of organisms within the oceans. The majority of ocean dwelling organisms either are for their life cycle (holoplankton), start their biological journeys (meroplankton), or feed upon small floating organisms spread across the biological kingdoms (Bar-on 2019). Rising temperatures reduce the amount of dissolved oxygen available for cellular respiration, increase ocean acidification - making available calcium lower for calcium carbonate skeletons, and disrupt ocean currents gigatons of drifting organisms. The billions of years in the evolutionary history of these biota require the chemical parameters to fall within certain boundaries in order for their biological functions to operate effectively, but life struggles to accommodate rapid changes.

Disruption of these patterns leads to economic disruption as the trophic levels rise. The daily/nightly, or diel, feeding pattern of small mesopelagic fish, the largest biomass of teleosts, true fish, is highly dependent on the abundance of small planktonic copepods (Battaglia et al., 2014). Changes to the planktonic makeup and to the water column itself affects the quality and quantity of these feeding patterns, and in turn the larger predators of mesopelagic fish experience the nutritional deficits too. Moreover, range and biome shifts are pushing species poleward, increasing competition for unstable and diminishing resources. The FAO has indicated that biomass changes within economic exclusion zones could decrease 7.0-12.1% with no mitigation, and 2.8-5.3% under scenarios utilizing strong mitigation (FAO, 2018). Thus the web of the ecosystem affects management of fisheries and the people that depend upon them.

Northward Impacts: More poleward geographies experience climate change at a rate twice than those towards the equator (IPCC, 2021) and the true circumpolar region, above 66 degree north, four times as much as the global average (Rantanen et al, 2021). The Arctic Climate Impact Assessment focuses on the northern regions and how they will specifically experience the warming. Issues related to the cryosphere, ocean currents, and chemical

makeup are all part of the engine that runs the North. While the opening of ports due to clearing sea ice may offer new passage and opportunity for a subset of people, the overall potential loss of the ecosystem means dramatic shifts in the ability to provide for unprepared communities.

The Bering Sea has experienced large biological shifts and losses resulting in populations of seabirds, marine mammals, crab, and salmon in far fewer numbers than historical averages (ACIA, 2004). Warming waters over the Bering Sea and Gulf of Alaska have resulted in shifting currents and less productive waters. The most notorious of these was a standing warm water mass in the Gulf of Alaska mass known as “The Blob”. This region of water, roughly 1/3rd the size of the contiguous United States, began in the fall of 2013. By 2015 it had doubled and stretched from Baja California to the Aleutians (NOAA, 2022).

The 2013-2015 four year heatwave led to a string of marine mortalities. Marine mammals and seabirds experienced die-offs in large numbers. Nearly 300 seals and 50 sea lions and walrus died between 2015-2019. Far north, on the remote island of Little Diomed, 39 walrus died in 2017. Necropsies on the gastrointestinal tract of walrus detected algal biotoxins (domoic acid and saxitoxin) which may have played a role in their passing. These biotoxins are the byproduct of harmful algal blooms (HABs) occurring in the warmer waters. The algae are consumed by filter feeding shellfish which then are eaten by the walrus where it could concentrate and potentially lead to death (Lefebvre, 2016). These HABs have also led to the closure of clam, oyster, and mussel harvesting, but the Chukchi and Beaufort Sea *Alexandrium catenella* cyst beds represent a new concern for the north. The Alaskan Harmful Algal Bloom Network and the Southeast Alaska Tribal Toxins (SEATT) partnership formed by the Sitka regional tribes represent some means for combating human impact from the HABs.

Bird “wrecks” have affected tens of thousands of Alaskan birds during the same period whose primary food are copepods and small fish. Auklets, murre, puffins, shearwater and more struggled to maintain not only their own body weight, but many have been unable to rear offspring. Postmortem and climate research have indicated that the failure of the murre population, some 62,000 birds, during the 2014-2016 years was from mass starvation that coincided with the Blob. The increasing temperatures pushed competing species, cod and pollock, into an “ectothermic vice” on forage species pushing resources into fierce scarcity leading to the die-offs (Piatt et al., 2020).

Impacts on Fishing: These die-offs are an important area of study since salmon, groundfish like cod and pollock, and marine mammals rely on the fatty, oil-rich fish that feed on plankton. Ecosystem research on key forage fish supports hypotheses related to high species mortality during the Blob and related to warming surface temperatures. A study on the Pacific sand lance, *Ammodytes personatus*, found the 2015 species cohort did not show lipid accumulations of cooler years, and the species in the 2016 cohort had 89% lower whole-body energy when compared to 2012-2014 cohorts (von Biela, 2019). These types of studies provide additional, essential information to understanding the interrelatedness of climate changes and trophic level declines as they relate to the entire ecosystem and the impact on rural fishing communities.

The warming surface temperatures and interrupted circulation has led to lower biomass and lesser quality the primary food sources of the economically important Pacific Cod (*Gadus macrocephalus*), a directed fishery that averaged ~\$168 million dollars in landings revenue annually from 2010-2019 (NOAA, 2022). The loss of food availability and lower prey quality for

juvenile fish, coupled with an increase in their metabolism due to warmer waters led to conditions that devastated their population. The Gulf of Alaska's Biennial bottom trawl survey revealed nearly absent younger year classes and 79% lower overall biomass in the annual trawl surveys in 2017 when compared to the 2013 results (NOAA, 2022). With few fish in recruitment, fisheries managers reduced the available federal total allowable catch (TAC) in 2018 by almost 80% resulting in an estimated economic loss of ~\$70 million dollars (ADFG, 2020). The governor of Alaska sent a letter to the federal agency to declare the fishery a disaster. Some 142 million pounds of pacific cod were landed in the Gulf of Alaska in 2017, but were cut down to 29 million pounds. The same year saw a decrease of 15% in the Bering Sea. Additional data during the following two years directed the North Pacific Fishery Management Council for the region to close the federal fishery altogether. 2021 did open a TAC for the Gulf of Alaska; however, concerns about the fishery loom and research on cod life cycles and climate change continue.

The change in ocean currents can also lead to potentially disastrous results. The United States National Oceanographic and Atmospheric Administration (NOAA) conducted the Gulf of Alaska Pollock Survey (*Gaidus chalcogramma*) and found an irregular abundance of juvenile fish, greater than any survey since 2000. Despite the high numbers, mortality was very high for the class year as indicated in the subsequent surveys. Research to better understand the phenomenon indicates that the shifting winds southwest from Kodiak and also down the Shelikof Strait led to an export of young fish due to transit by wind. This led to more juvenile fish, unable to combat the moving water in their youth, than could be supported by the copepod and lower quality euphausiid populations (NOAA, 2021).

2.4 - Preparations for Improvement: Systems Approach, Socio-Ecological Systems, and Vulnerabilities

2.4.1 - Systems Theory

The historical context of Alaska's fisheries gives rise to the regulatory processes that govern them, the current state of individuals in how they gain access to those fisheries, and provides a prologue as to how those systems are vulnerable. In this way the interrelatedness of these components can be understood as a web.

The whole system, all stakeholders, the components of change, and how those variables react must be understood in order to build resiliency within coastal communities. Systems theory, an interdisciplinary study of complex systems, to ecology and communities attempt to assess the mechanisms for changes within a defined area. The socio-ecological, socio-economic, and political couplings can be broken down into its constituent parts to determine what variables exist within a system, how those variables compliment one another, and then be used to inform how the pieces form the fully working system (Peterson, 2000). Studies utilizing such schemes investigate how environmental, policy decisions, and societal shifts affect overarching systems and the people within it. Fisheries encapsulates a system of people, markets, and the species within the ecosystem. Shifts that alter the dynamics of the systems can have results in areas like employment, cost of product, or increased pressure on stocks.

2.4.2 - People Ecology: Socio-ecological Systems

Still, measuring the overall system can miss the nuance of the individuals; thus, a “people ecology” lens might better fit (McCay, 1978). The concept of a people ecology puts emphasis on the unit of people as having adaptive capacity, and requires contextualization of the social, environmental, and political pressures that constrain their decision making. The work done in this paper illustrates how policy decisions affect communities and lead to the fishing peoples of the Fogo Island community responding to these choices. These communities did not see overharvesting issues having maintained smaller local access rights, until larger industrialized international vessels arrived in the 1970s nearly depleting the resource.

Like Alaska, requests for management brought in distant controls and management systems. Utilizing a systems approach, McCay illustrates how individuals reacted to a declining resource through two adaptive mechanisms, diversification and intensification. Diversification can be described as occupational pluralism, where the work of individuals might be spread temporally across multiple fields to make ends meet. Intensification may mean increased resource reliance and/or welfare supplementation. Additional management decisions to help populations adjust to fishery specific declines led to subsidies, which some resulted in the development of a new longline fishery, or resettlement funds to help people migrate out of the community. Those that intensified chased a declining resource, and for those who had increased their reliance, saw a second negative impact of policy choices. In either case, policy choices led to individuals measuring their inherent risk, making a decision to adapt, withdraw participation in the fishery, or simply leave altogether.

The paper provides early work that highlights important features relevant to Alaska’s position: adaptive strategies in response to policy decisions, and an attempt to identify and reconcile policy choices at the level of people in a systems approach. Both of these can function as guides for better systems and offer possible remedies to communities and the tragedies that have emerged from policy decisions.

Two more system approaches give some insight into tools to analyze the webs that coastal fishing communities take part in, and the decision-making processes within that web. These take additional measures to incorporate the human aspect into “socio-ecological systems” or SES. An effort to determine what the cause and effect of variables within Alaskan fisheries changes are outlined in Robards and Greenberg(2006) and Himes-Cornell and Hoelting (2015). Both note the complication and interrelatedness of the ecological, social, and policy decisions as demonstrated in the example in Figure 5. Their works are built upon modeling the socio-ecological systems (SES) for the evaluation. In their respective works, fisheries stocks change as a result of fishing and climate pressure so that the resulting effects to the communities can be measured as reactions to workforce participation, outmigration, or loss of economic output. . These are placed within global and local boundaries to explore the entanglement of the systems’ components. Of note, the movement of people is highlighted in Figure 5 as influenced by economic diversity, economic capital, and social capital, which suggest linkages the opportunities within Alaskan communities.

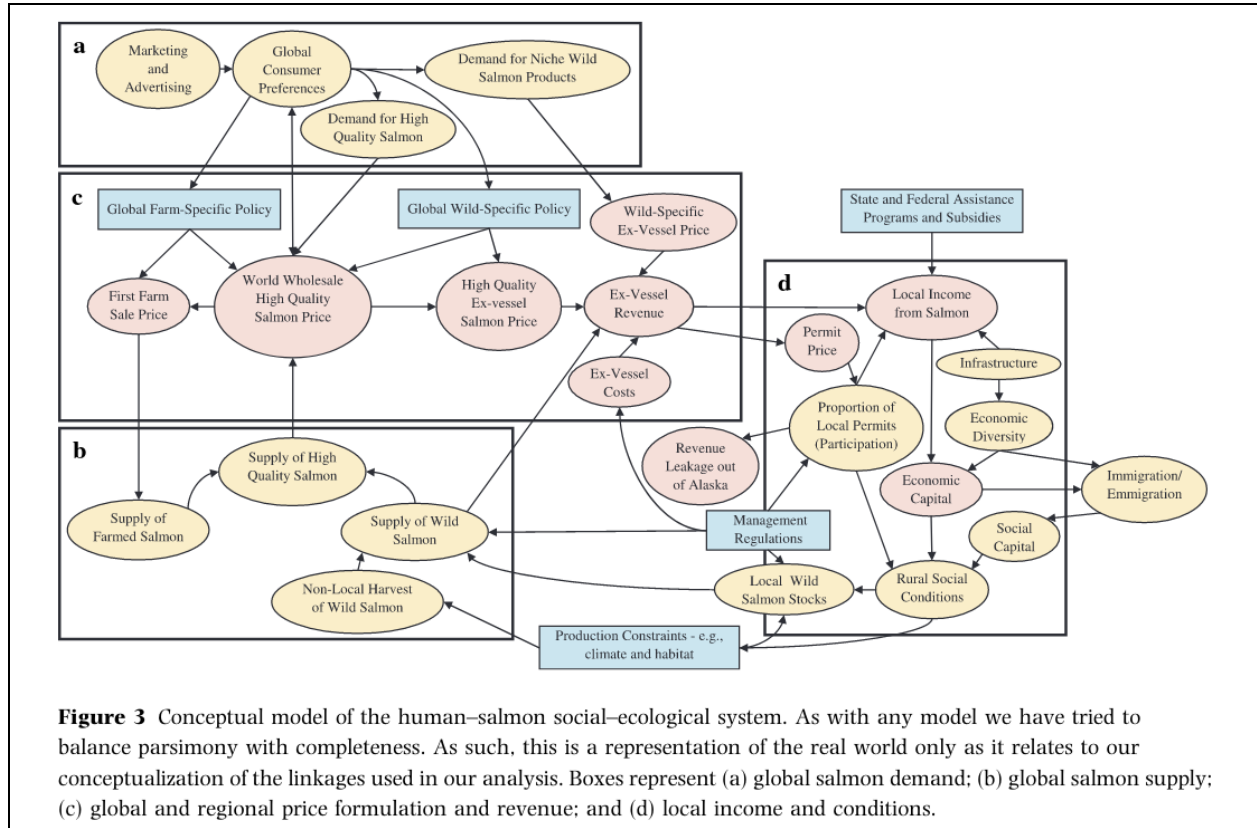


Figure 5 - Human-salmon Socio-ecological system (SES) Diagram. (Robards and Greenberg, 2006)

Knowing that events, influences, and decisions can cascade, have intertwined consequences, and feedback loops then it should be desired to find ways to mitigate or buffer negative impacts within the communities.

2.4.3 - Resilience

Foundations: At the most basic level resilience is just “capacity of a system, be it an individual, a forest, a city or an economy, to deal with change and continue to develop (Stockholm, 2022)”; however, as larger systemic approaches to resilience are concerned it is, “about how periods of gradual changes interact with abrupt changes, and the capacity of people, communities, societies, cultures to adapt or even transform into new development pathways in the face of dynamic change (Folke, 2016).” In a modeled socio-ecological/economic system, the components and the interactions they might take due to changes in variables are the focus of resilient efforts. In this context the goal should be both ecological and economic resilience so that communities can weather transient shocks and to adapt or transform when needed.

Resilience thinking touches on three main pillars in its aims: to persist, adapt, and transform. Persistence is steadfastness in the way of change. A persistent system involves barreling on ahead despite an interruption. As mentioned in the vulnerabilities section, adaptive capacity is the ability for a system to be able to react to change. Finally, transformation is the ability for the system to move into novel solutions in order to continue moving forward (Folke,

2016.) These three pieces of resilience are components to building coastal communities that are able to handle the ever increasing number of disruptions that face them.

Fisheries Resilience: Resilience thinking is supported in fisheries where complex systems face fisheries and those engaged in decision processes. By analyzing the historical context, human-ecological interactions, and policy decisions Peterson (2000) notes how the framework for resilience can outline and guide future efforts in managing the Columbia River Basin salmon fisheries. Most notably he links the requirement of a transdisciplinary approach to interpersonal, environmental, and political strategies employed in addressing such a complex system and the adaptive cycles that the Basin has already undergone. Similar work has been in Mozambique, where the analysis of two coastal fishing communities and under-represented members were examined for their durability in the face of change (Blythe, 2016). They implement a method for surveying their stakeholders in order to determine what their responses would be in the wake of hypothetical fishery declines. Much like Alaska, a heartfelt cultural connection sets the baseline for community resilience, and they conclude that the ultimate test of resilience will be whether this identity impedes the decisions to adapt where possible and transform when fishing must be abandoned (Blythe, 2016).

Criddle (2012) cites four examples of Alaskan fisheries whose socio-ecological systems analysis show they have been built upon sound policies, yet experience threats to their long-term resilience. The paper highlights salmon, Pacific halibut, pollock (*G. chalcogramma*), and crab fisheries. While AK salmon may be biologically sustainable, its economic sustainability is questionable as aquaculture eats into salmon profitability. Halibut has overcome economic and most of the ecological concerns, but recreational vs commercial IFQ politics and management threaten social sustainability. The mighty pollock is at risk from exogenous threats to the pollock market (demand, roe prices, ect.), rising fuel/operational costs, and potential residual capitalization. Crab resource and accessibility rights that pertain to catch/buy/sell have helped smooth over the social and political aspects, but volatile stock and the policy's consequential results have led to inflexible harvest/processing solutions which threaten economic resiliency of the remote island communities whose adaptive capacity is limited. The lens of resilience can help create the SES models which can help identify threats and vulnerabilities to guide conversations towards responses.

The coastal Alaskan communities that are highly salmon-dependent may be highly vulnerable as farmed salmon does not have catch limits and the technology to enable cost reductions is rapidly accelerating. Through the conceptual development of a socio-ecological systems model, see Figure 5, Robards and Greenberg (2006) explore the components of the SES and the kinds of perturbations and disruptions that can threaten them. They discuss the global supply (Chile and Norway comprising some 70% of the salmon supply in 2002), the global markets (changing preferences such as Japan moving away from wild-catch, having bought 3/4ths of Alaska's salmon from 1990-2003), and local impacts (salmon numbers, management, and community development) as comprising the dynamic environment of the SES. They conclude that the strongest drivers of their local livelihoods might be tied to too many factors external to the community. Options exist, while salmon farming and traps are constitutionally prohibited in Alaska, leadership from within the communities can help look at mechanisms to sustain what exists, diversify abilities, or consider transformative processes beyond the resource. Perhaps better put, "Therefore, for those committed to the place of community, finding

new economic options for trade (akin to resource switching) at times of hardship is at least in theory, a logical and necessary step towards maintaining social infra-structure (Robards and Greenberg, 2006).”

Applying Resilience to the SES: Having seen examples of resilience identification through socio-economic modeling, it is important to look at what mechanisms may increase resiliency in Alaska. Himes-Cornell and Hoelting (2015) identifies the loci for strategy at the community, individual, and SES level (Figure 6). The paper cites examples of mechanisms that can come from the government by way of permits, community entry systems, geographic right-of-way (landings, first right of refusal), and federal (NMFS) permitting. Examples of leveraging private and community tools through catch shares, financing, quota succession planning, and value chain improvements. However, despite these tools there is the long-term impact of climate change, regulatory actions, shifts in overall markets, and cultural changes. The determination of a community to act within their resources may ultimately not be enough, and, “evidence suggests that Alaskan fishing communities are in need of new resilience strategies to help counteract destabilizing shifts in large-scale variables.”

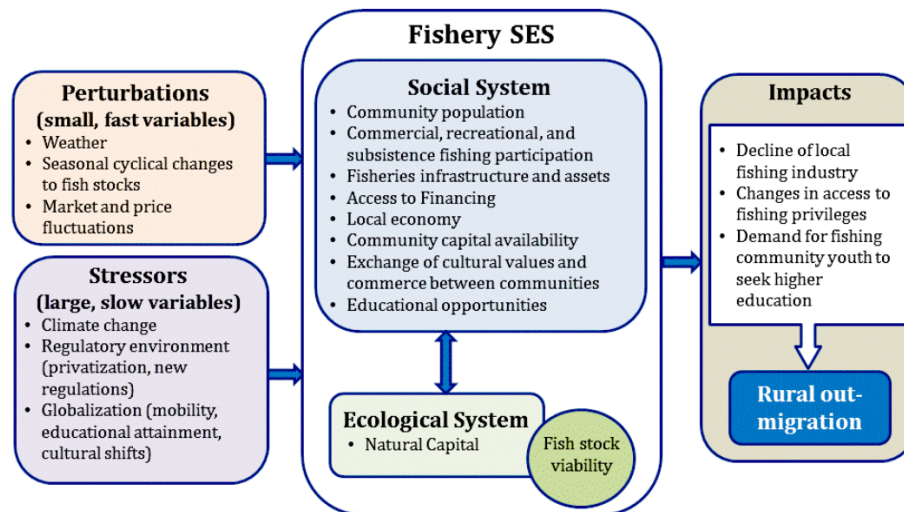


Figure 6 - Fisheries Socio-Ecological System (SES) Diagram. (Himes-Cornell and Hoelting, 2015)

In particular, the areas relevant to the question about educational-economic models should take note of how intervention in the communities can directly impact individuals’ workforce participation and resiliency. The use of systems-ecology, sustainability, and resiliency thinking, provide a pathway for untangling the human-environment interaction such that we can understand how disruption and policy changes can have cascading effects into coastal communities.

2.5 - Building Communities through the Individual: Methods and Existing Structures

2.5.1 - Capabilities and Careership

Capabilities Approach: In order to help build resiliency, the efforts of modeling an SES center requires direct focus on the human capacity to build upon the individuals within the

community. Capabilities approach is one such conceptual framework that helps identify the transformation of available resources into livable works. More specifically, “Whether someone can convert a set of means - resources and public goods - into a functioning (i.e., whether she has a particular capability) crucially depends on certain personal, sociopolitical, and environmental conditions, which, in the capability literature, are called ‘conversion factors.’” (Robeyns et al, 2021). The approach focuses on the ability to achieve rather than the freedom to do so.

This work, as devised by Sen, Naussbaum, and Anand, also helps to tie economic growth to human capacity rather than just GDP, a monolithic measurement of growth. This development grounds the United Nations use of the human development index to measure the well being of citizens within countries (Anand et al, 1994). The approach also can serve as the basis for how communities might achieve higher levels of resilience through greater and diversified achievement. Specifically, the concepts of human development and economic growth are tied such that when human development is invested in, economic growth tends to follow (Ranis, 2004).

Like other systems mapping and thinking, capabilities approach can be used to help visualize the existing scenario, barriers, and potential solutions to individual achievement. The created example in Figure 7, a route of educational (and nutritional) functionings is presented. Here, a lack of resources (e.g. quality schools), conversion factors (e.g. cultural norms), and freedoms within the capability set, their choices, are laid out to show what might be possible for an individual within their setting. Being able to identify what existing resources are available to Alaskan youth, conversion factors like the current cultural perceptions and social influence, and choices for applying their abilities towards may help provide a roadmap to coastal development.

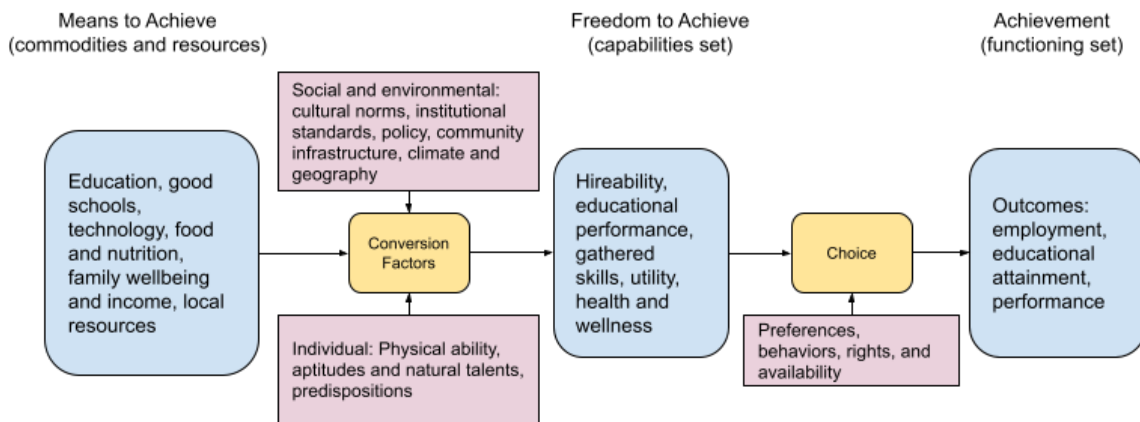


Figure 7 - Created example of a capabilities approach diagram.

Careership Theory: On its own, there is skepticism that the capabilities approach is a direct mechanism for career development, but a hybrid of approaches may work best (Robertson et al, 2018). Careership Theory is one more model that may aid in gathering the tools to assist our youth. The work done by Hodkinson and Sparkes (1997) examines how and

why people take on specific work pathways. Its efforts provide an additional angle to supplement why young people are not participating in their blue communities. Specifically, it notes that “Folk Theory” makes too many natural assumptions that jobs are merely selected as a rational, linear set of decision making processes that fills open positions.

Instead, it is a complex machinery that is influenced by many of the same variables found in the SES models and capabilities approach, and “everything takes place within a macro-context which has political, economic, cultural, geographical and historical dimensions. (Hodkison and Sparkes, 1997)” The influence of these complicated systems determines “horizons for action”, what can be seen and done by an individual based on their own habitus and experience. The work offers rational behind decision making processes and development of career paths. Both careership and capabilities approaches suggest analyzing what resources, influences, and choices are currently available to people, so that policy decisions enhance and support individuals and thus the community.

2.5.2 - Alaskan School Performance

Alaska’s school performance may be a larger indicator for whether or not existing a career program could be an effective tool for increasing success rates. High school, or secondary, graduation and dropout rates are one such tool for measuring how well schools are achieving. From 2014-2018 the Statewide rates of graduation are increasing while dropout rates are decreasing (AKDOE, 2018). Graduation rates are not homogenous throughout the State (Public School Review, 2022). Alaska, for its 132,589 students, has a median school enrollment of 426 students. Out of the 57 districts, 24 of them have less than the median enrollment. Of these lower enrollment schools that reported graduation rates, the average graduation rate was 59%. This is compared with 70% for those with enrollment above 426 (see table 2 below).

Alaska Department of Graduation Rates - AKDOE, 2018

School Year	Graduation Rate	Graduate Count	Dropout Rate	Dropout Count
2004-2005	61.40%	6,905	6.00%	3,791
2005-2006	61.60%	7,361	5.80%	3,642
2006-2007	63.00%	7,666	5.50%	3,434
2007-2008	62.60%	7,855	5.20%	3,232
2008-2009	67.50%	8,008	5.20%	3,146
2009-2010	67.40%	8,245	5.00%	2,990
2010-2011	68.00%	8,064	4.70%	2,779
2011-2012	69.60%	7,989	4.80%	2,830
2012-2013	71.80%	7,861	4.00%	2,364
2013-2014	71.10%	7,668	4.00%	2,303
2014-2015	75.6%	8,253	3.70%	2,141
2015-2016	76.1%	8,108	3.90%	2,268
2016-2017	78.20%	8,385	3.50%	2,003

AK DoE NOTES: There is often confusion between graduation rates and dropout rates. Dropout rates are event rates meaning they are calculated across a single year. The graduation rates are measures of cohort groups across four years. Dropout rates are calculated by dividing the total number of students dropping out of public school, in grades 7-12, by the October 1 enrollment count for all students in grades 7-12. Graduation rates and dropout rates are calculated independent from each other and are not the inverse of each other. Also, a student counted as a dropout in one reporting year may be counted as a dropout in another year.

Table 2 - Graduation Rates in Alaska. Adapted from Alaska Department of Education, 2018.

Figure 8 below shows the distribution of graduation rates versus the number of enrolled students. The largest coastal community, Kodiak has some 600 students within the borough. The general trend shows a decline in graduation in the kinds of smaller communities that define the coastal regions. Additional understanding of this trend might help determine if smaller schools simply suffer from a critical mass, if a lack of educational attainment requirements for local work is the norm, or that supplemental educational effort may be needed to bolster graduation rates.

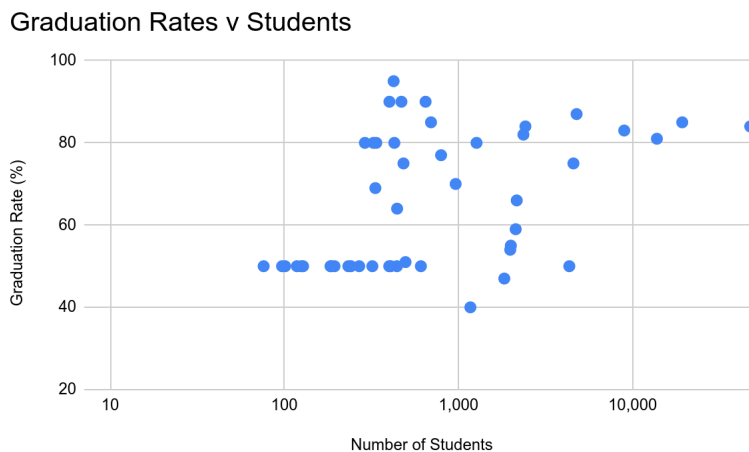


Figure 8 - Graduation Rates v Students. Graph produced from data from Public School Review, 2022.

Alaska has an abundance of training programs that are meeting a portion of the training needs to help people expand their individual faculties and join the workforce. The distribution, age ranges, and region of impact are somewhat limited and do not necessarily target young people while they are enrolled in their primary and secondary education. Table 3 below shows a small set of current existing programs within the State.

Existing Training Program Examples

Training Option	Target Areas	Age Group	Region
Alaska Longline Fishermen's Association's Crew Training Program	Primary Fisheries Sector	18+	AK - recruiting membership abroad
Alaska Maritime Education Consortium (AMEC) - multiple programs, multiple partners	All sectors	18+	Programs through regional institutions
Alaska Works Partnership Inc.	Secondary and Tertiary Sectors	16+	Anchorage, AK
AVTEC Alaska Maritime Training Center (AMTC)	All sectors	18+	Primary facility - Seward, AK
Bristol Bay Economic Development Corporation - multiple programs	All sectors	13+	Bristol Bay Communities
Bristol Bay Native Association - Crew Class / i-Fish	Primary Fisheries Sector	13+	Bristol Bay Native Association
King Tech High School	Tertiary	16+	Anchorage, AK
Mariculture Resource Training Center	Primary and Secondary	TBD	TBD
UA Kodiak College Workforce Training	All sectors	18+ (16 KHS)	Kodiak, AK
Workforce Innovation and Opportunity Act (WIOA) Youth program	Services for youth development	14+	Alaska-wide
Yukon Delta Fisheries Development Association - Fisheries Program (joint)	All sectors	13+	Yukon-Kuskokwim Delta

Table 3 - Small selection of current existing programs in Alaska as of 2022.

Given the shape of the current socio-ecological systems that Alaskan the the coastal communities make up and the notion of economic development through educational efforts to provide resiliency, the current scope of these schools is on the right track. However, the distribution of the schools, aims of the programs, and the age groups they target, show that there is a gap for addressing a broader audience of youth for career development.

2.6 - Iceland School as Inspiration

2.6.1 - Similarities in Resource History

Iceland shares not only similar marine resources and arctic oceanographic influences, but also has a similar history of changes to fishing practices in the 20th century. Where original forms of employment and provisioning may have come from a diverse set of works or needs tied to opportunity there were shifts in livelihoods as fisheries were industrialized (Kristjánsson 1985). Like the United States, in 1975 it extended its EEZ and domestication of its fisheries, but differently, it did sign the United Nations Convention on the Law of the Sea in 1982. While capelin and herring had been managed with quota prior to changes in management, the Fisheries Management Act, signed in 1990, developed their individually managed quota (ITQ/IFQ) system. These systems had similar effects on rural communities where disparate access to capital led to consolidation, outmigration, export of raw product, and quota consolidated away from rural owners whose effects were also felt in employment numbers in supporting industries (Pálsson and Helgason 1995) which can be seen in Figure 9. Similarly, community interviews conducted in the study indicate that youth perceive the fishing industry as an area that may be out of reach, or, from the perspective of older generations, few want to participate (Chambers et. al, 2017). These, in combination with rapid technological advances, set the stage akin to that of the Alaskan situation.



Figure 9 - "Skagaströnd population changes vs major fisheries-related events (Chambers et. al, 2017).

2.6.2 - The Fisheries School

One approach to encouraging young people to participate in careers within their blue communities is the Sjárútvægsskólinn, "the fisheries school." In an attempt to reconcile declining exposure and access into the fisheries sector, the University of Akureyri (UNAK) forged partnerships with local communities and industry. The primary mission of the school, which has now operated for 8 years, growing rapidly in the last 3, is to inspire communities to work together with industry in order to provide education and exposure to help inspire young people to live, find new opportunities, and thrive in their coastal communities.

Students: Part of what the school operates on is a larger focus on existing earlier youth-work-civic engagement programs. This is a program, guaranteed under Icelandic law, to provide access to community work to youth in age 13-15 are eligible. This country-wide program grants the right to work within their community for minimum wage, few weeks, every summer, from the community funds to get them engaged.

The Sjávarútvegsskólinn is intended to target children in this age group, which has amounted to some 300 students within the participating municipalities (see Figure 11). Around the rural coastal areas, this may be 12-20 students in a one week course at each site. Due to the openness of the school, almost 100% of their students get to participate; however, Reykjavik, the capital and largest city, had to select 100 students due to the high level of interest. As part of this selection process they targeted older (15-16) students since they are closer to joining their higher level of education, and this program could help them decide what they want to learn or do.



Figure 10 - Engagement with a cod at the Sjávarútvegsskólinn. (UNAK, 2022).

The Teachers: University undergraduate students studying fisheries science, natural resource science, and biotechnology are the primary educators for the Sjávarútvegsskólinn. This opportunity is sold to students as a way to learn more and gain teaching experience. These university students get a uniquely experiential summer job: they practice presenting, gain soft skills, garner feedback and training they might not get otherwise, and by participating they get an opportunity to meet potential employers. These students are hand selected by their professors (due to the close-knit nature of the university) for their interest in their communities, knowledge of the material, and engagement within the program. These “student “ teachers go through roughly 1-2 weeks of preparatory work, program building, and training to gain the skill sets necessary to engage with the fishery school’s pupils. Previous student teachers engage and help train other university students which allows for buy-in, peer-to-peer bonding, and multiple levels of learning and engagement throughout the university program. Students will use what they have learned from their classes and create the materials, and supervising experts and professors approve their materials and methods. The student summer semester is 3 months, roughly 12 weeks during which the school operates a 10 week teaching season in various communities depending on local enrollment. Part of this design is that the school has found that these younger university students have more insight, “withitness”, and familiarity to better engage with young people than traditional teachers or professors the pupils encounter during their regular school year. Two of these student teachers lead each community training.



Figure 11 - Map of participating communities in the Icelandic School in 2019.

2.6.3 - Creation of the School

The original program was created by a former University of Akureyri fisheries science graduate. Having graduated and returned home to work in industry, the individual reflected on their experience, changes in the community, they recognized that young people even as young as 11 used to be able to have a role, exposure, work, on the docks near their homes. Changes and shifts due to production and efficiency, safety, quality controls, and regulations have reduced the ability for young people to participate in the ocean food systems. They recognized the lack of exposure because industry is in “closed buildings.”

This person wanted to use their experience and schooling to benefit their community by educating young people and providing them with this exposure. Following the work of the youth work program, he contacted his local municipality and wanted to borrow the time and efforts of young people and plug them into their fisheries. This communication was well received and was started. Communities utilized their work stipends, and industry participants provided them with food, experiences, and transportation. Students had the opportunity to do onsite visits, following all the necessary safety precautions, and got to see first hand what was being missed with the shifts in fisheries.

This happened for two summers before neighboring communities started asking to participate. The initial program had outgrown the phone and handshake agreements, so he sought university support. Together, they looked at primary, secondary, and tertiary industries within the covered regions. Quickly, 2 communities grew to 5, and smaller east Icelandic communities were included. North Iceland followed suit after they conducted their own community surveys and spoke with local leaders who desired to include their students in the program. With increased enrollment, it took 9 weeks to fit all Akureyri’s youth participants. In

North Iceland there are a few limitations and program exceptions due to lack of industry financial support. The wages of university students' summer work, travel, lodging, and food for all university students and young people are covered by industry under their current implementation. Businesses were initially called or visited in person to solicit their participation and support into the school, and prior each subsequent year they were consulted with to discuss costs, payments, and student/industry participation (see table 4 for some participating industries).

Examples of Companies Participating with the Fisheries School.

Company	Industry
Eskja	Harvesting, Processing
Fóðurverksmiðjan Laxá	Feedmill - Aquaculture and pets
GPG	Harvesting, Processing
Gullberg-Síldarvinnslan	Fish processing
HB Grandi	Fish processing
Kælismiðjan Frost	Refrigeration
Loðnuvinnslan	Fish processing
Samherji	Harvesting, Processing
Síldarvinnslan	Harvesting, Processing
Slippurinn	Processing Equipment
Skinney-Þinganes	Harvesting, Processing
Rafeyri	Electrical Engineering, Services
Raftákn	Electrical Engineering, Services

Table 4 - List of just some of the participating industries in the Icelandic School.

2.6.4 - Curriculum

Since the school engages with young people, the program tries to make it as engaging as possible with fewer worksheets, books, and slideshows than they might regularly see. This includes many videos and figures of the industries, concepts, and people actively involved in their fields. The “lecture” portion of the class is from 9-12: training, Q&A, team building, quizzes, and competitive games are used to teach about the materials. Using multiple-levels of education, praxis, the students are prepped to visit in the afternoons, after lunch. After five days they’re done with school and ready for the weekend.

The school makes an attempt to cover all of the work and career possibilities in as many places within Iceland’s blue economy and blue adjacent as possible, but it does inform about the geographic locality of what is currently available. The background information is covered in introductions and discussions on quota systems, fisheries, whaling, tourism, processing, technology, and biotechnology. It dives as deep as touching on raw materials, products, markets and sustainability, and is as visionary to talk about potential futures and the world to come.

Discussions about the curriculum attempts to be as encompassing as possible in order to meet communities, industries, and students where they are. This multi-stakeholder engagement helps to determine what are each of their areas of immediate need while still remaining fluid and relevant as markets, industries, and technologies are ever changing. The program looks at

the entrepreneurial and nascent developments as part of this effort. This includes looking at some of the more high-tech work (biotech/tech) in development where nutraceuticals, pharmaceuticals, and other high value add products that could be created and remain within Iceland.

2.6.5 - Future of the School

The success of the school has led to conversations to grow the program's depth and breadth. The Fisheries School expanded to creating "The Aquaculture School" in areas where aquaculture is practiced and available geographically, mainly East and West Iceland. Similarly, businesses working with the municipality of Vestmannaeyjar are collaborating with UNAK to develop a Biotechnology Summer School in South Iceland.

Beyond the borders of Iceland there are discussions for the Icelandic Schools to partner with the EU/EC and adapt it to fit within their "mobility program" to allow students and professors to apply to move between locations. This would allow them to have an exchange for students and work to develop a larger, more diverse, and integrated program. University of Algarve in Portugal is cooperating with UNAK on a "school" of their own, suited to their specific needs. Likewise, collaboration in a 3-yr Erasmus+ project, run by Norway, based on the Icelandic model, with the long term aim to encourage improved vocational education in aquaculture in the Nordic countries. The expansion of the program suggests that much of what they are doing is working, garnering new interest, and could provide Alaska with a model to follow.

2.7 - Specific Aims and Research Questions

1. How do current stakeholders perceive the current economic conditions of their coastal communities?
 - a. What do community leaders see as their leading problems?
 - b. Their solutions?
2. Is there a demand in Alaska for this type of program?
 - a. Do students have an interest in participating?
 - b. Does industry have an interest in participating?

3 - Research Methods

This study utilized two tools to approach the research questions pertaining to the current perception of the economic state of rural Alaskan fishing communities. The use of interviews and surveys constitute a qualitative mixed-methods approach to the project (Beaudry & Miller, 2016). The first element consists of informal interviews with key informants and stakeholders to help identify themes within the blue communities and economy as to how they perceive their subject matter, their locality, the future of the career availability around them, and the areas they would prefer an educational program to address. In the second, surveys were conducted to poll industry sectors for their opinions about hiring practices, the hiring forecast of their sector, and whether or not the program could benefit their business. Student surveys were conducted to poll 18 year olds, or older, about their perceptions of careers available and career development.

With the small number of participants available, sampling was non-random and combined snowball and voluntary sampling methods. The snowball and volunteer sampling techniques involved identification of a few potential key stakeholders and their recommendation or dispersion of the participation opportunity to willing, legal adults that fit the profile of applicable research subjects (Beaudry & Miller, 2016).

This project's research methods have been reviewed by the University of New England Institutional Review Board (IRB), and was designated exempted from IRB oversight. All subjects participating in the research have been provided anonymity or confidentiality, and were over the age of 18 prior to their participation.

3.1 - Interviews

Following extensive background reading on the employment context, climate change, and economics with regards to rural fishing communities, five semi-structured interviews were conducted in person, by phone, or using video conferencing tools. These took place from 2022/03/30 until 04/23. Initial key stakeholders/informants were chosen from prior knowledge, discovery via background research, or from snowballing. These five interviewees represent subject matter experts in their communities, fishing industry, processing, advocacy, and businesses and economics.

All individuals were interviewed independently and ensured confidentiality for the information provided. The interview durations ran from 20 minutes to an hour. The interviews began with Likert prompts which were used to create dialog for the open answer, semi-structure section of the interview. The Likert scale utilized a 5 point system (strongly disagree, disagree, neutral, agree, strongly agree) which provides a simple way to categorize their feelings and perspectives. This scaffolding allows for guided, yet unrestrained information gathering. Interviews were not recorded for the sake of confidentiality, but summary notes were transcribed and provided back to the interviewee upon request. The questions were fairly broad and allowed participant interpretation to allow for natural conversation and exploration of themes. The interview instrument is in Appendix C.

3.2 - Surveys

3.2.1 - Industry Survey

From 2022/03-30-04/29 industry surveys were conducted in the selected Alaskan communities of Sand Point and Kodiak. After combing through the background information on the fishing industry, primary and secondary job sectors as per NAICS, and key components to the Icelandic “Fisheries and Aquaculture Schools”, a set of specific industries that contribute to rural fishing communities and the “blue economy” were selected. These groups are informative to determine their training needs, hiring practices, and likelihood of participation in and around the design of educational programs for young people to learn about those industries. Questions were multiple choice for field identification and used Likert scale statements to gather opinions about pertinent community questions.

Industries were selected opportunistically from the available workforce information in each region. Seven interviewees were offered to either use the online survey form or have it read to them and then data was collected over the phone by the researcher. The industry survey instrument is in Appendix D.

3.2.2 - Student Survey

From 2022/03-30-04/29 student surveys were conducted in the selected Alaskan communities of Sand Point and Kodiak. Surveys were entirely voluntary and required that the student participants be from the designated communities and at least 18 years of age and enrolled in high school. Eleven students were provided a set of multiple choice and Likert scale questions that asked about their knowledge of the career field, the desire to learn about local “blue” careers, and interest in participating in a career development program. The student survey instrument is in Appendix E.

3.3 - Data Analysis

Data analysis was conducted for interviews in order to pull out thematic information. Transcription summaries from the interviews were initially read, and, due to their semi-structured nature, were structurally coded by the questions presented to the participants. A second pass through was conducted using inductive coding to identify codes from the ground up. This pass used an open coding method to break respondent conversations into new, discrete parts. Interview participants may have been emphasized or repeated by the participant which led to axial, or connected coding (Delve Tool, 2022). At this stage, codes from across the individual interviews were sorted and categorized, and finally linked by thematic importance using the structure of the interview questions. These themes are summarized in the results section.

4 - Results

4.1 - Alaskan Community Interviews

The community interviews were transcribed into summaries for additional examination. These summaries were then codified into each conversation's main points. The word cloud in Figure 7 was built from the interview codes, lemmatized (truncates to root words) them, and then displays the words based on frequency. It is simply a unique visual that highlights some of the discussions from the research.



Figure 12 - Word cloud of interview codes.

Five interviews support the main body of research in this study. These individuals comprise subject matter experts in their communities for the fishing vessels, processing, advocacy, and business and economics. Interviews started with two Likert-scale questions to help prime discussions about local communities, the “blue economy”, barriers and threats, the

future of those areas as participants saw them, and desired properties of a school program. 60% of respondents disagreed with the categorization that the state of the “local” economy is strong, and 100% considered an educational program for local youth to be beneficial.

These participants noted that their opinions reflect their best knowledge of their areas, but Alaska, “is not monolithic and communities are not homogenous.” The parent themes from the interviews come from the questions asked regarding current economic opportunities within their community, barriers, recommendations, predictions about the future of their subject area, and thoughts on what an educational career development program needs to look like to best benefit their region. The initial opinions regarding their opinion of the state of their local economy and whether they believed an educational program might benefit the community are in figure 13.

Likert - Interview Opinions

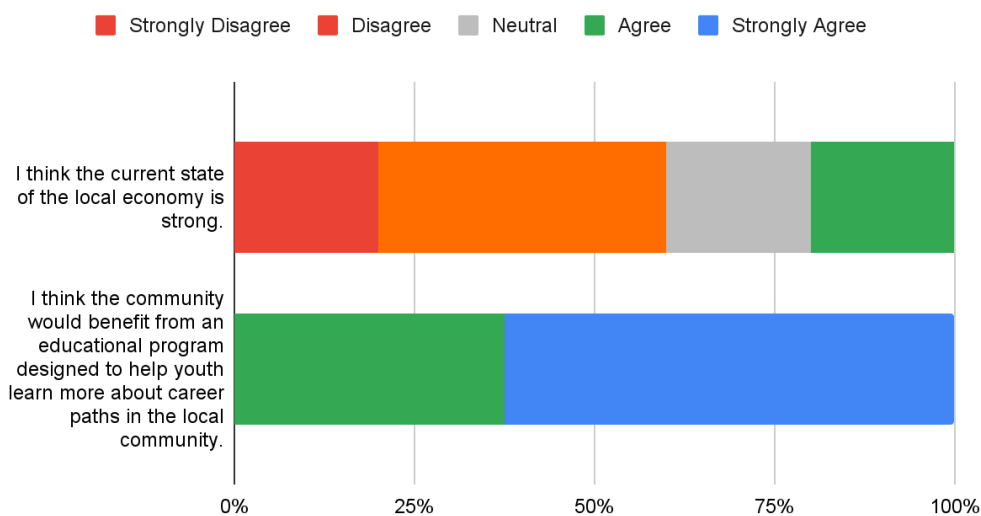


Figure 13 - Interview opinions graph (n=5)

4.1.1 Current Opportunities

All respondents communicated their belief that opportunities are available to young people within their community; however, the degree to which they felt it was readily accessible varied highly between the respondents. Consistently, interviewees discussed that there are job openings either in their direct or adjacent fields. Most felt that despite disruptions to normal activities - specific to the case of specific fisheries shocks - that the fisheries were relatively stable.

Participants from or representing the secondary industries (ie. processing and product transportation) cited a need for support roles in the processing sector. These were purported to represent specialty trade and vocational fields that include electricians, Baader technicians, mechanics, refrigerant technicians, and others whose typical off “road-system” positions have a median wage upwards of \$25/hour (\$50k USD salary equivalent). These tend to demand more within the fishing and processing industry due to its time-sensitive and isolated/remote nature (BLS-OES, 2022). Management and leadership roles within the processing and support roles are also in need as large numbers of seasonal or “outside” (non-resident) workers fill typical

“filet-line” type positions during peak operations.

In the tertiary, support sectors, a number of businesses are looking to fill a wide set of positions across nearly all fields. These overlap with the processing sector in terms of the requirements and vocational attributes, but are usually separate from the processing entities themselves. Local fabrication, repair, maintenance, and construction businesses have an “abundance” of vacancies and are struggling to keep these roles filled. Anecdotally, it was stated that local talent tends to stay longer, and this is something respondents are keen to capitalize on when it is available - a recurring theme across all job sectors.

Beyond the fisheries of the coastal areas, the communities must also provide for the needs of all citizens and transient participants. This means employment within village utilities and administrative services, education, healthcare, and retail. Two participants noted a number of small businesses with open positions, going up for sale, or simply closing. They both continued to add opinions about long-standing vacancies within healthcare and education. Kodiak in particular is seeing a population growth which will require more of the non-coastal specific elements.

4.1.2 - Barriers

Big Picture Issues: Respondents were able to provide their opinions on current situational factors that are impeding development within their respective areas. High-level threads from respondents were concerns about economic and political uncertainty, COVID-19, and drug use. 3 out of 5 participants cited COVID and drugs, and 40% cited regulatory instability. COVID and the latest wave of drug issues are new and, hopefully, transitory issues that interviewees have reported disrupted hiring practices, how business is conducted, and the wellbeing of people in their regions. COVID and drug-use share an unfortunate similarity in the maritime and maritime-adjacent industries in that positive tests result in suspension of employment until the individual is able to provide negative test results. The scientific management piece for some of these fisheries comes from surveys, research expeditions that gather sample data for stock assessment, which did not occur due to COVID according to an interviewee. This meant management was working from historic data, and thus the regional bodies were opting for conservative harvesting practices. Participants cited that the combination of interruptions and unknown consequences of these shared issues have led to businesses shutting down, failing to keep positions filled, and financial losses.

Graying Out: Another shared concern is that of the aging or “graying out” of certain positions or skill sets across all sectors. Every interviewee cited specific examples and worries about the loss of talent or institutional knowledge with a lack of means to train or backfill. Certain members noted how in highly-specific roles or in “critical” positions or regions where there is no redundancy that this could be “catastrophic” if a community was unable to provide those necessary services. One noted that they believed there may need to be a cultural or community-wide decision to discuss how to address this issue before it came to a head. They made a note that too young and inexperienced, and the individual may not be able to train new prospects; too old and they may not have the interest, energy, or inclination to provide new entrants with those skills. “They’re too tired and grumpy to teach anyone.”

Remote: Remote work, something reinforced with COVID, has made the ability for someone to do work for a location while living in another. Respondents noted that not only does

this allow for many non-hands-on support roles to be filled from outside the region, but that what could be an opportunity may be a hindrance. Remote work was often coupled in discussions with the notion of being “enticed” by the “cities” and the “lower 48”, where amenities, comforts, and other attractions might lure youth away from the more isolated nature of remote, coastal living. In addition to technologies enabling remote work, the levels of educational attainment required to work technologically sophisticated roles means requiring more availability of that tech-ed. It was noted that there tends to be a local gap in having the technical experts to both fulfill (service) and to provide training for certain existing needs and planning for future ones.

Costs and Housing: The cost of doing business, dealing with the road system, and the reality of rising costs from both the state of inflation and point-source increases plays into all aspects of the communities. Half of the respondents mentioned costs as a barrier to economic growth within the community. Within the primary sector of the fishing industry this is driven by upfront capital costs and fuel costs. Fuel fluctuations, as it pertains to sustainability/resiliency, can send shockwaves into the subsequent sectors if the marginal cost of fuel outweighs the benefit to harvest. Additionally, the citizens of an area feel the micro-economic effects of demand as these isolated locations have even more limited access to goods and services. The rising housing costs are more severe in the off-road communities. Two participants stated direct concerns about the housing market. Kodiak may experience new housing demand as “off-island workers are sourced, and the Coast Guard is looking to increase their presence in the Arctic. This in turn will require more workers to fill already vacant positions, further increasing housing demand.

Distances: The physical size of Alaska, the remoteness of coastal communities, and competing interests of Alaska pose unique challenges as well. Participants discussed certain “tension” and “animosity” towards one another. Some of the historic concerns have been mineral extraction versus the fishing industry; however, infighting among the fishing sectors (fisheries, gear types, etc.) is not uncommon. One such example given was that between “draggers”, the large trawl-vessel sector, and fixed gear vessels. Similarly, the pollock vessel fleet has been under pressure from the salmon harvesting groups for what is perceived to be high levels of salmon bycatch in the fishery. These interests make it difficult to bring parties to the table to help work on similar projects. This problem can also be viewed from a geographic lens when comparing the divisions of state, federal, and grant pools of funds. This is compounded when, as participants noted, political processes may worsen, convolute, or not exist with issues. As one interviewee pointed out, **“we are consistently underestimating how far apart stakeholders are.”** Despite the physical and metaphorical distances between Alaskans, the interests shared are similar, and should be addressed together.

4.1.3 - Recommendations from the Community

Strategy: Participants provided their opinions about what they would hope to achieve for their communities and their recommendations. A common thread across all participants was the notion of needing a strategic vision or plan to deal with the issues - formulating something that looks several years out. Some suggested polling or opinion gathering in order to categorize the issues from the people that experience them. They indicated that collaboration is an

essential component for solving these wicked problems regarding the economic well being of their communities.

Inviting Communities: Three participants noted that well-being should be enhanced by the amenities within the communities - that these should be a part of enhancement discussions. These would be improvements like walking paths, communal areas, food and culture, and attractions that make a city vibrant. Kodiak is planning upgrades for the St. Paul Harbor with hopes that it keeps and invites new people into the community. The creation of places that people desire to go ties lightly into tourism, where the environment and landscape of Alaska should be a utility promoted by the areas they serve. The ability to attract new people, in addition to keeping or encouraging current residents, plays into a comment about Alaska requiring recruiting “outside” talent as the internal energies of the state may not be enough to help push it towards more positive outcomes.

Pay: There seems to be some concern about wages and pay for jobs within their communities. Two said that there was an abundance of well paying jobs, while two others believed there may not be a financial incentive to bring people to their towns. Moreover, an interviewee suggested that there was a disconnect between solicitations for work, pay advertised, and the pay being given upon hiring. Given the high cost of living being cited as a barrier to employment, this may be an area for further investigation. A relevant recommendation was to help promote local jobs through job fairs, and providing workshops to help align openings with people possessing those skills. One specific workshop suggested was a disconnect between job posters and resumes.

Build Local: A recurring theme amongst the group was the notion of local accessibility. This had breadth in its meaning, but overall this meant having resources available to the young people on the island. Big cities and the “lower 48” might have density and locations that could offer more exposure, training or career-oriented prospects, or educational programs that Alaskan coastal communities do not. All participants suggested helping provide “local opportunities” for personal growth to young people, so that they could learn within their community. In this vein, investing in infrastructure was posited as one mechanism for addressing this issue - the cost barriers for physical development and for people to venture outside their towns can be prohibitive for people to invest in themselves. One interview led to the proposal of a potential solution to the capacity of these communities’ limited resources; the option for collaboration with the Alaskan university systems. They commented that the lack of human and structural stability within an area can be buffered by the institutional faculties of the universities. These institutions are established, are education-focused, and have access to a multitude of funding sources to help weather most shocks.

4.1.4 - Sages and Soothsayers

Graying Out Again: Respondents were asked to describe the future in their respective domains and regions as per their knowledge and experience. Participants indicated that “graying out” is rapidly approaching, and that good paying jobs are about to open up whether or not they have the training, experience, or desire to fill them. One point of concern was that young people “do not want to do the hard work” within the harvesting sector or other laborious positions. The reliance on individuals’ availability to juggle work and have the energy or the willingness to relinquish their efforts in a way that encourages healthy succession was noted by

two interviews. The notion of aging is a persistent topic within the state that comes with a contentious set of opinions as to the cause.

Education: One disparate point of concern from the interviewees was found within the prospect of education and training. Kodiak has a sufficient number of students to receive state funding for their schools. Sand Point Alaska, has fallen below 100 students in 2022 and relies on a small section of federal funds and then requires the municipality, Aleutians East Borough, to pay for the rest. The respondent elaborated that with shocks to fisheries, this means the school may have inconsistent funding due to the nature of the tax system that provides resources to the community. The structure gathers most of its income from the landing tax, a rate that works on how many pounds of fish are landed within the Borough. This information is consistent with the literature about Sand Point's vulnerabilities (Lavoie et al., 2000). Continuing, with Climate Change having dramatic effects on the location and abundance of pollock, the winter "A-Season" has left the local processing facility closed. Kodiak, as indicated by another interviewee, is faring somewhat better as the grant fostered by one of Alaska's senators will help by providing a school to train and upgrade the processing facilities there. The local high school on the island also incorporates the community college to help students get dual-credits or plan for vocational certifications.

Technology: The T3 Program, "teaching through technology", has been implemented in Cordova, Kotzebue, and soon in Valdez. The program offers youth the opportunity to participate in a "full circle" approach to solving problems. Within the program, students have the potential to identify an issue, learn to write and apply for a microgrant, develop an implementation plan, and execute their ideas. The program supports students through the use of technology by addressing today's issues with tomorrow's solutions, as well as leveraging existing technology to help children gain a footing in STEM (science, technology, engineering, and math) fields. The interviewee said this kind of program is essential in the blue economy where fisheries, processing, mariculture, and support fields are all seeing substantial growth in the use of technology and automation. These students graduate with these needed skills. Other industry representatives echoed the sentiments that technology and computing are key to the higher level roles within their jobs, and that highly manual tasks in the processing field will require skilled knowledge of the machines that are starting to fill newer facilities.

Mariculture: With maricultural leases and ventures hot on the rise in Alaska, respondents noted positive hopes for development in their coastal zones. A common theme was that there is a lot of seasonality within the economies of their communities. It was posited that mariculture could help round out the jobs between seasons for young people willing to take on those kinds of roles. For some types of fishing, seaweed fills in the gap when salmon is down. They believe this pairing could entice people to stay when, "coming up for less \$40k just doesn't make ends meet." A processing representative points out that because fishing seasons are geographic in nature, many processors are more than willing to have people hop from site to site. They too are looking at the future of mariculture within the state.

4.1.5 - Suggestions for an Educational Program

Collaboration, Local Voices: The most commonly shared themes were ones of collaboration, community input and mediation, and building of "pathways" or "exit ramps".

These communication-themed suggestions address the need to ensure that the large body of potential stakeholders work together. As mentioned in the barriers section, competing interests may very well be invested in the same goals at the level of youth education. These parties have a vested interest in the success of their future constituents, employees, and peers. Most participants noted that unique and specific issues should come from local voices whose wants and needs should be heard to form the basis of the program. Their hope for the key function of this program would be one that helps expose and inform younger minds so that they may find a way to go from textbook to livelihood.

Blue Core: The group did suggest that there be a “core” of the local blue community as the curriculum. This could be accomplished by providing insight to the areas, people, and careers available around them through field trips, visits from seasoned professionals, and experiential learning. One supposition for marginal youth engagement might come from their lack of experience and exposure to the jobs available. This individual continued, there should be a goal of being able to celebrate communities and the identity of their people to bolster positive opinions and attitudes. Several elaborations on the curriculum expressed desires to ensure that it included not just “fishing and processing”, but the support roles, specialty trades/vocations, and mariculture. They discussed “well roundedness” to help catch all of the different potentials young people have in order to appeal to “all careers in all places”, “not just college”. One individual wanted to see what potentially new business that could come about, citing mining (Apollo on the neighboring Unga Island), tourism, and all of the changes to a city that would be required as in Sand Point.

Well-roundedness: The latter set of ideas ties into the “future proofing” aspect of the school that should be looking to the future. What are the jobs of tomorrow? How will technology and automation disrupt coastal, rural communities? In a good way or a bad one? Can these techniques be used in the school? Interviewees requested some basic soft-skills like understanding money and budgets, writing resumes, and applying and interviewing for jobs to help students move forward wherever they want to go.

4.2 - Alaskan Community Surveys

4.2.1 - Industry Survey Results

An opportunistic sampling of industry members from the primary, secondary, and tertiary fishery (potentially aquaculture) sectors were selected from representative organizations within the communities. Seven respondents were able to provide input for this research at this time and typify the communal feelings without the need of wider polling. Industry survey respondents provided the opinion of ease and status on their current hiring, preference on hiring (local or otherwise), and the minimum educational attainment requirements in order to work in their field or within companies’ various positions. The graphs in figures 14, 15, and 16 illustrate the Likert results, educational attainment requirements, and current hiring status.

Likert - Community Industry Survey

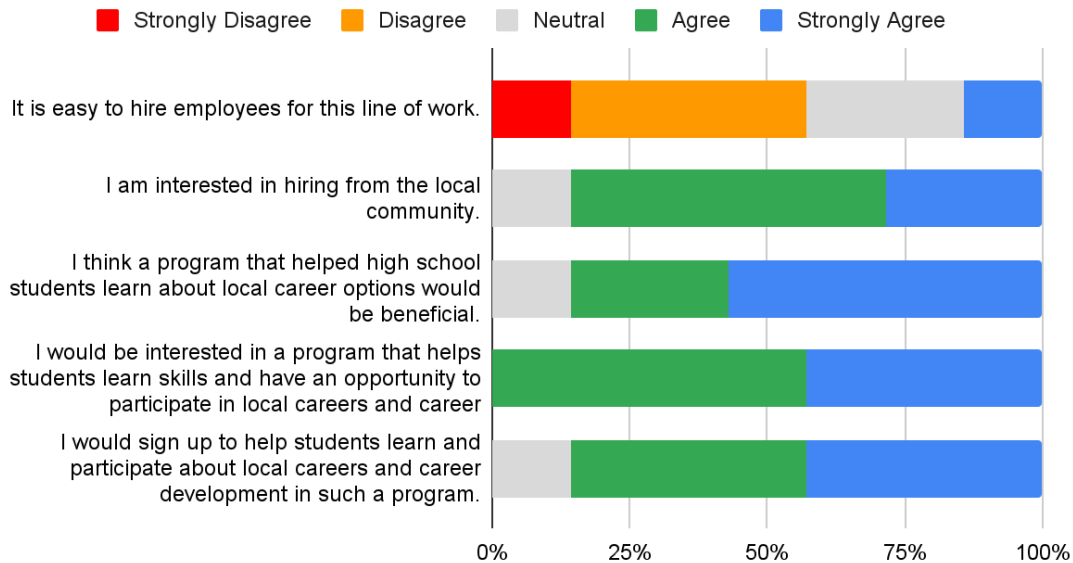


Figure 14 - Likert graph of community industry survey (n=7)

More than 85% of respondents stated they are either neutral or have difficulty hiring for their positions. More than 85% of respondents indicated preference for hiring locally. Information provided outside of the survey instrument from those indicating this preference stated this was due to the longevity of local hires where “isolation” was thematically associated with employee departure. More than 85% of respondents thought a program that helped local young people learn about careers would be helpful, with more than 50% strongly agreeing. 100% of the participants agreed or strongly agreed with the statement regarding interest in a program, and 6 out of 7 respondents indicated that they would be willing to participate in the program.

Educational Attainment Required - Multiple Selected if Multiple Positions at Employer

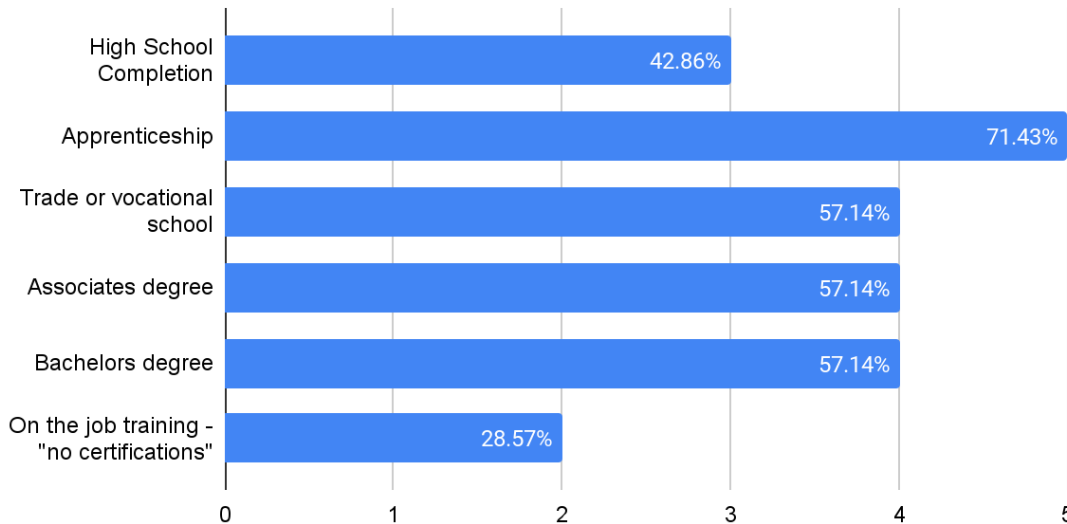


Figure 15 - Educational attainment required as per industry survey responses (n=7)

The hiring requirements vary between businesses; however, trends indicated specialty trades required certifications (ex. refrigeration) or apprenticeships in order to work those positions. As reported outside of the survey instruments, some of these included supplementary certifications like HAZWOPER, first aid, and OSHA training. Many businesses reported that they have positions that include “on the job training”, where high-school graduation is not required, all the way up to requirements for postsecondary and graduate-level education.

The question about hiring practices indicates that less than half are hiring; although it should be pointed out this question was referring to immediate needs, and for some of these businesses/industries they are between seasons.

Current Hiring Status

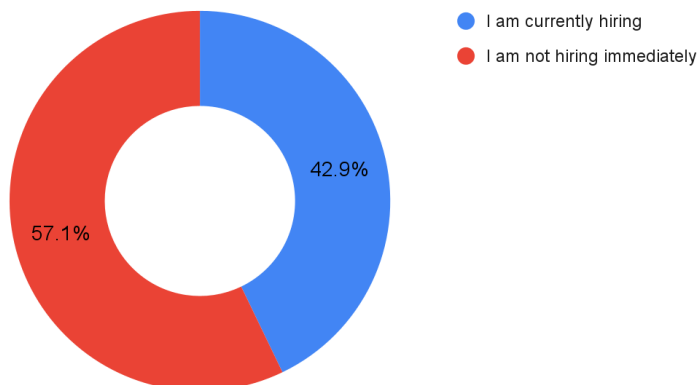


Figure 16 - Industry hiring status (n=7)

4.2.2 - Student Survey Results

Student respondents were asked if they were originally from the community and whether or not they would like to work within the local offerings. Eleven students completed the survey; due to the nature of the small schools and few 18 year olds in the graduating class, this number represents a good subset of eligible students. They were then given a set of Likert-scale framed statements to determine their interest in learning about local careers, a program that taught about local careers (exposure), a program that offered training toward said careers, and whether or not they would be willing to sign up for a program that served those functions. Figures 17 and 18 show their interest by their place of origin and Likert responses.

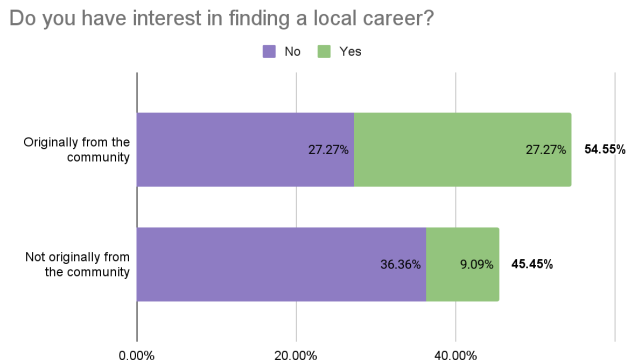


Figure 17 - Student responses to finding a local career by community origin (n=11)

Likert - Community Student Survey

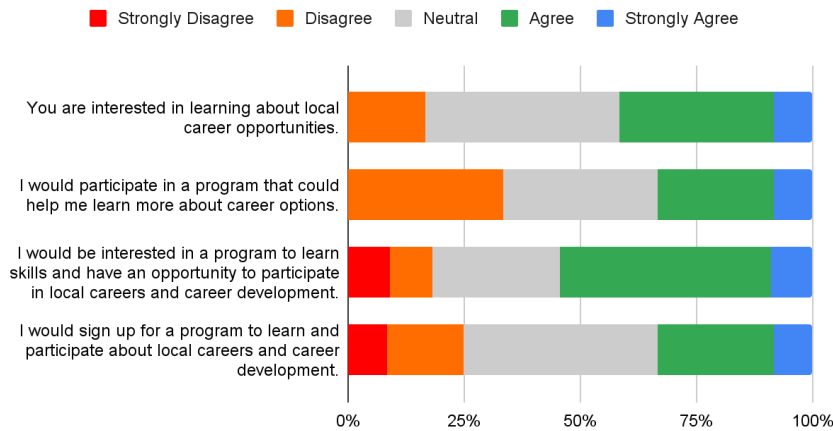


Figure 18 - Likert graph of community student survey (n=11)

From the participants, 6/11 responded that they were from their coastal community. Students originally from the community were split 50/50 with regard to their interest in finding a local career whereas only one from “outside” was interested in a local career. 5/11 students showed interest in learning more about local careers, with 4 neutral, and 2 not showing interest. More than 50% did indicate that they agreed or strongly agreed that they would be interested in a program that would provide them with skills and an opportunity to gain understanding about career options. Despite this interest, less than half indicated that they would sign up to participate.

5 - Discussion

5.1 - Communities with Grit

From the literature reviews, things have changed in Alaska in the last 150 years. The historic baseline of resource and place-based stability has seen shifts due to changes in management, industrialization, and trends in the global market. Employment from wild catch fisheries in Alaska peaked in the early 90s and fell due to over-capitalization which then contracted as a result. A set of policy, private reactivity, and social engagement helped buffer these trends, and attempts at sustainable fisheries management have created a means of ecosystem-based harvest limits that remain today. This stability is in contrast to growth, where the wild-catch fishing industry has a ceiling on landings. Despite this, the group of industry sectors employs tens of thousands, and, even though there are many available positions, Alaska is struggling to find people to fill the positions available to them. Work done examining fisheries participation suggests attitudes reflect their examination of prospects' futures, exposure, and sense of community (Cullenberg, 2017; Coleman et al, 2019). The Alaska Permanent Fund Dividend (PFD), the yearly financial contribution from Alaska's oil fund, data shows a large outmigration of young people from their coastal communities (see Figure 19 below). Likewise, rural communities appear to have low, disparate graduation rates from high school. Targeting youth with early career exposure may offer a means to interject into the cycle of outmigration.

Currently, the fishing industry within Alaska remains relatively stable outside of the current set of cyclical fluctuations and transitory shocks. However, uncertainty from a combination of rising costs, changes and threats to maximum harvest, impacts from climate change, and an increase in farmed or alternative proteins threaten the robustness of this historical cornerstone of coastal communities. The resource dependency and adaptive capacity may be good measuring tools for the likelihood for a community to handle such vulnerabilities. Alaskans need to recognize the massive impacts of climate change to adjust to what is occurring now, to make predictions for what is next, and for the protection of the socio-ecological well being of all stakeholders, current and present. It is then the goal to make adequate and thorough preparations for the rapidly approaching future since disruptive circulation patterns are occurring and will occur at higher frequencies under new ocean conditions resulting from climate change. Diversification for individuals, and thus communities, offers a method for bolster resilience and a chance to enhance or broaden career opportunities (Lavoie et al, 2018; Himes-Cornell and Kaspersky, 2015). Education, career development, and promoting emerging industries can help communities foster this kind development.

2015-2020 Coastal Migration from PFD Demographics by Age Group

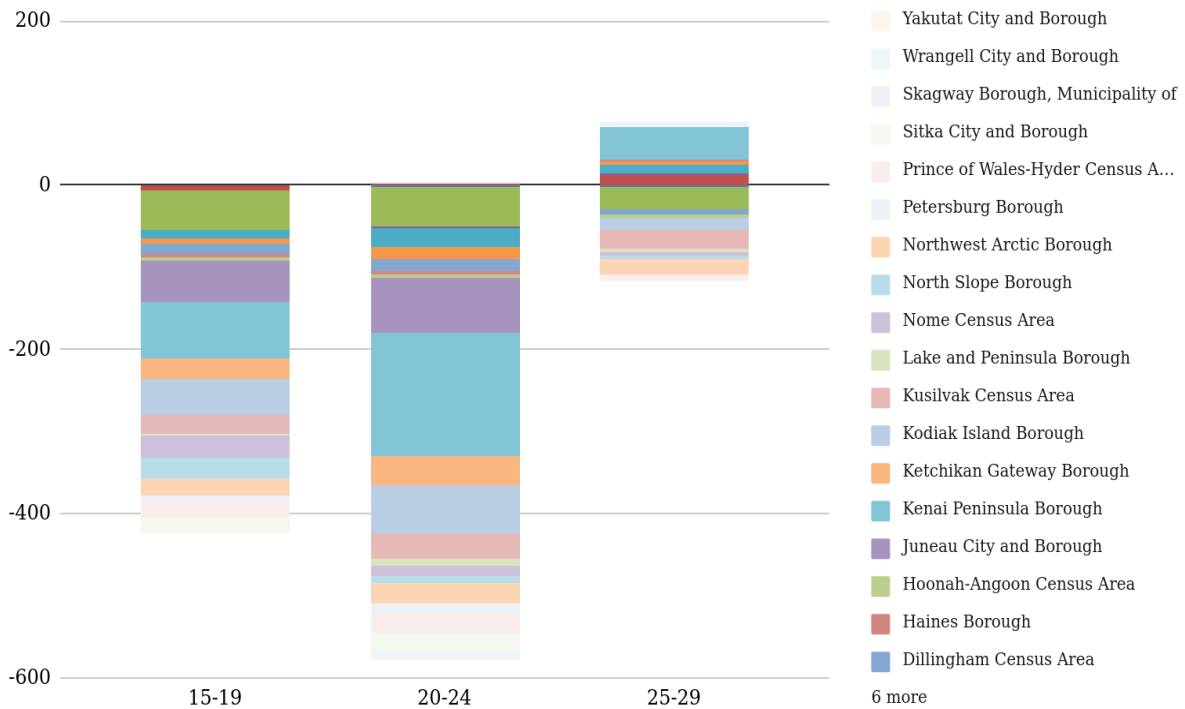


Figure 19 - Outmigration of coastal communities of young people and young adults

5.2 - Employment and Career Development

The research conducted in this study suggests that there is awareness about employment struggles, opportunities, and threats within the communities. Literature on the issues raised during the research supports the concerns of graying of the industry sectors, lack of access, and lack of prior knowledge among youth about the blue economy (Cullenberg, 2017). There are mixed-feelings about the abundance of “well paying” jobs in the secondary and tertiary adjacent-sectors, and hopes that increasing exposure, education, and more clear pathways to employment could help remedy the existing issues.

Moreover, feedback shows community held foresight that indicates they believe diversification of work could be helpful with economic uncertainties. Interviewees and industry surveys all shared positive opinions about coastal community targeted career development programs. A combination of on-the-job exposure, training, and education can meet young people at their individual potential for jobs that require explicit certifications to those that need speciality on-the-job experience. This is corroborated by state level jobs-numbers and industry surveys that indicate the minimum levels of educational attainment required. Stakeholder interviews suggest that they are in favor of a program that supports the variety of careers currently available, but also looks to the future of potential jobs, technologies, and disruptive patterns. A blue careers program targeting these trends could aid in this line of thinking.

Interviews and surveys from this research suggest that local talent is preferred since those hiring understand the realities of living in rural, coastal communities and anecdotally are

less likely to leave. Industry seems highly supportive not only of the idea of a program, but shared willingness to participate in an educational program that targets careers. Surveys of young people indicate those from the area are more likely to show an interest in local careers than those from “outside”, which supports the same opinion from industry. The students surveyed in this research do not show the same kind of unanimous desire to participate in such a career development program, but stakeholders and literature on youth attitudes question whether or not exposure might help change attitudes towards career programs (Coleman et al, 2019). It is also possible exposure may have some overlap with the adult expressed opinion that the coming generation does not like hard work.

Capabilities Approach and Careership Theory both offer frameworks that can support the communities’ desire to build robust skillsets for young people so that they might not just live up to their own personal potential, but also help build resilience within their communities. Looking at the systems within the communities and using the framework of capabilities approach, potential shortcomings and opportunities can be identified to help facilitate conversions of resources into abilities and boost overall achievement outcomes. Careership theory acknowledges the experiential and resource deficits that have been observed within the works. It investigates why young people may not be entering their local blue workforce, and can provide a look at the cultural and policy influences that render community goals. The literature suggests increasing educational resources, fostering a system that promotes human capital, and works within a combined mix of local and global knowledge. A special program focused on career development could help meet Alaskan needs.

5.3 - A Program for Alaska

The efforts from the interviews and surveys indicates Alaskans are supportive of a career minded educational program, and Iceland has demonstrated what a school can look like. Their collaboration with community leaders, industry, and their university institutions has helped young people get “real world” experiences and applied concepts that supplements their normal academic trajectory. Using an SES method for modeling an Alaskan solution and including communication with the University of Akureyri would help build the foundation for a school. It is noted that such a program would not be a copy/paste solution, but, coupled with local Alaskan input, can prevent reinventing the wheel, build upon existing successes, and learn from missed opportunities with the school. For Iceland, the most important pieces include getting industry on board to financially support the school. Alaska may need to pursue multiple funding avenues to make the program financially viable.

Value add is a topic within Alaskan and Icelandic circles for those countries to build and keep money inside their communities. Rather than serving as export hubs for raw ocean materials, people could provide more revenue, diversify their efforts, and have increased reasons for staying in their coastal communities. The entrepreneurship and economic enhancement/accelerator groups, like the Ocean Cluster houses, could host important conversations about Alaska’s economic future. Because the state boasts a strong environment of entrepreneurial development tracts, the ability to find startup funding (ex. SBIR, Sea Grant, etc.), gather coaching, find investors to build development runways, and networking testbeds can help foster new businesses from concept to business. Moreover, they encourage new developments that are not only local, but forward thinking.

Technology is most certainly coming in many forms to the blue economy. Automation, computer vision/machine learning, and biotech are disruptive forces that can lead to positive or negative shocks within the industry. Already, efforts to use multiple technology strategies like phone apps, distributed ledgers (ex. blockchain/cryptocurrency), and RFID tags to increase traceability, reduce piracy and fraud, and add market value using “fin-to-fork” strategies. Advanced filet machines and increased desires for “one fish, one name” sustainability and product manipulation reduction efforts are using computer vision and machine learning, specific forms of AI (artificial intelligence), to aid with the precise cutting of product for maximum yield and use of cameras and computers to help ID organisms down to species. Similarly, enhancements to mariculture operations for feed operations, monitoring growth, and spotting disease require accurately annotated image libraries and sensor inputs to create efficient, productive farms. Fishing vessels themselves are crawling with sensors, actuators, and computers in SCADA (supervisory control and data acquisition) systems, a type control system architecture used to operate the myriad components, engines, motors, winches, refrigeration units, and sonar/radar. Increasingly, computers and high-tech gadgetry are being used to optimize industrial practices and incorporate algorithmic learning to maximize every inch of efficiency possible, this is especially true with rising fuel costs. And since fossil fuel prices are increasing while contributing to climate change, the focus on “blue” fuels, either power harnessed from the movement on or under the ocean (ex. tidal, wave, wind, etc.) or from biomass using hydrothermal liquefaction. Enhanced usage of product might extend the value of the resource as biotechnologists and bioengineers use lower value outputs like fish skins and turn them into skin grafts, pharmaceuticals, and nutraceuticals. These kinds of tools require a technical skillset to build, operate, and maintain the computers and electronics that are required to maximize the efficiency of and add value to industries. Following market trends may be difficult, but preparations will allow communities to prepare for those changes. Some educational programs are using tech to teach (e.g. the T3 Partnerships) in order to help students prepare for those eventualities, and an Alaskan blue education program could borrow and collaborate with those existing programs to prepare students for this tech future. However, there are only two existing T3 partnerships and more work needs to be done. Likewise, STEM/STEAM magnet and technical schools are curating curriculum that is focused on these skills. Coupled with existing entrepreneurship, grants, and with needed policy decisions that incentivize development, there is an opportunity built into the cutting edge.

Alaska’s Maricultural Taskforce, which, following its task completion, has been renamed the Alaska Maricultural Alliance, has witnessed extraordinary growth in lease acreage. Alaska had permitted less than 350 acres leased in 2016, yet this grew to nearly 3,000 in 2021 seaweed aquaculture. The Alliance aims to create a hundred-million dollar industry that adds over 1,500 jobs by 2040 (AKMTF, 2021). The Alliance has created the Alaska Mariculture Development Plan, written in 2021 which could be another source of inspiration and cooperation. The group has released multiple papers with encouraging materials on Kelp Energy Products and Marine Renewable Energy for Coastal Alaska Communities. This publication explores the potential of nascent industries for food, feedstock, life cycle assessment, global use of these ideas, and the potential for novel energy creation using marine biomass. Both of these areas will need people to lead in the primary, secondary, and tertiary industry sectors, and those could be Alaskan youth with proper training. In that vein, they have plans for a Maricultural Training Center, which is still in its early planning stages, and would offer an excellent opportunity for partnership.

The state is chalk full of existing plans, centers, and institutions that intend to build a more comprehensive workforce; however, with so much happening there appears duplication of effort, reinventing of wheels, and siloing of good ideas. There are more than a dozen groups working on means to train individuals for technical work in Alaska. The combination of technical and vocational schools, universities, and training programs sometimes overlap or have gaps in coverage. The Alaska Maritime Workforce Plan (2014) has outlined many of the steps they see necessary to expand capacity in nearly every industry sector within the state, yet the program is now 8 years old with an effort that could use reassessment to understand the successes and shortcomings. Alaska Research Consortium (ARC), an industry lead spearhead, focuses on the fish processing and support industries within the state. As the literature shows, the 50,000 upward participants in these sectors are a big player in Alaska's economy and indeed merits a level of directed focus. The ARC paper notes that processors want to do something in the communities where they work, but aren't plugged into the leadership and educational aspects. There's potential within the fishing industries to build inroads for young people. An Alaskan blue career youth development program could be the bridge for these groups to operate and communicate together..

5.4 - Recommendations

The best time to invest was yesterday, but the next best time is today. Because surveyed Alaskans show strong support for the creation of and participation in a blue career development program, the next steps should be a detailed socio-ecological systems model for a stakeholder analysis phase that looks back at previous shortcomings and successes of similar multi-party initiatives and existing efforts to reduce duplicity and ensure marginalized communities are included. The broad spectrum of existing industries and workforce schools means communication between them can foster a directed hub for all the skills among the blue economy. Likewise, a mixed future threatened by climate change but with an opportunity to innovate through technology requires novel thinking, integrated education, and policy decisions that incentivize the creation of new, blue-tech businesses.

A common theme from industry and leadership participants in this research cited the non-monolithic nature of the communities, so sourcing a local mediator from those areas is central to prevent loss of voices. Literature demonstrates how many groups have historically been left out of influential decisions that affect their daily lives. Diverse inclusion and guiding design principles can mitigate stakeholder gaps and encourage a wider spectrum of ideas. In this way, a grassroots approach may make the most sense.

Once assessed, outreach to potential stakeholders should begin to solicit for participation in a larger working group. Initial assessment on a basic systems map (Appendix F) shows the diversity of participants that might be included. Collaboration should be multi-party and transdisciplinary at first glance since an educational program would need to consist of communities, industries, and institutions. Those groups' boundaries, interests, and contributions should be mapped as part of the larger SES.

This mission of this coalition should have shared goals based in the belief that their students are the future of those communities and industries. Housing that group within an Alaskan university system would help with the potential for stability, trust, and grant funding issues that might be more problematic in the creation of a new entity. With regard to new

businesses the organization can take advantage of entrepreneurial tracts and business development programs and grants. From there the organization can work on strategic planning for creating a blue economy focused youth program, youth outreach, the curriculum, and breaking new grounds in building a brighter, more resilient Alaskan future.

5.5 - Future Work

- Finding an institution to house the next work
- Stakeholder mapping and outreach
- Evaluating existing or creating an SES map
- Create stakeholder group
- More surveys, if requested by stakeholders
- Seek methods for financial security
- Create a baseline of current trends in order to build OKRs in a strategic plan
- Targeted curriculum development
- Find the first wave of students

6 - Conclusion

With historical context and future uncertainty, there is evidence of a defined need to invest in the future workforce within Alaska. The State, industry, and students surveyed appear to share a vested interest in the future of youth career development in coastal fishing communities. Collaboration and unification in an effort to build a blue career program are lacking at this time and may be best served by an association, institution, or other organization to help reduce redundancy and lead a concise initiative to simultaneously meet the workforce needs and help encourage young people to find a successful career path within the Blue Economy. The recurring needs, current vacancies, and potential futures can all benefit from supporting Alaskan youth. Exposure, interest building, education, and training can provide the functions and skills necessary to achieve optimized employment for individuals, businesses, and help create more vibrant, thriving communities. An Alaskan Blue Careers Program that targets youth could be the answer to building coastal resiliency in a fast moving world.

References

- Arctic Climate Impact Assessment (ACIA). (2004). Impacts of a Warming Arctic: Arctic Climate Impact Assessment. ACIA Overview report. Cambridge University Press. 140 pp. <https://www.amap.no/documents/download/1058/inline>
- Alaska Department of Fish and Game (ADFG). (2018). Final DRAFT Distribution Plan for Funds Appropriated to Address the 2018 Gulf of Alaska Pacific Cod Disaster Declaration - ADFG - OFFICE OF THE COMMISSIONER https://www.adfg.alaska.gov/static-f/fishing/pdfs/2018_finaldraft_pcod_plan.pdf
- Alaska Bureau of Labor Statistics (AK BLS). (2022). Alaska Economic Trends. Volume 42 Number. 5 ISSN 0160-3345. <https://labor.alaska.gov/trends/may22.pdf>
- Alaska Bureau of Labor Statistics (AK BLS). (2020). Population in Alaska <https://laborstats.alaska.gov/trends/feb20art1.pdf>
- Alaska Department of Education (AK DOE). (2018). Graduation Rate Fact Sheet. Alaska Department of Education & Early Development Produced on March 19, 2018. https://education.alaska.gov/Stats/HSGraduates/Graduation_Rate_Fact_Sheet.pdf
- Alaska Maricultural Task Force (AK MTF). (2021). Final Report to Governor Dunleavy <https://www.afdf.org/wp-content/uploads/Mariculture-Task-Force-Report-to-Gov-Final-compressed.pdf>
- Anand, S., Sen, A., & UNDP. Human Development Report Office. (1994). Human Development Index: Methodology and Measurement. New York: UNDP.
- Andrews, C. (1918). The Salmon of Alaska. The Washington Historical Quarterly Vol 9 No 4 (October 1918)
- Alaska Research Consortium (ARC). (2021). Alaska's Seafood Future: Community Resilience Through Workforce Development and Research Innovation. https://www.alaskaresearchconsortium.org/uploads/1/2/1/9/121982506/alaskas_seafood_future_-_march_2021.pdf
- Bar-On, Y. M., & Milo, R. (2019). The Biomass Composition of the Oceans: A Blueprint of Our Blue Planet. *Cell*, 179(7), 1451-1454. <https://doi.org/10.1016/j.cell.2019.11.018>
- Battaglia, P., Esposito, V., Malara, D., Falautano, M., Castriota, L., Andaloro, F. (2014). Diet of the Spthead Lanternfish *Diaphus metopoclampus* (Cocco, 1829) (Pisces: Myctophidae) in the central Mediterranean Sea. *Italian Journal of Zoology*. 81. 10.1080/11250003.2014.948500.
- Berkes, F. (1985). Fishermen and 'The Tragedy of the Commons". *Environmental Conservation*, 12(3), 199-206. <http://www.jstor.org/stable/44520413>
- Bittenbender, S. (2017, July 24). US Fishing Industry Breathes Sigh of Relief as H-2B Visa Program Expanded. *Seafood Source*. <https://www.seafoodsource.com/news/supply-trade/us-fishing-industry-breathes-sigh-of-relief-as-h2b-visa-program-expanded>
- Blythe, J.L. (2015) Resilience and Social Thresholds in Small-scale Fishing Communities. *Sustain Sci* 10, 157-165 . <https://doi.org/10.1007/s11625-014-0253-9>
- Carothers, C. (2010). Tragedy of Commodification: Displacements in Alutiiq Fishing Communities in the Gulf of Alaska. *MAST*. 9.

- Chambers, C., Helgadóttir, G. & Carothers, C. (2017). Little Kings: Community, Change and Conflict in Icelandic Fisheries. *Maritime Studies* 16, 10.
<https://doi.org/10.1186/s40152-017-0064-6>
- Coleman, J., Carothers, C., Donkersloot, R., Ringer, D., Cullenberg, P., Bateman, A. (2019). Alaska's Next Generation of Potential Fishermen: a Survey of Youth Attitudes Towards Fishing and Community in Bristol Bay and the Kodiak Archipelago. *Maritime Studies*
- Cullenberg, P., Donkersloot, R., Carothers, C., Coleman, J., Ringer, C. (2017). Turning the Tide: How Can Alaska Address the 'Graying of the Fleet' and Loss of Rural Fisheries Access? Alaska Sea Grant
- Cridle, K. (2012). Adaptation and Maladaptation—Factors that Influence the Resilience of Four Alaskan Fisheries Governed by Durable Entitlements. *ICES Journal of Marine Science* 69: 1168-1179.. 1168-1179. 10.1093/icesjms/fss085.
- Donkersloot, R. (2021). Research Restoring Local Fishing Access and Opportunity in Bristol Bay Salmon. *Fisheries Coastal Cultures Research*
- Folke, C. (2016). Resilience (Republished). *Ecology and Society* 21(4):44.
<https://doi.org/10.5751/ES-09088-210444>
- Greenberg, J. (1998). The Tragedy of Commoditization: The Political Ecology of the Colorado River Delta's Destruction. *Research in Economic Anthropology* 19:133-149
- Ranis, G. (2004). Human Development and Economic Growth.. Yale University. Center Discussion Paper #887. http://www.econ.yale.edu/growth_pdf/cdp887.pdf
- Himes-Cornell, A., Hoelting, K. (2015). Resilience Strategies in the Face of Short- and Long-term change: Out-migration and Fisheries Regulation in Alaskan Fishing communities. *ECOLOGY AND SOCIETY*. 20. 9. 10.5751/ES-07074-200209.
- Himes-Cornell, A., Kasperski, S. (2015). Assessing Climate Change vulnerability in Alaska's Fishing Communities. *Fisheries Research*. 162. 1-11. 10.1016/j.fishres.2014.09.010.
- Hobart, W. L. (1996). Baird's Legacy: The History and Accomplishments of NOAA's National Marine Fisheries Service, 1871-1996
<https://spo.nmfs.noaa.gov/sites/default/files/BairdsLegacy.pdf>
- Hodkinson, P., & Sparkes, A. C. (1997). Careership: A Sociological Theory of Career Decision Making. *British Journal of Sociology of Education*, 18(1), 29-44.
<http://www.jstor.org/stable/1393076>
- Homan, F. (2005). Limited Entry in Alaska's Commercial Fisheries . CFEC AK
<https://www.cfec.state.ak.us/pregs/StateLimitedEntry.pdf>
- IPCC, (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, In press, doi:10.1017/9781009157896.
- Kleinen, J. (2011). The Tragedy of the Margins: Land Rights and Marginal Lands in Vietnam (c. 1800-1945). *Journal of the Economic and Social History of the Orient*. 54. 455-477. 10.1163/156852011X611328.
- Knapp, G. (2011). Local Permit Ownership in Alaska salmon Fisheries. *Marine Policy* 35: 658-666
- Lavoie A., Sparks K., Kasperski s., Himes-Cornell A., Hoelting K., Maguire C.. (2018). Ground-truthing Social Vulnerability Indices of Alaska Fishing communities, Coastal Management, DOI: 10.1080/08920753.2018.1498710

- Lewandowski, I. (2018). Primary Production. 10.1007/978-3-319-68152-8_6
- Magnuson-Stevens Fisheries Conservation and Management Act, 16 U.S.C § 1802 (1970).
<https://www.govinfo.gov/content/pkg/USCODE-2013-title16/html/USCODE-2013-title16-chap38.htm>
- McCay, B.J. (1978) Systems Ecology, People Ecology, and the Anthropology of Fishing Communities. *Hum Ecol* 6, 397–422 . <https://doi.org/10.1007/BF00889417>
- Mossler, M. (2020). State of World Fisheries and Aquaculture 2020. Retrieved from <https://sustainablefisheries-uw.org/fao-state-of-world-fisheries-2020/>
- National Oceanographic and Atmospheric Administration (NOAA). (2022). Fisheries Economics of the United States 2019 U.S. Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service NOAA Technical Memorandum NMFS-F/SPO-229 March 2022
- NOAA Fisheries, (2022). Alaska Cod Populations Plummeted During The Blob Heatwave— New Study Aims to Find Out Why. (2022). Retrieved 6 April 2022, from <https://www.fisheries.noaa.gov/feature-story/alaska-cod-populations-plummeted-during-blob-heatwave-new-study-aims-find-out-why>
- Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press. ISBN 978-0-521-40599-7.
- Ostrom, E. (2010). Beyond markets and states: polycentric governance of complex economic systems. *American Economic Review*. 100 (3): 641–672. doi:10.1257/aer.100.3.641
- Pauly, D., Zeller, D. (2016). Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining. *Nat Commun* 7, 10244
<https://doi.org/10.1038/ncomms10244>
- Peterson, G. (2000) *Political Ecology and Ecological Resilience: an Integration of Human and Ecological Dynamics*. [https://doi.org/10.1016/S0921-8009\(00\)00217-2](https://doi.org/10.1016/S0921-8009(00)00217-2)
- Piatt J.F., Parrish J.K., Renner H.M., Schoen S.K., Jones T.T., Arimitsu M.L., et al. (2020) Extreme Mortality and Reproductive Failure of Common Murres Resulting from the Northeast Pacific Marine Heatwave of 2014-2016. *PLoS ONE* 15(1): e0226087.
<https://doi.org/10.1371/journal.pone.0226087>
- Public School Review. (2022). <https://www.publicschoolreview.com/alaska/school-districts>
- Rantanen, Mika & Karpechko, Alexey & Lipponen, Antti & Nordling, Kalle & Hyvarinen, Otto & Ruosteenoja, Kimmo & Vihma, Timo & Laaksonen, Ari. (2021). The Arctic has Warmed Four Times Faster than the Globe Since 1980. 10.21203/rs.3.rs-654081/v1.
- Robards, M., Greenberg, J. (2007). Global Constraints on Rural Fishing Communities: Whose Resilience is it Anyway?. *Fish and Fisheries*. 8. 14 - 30. 10.1111/j.1467-2979.2007.00231.x.
- Robeyns, I., Morten Fibieger B. (2021). The Capability Approach. *The Stanford Encyclopedia of Philosophy* (Winter 2021 Edition), Edward N. Zalta (ed.).
<https://plato.stanford.edu/archives/win2021/entries/capability-approach>
- Robertson, P. J., Egdell, V. (2018). A capability Approach to Career Development: An Introduction and Implications for Practice. *Australian Journal of Career Development*, 27(3), 119–126. doi:10.1177/1038416217704449
- Sethi, S., Riggs, W., Knapp, G. Knapp. (2014). Metrics to Monitor the Status of Fishing Communities: An Alaska State of the State Retrospective 1980–2010. *Ocean & coastal management*, 88, 21-30. doi: 10.1016/j.ocecoaman.2013.11.007

Stockholm Resilience (2015, February 19). What is Resilience?

<https://www.stockholmresilience.org/research/research-news/2015-02-19-what-is-resilience.html>

United Nations Food and Agriculture Organization (UN FAO). (2020). The State of World Fisheries and Aquaculture 2020. Sustainability in action.

<https://doi.org/10.4060/ca9229en>

United Nations Food and Agriculture Organization (UN FAO). (2021). FAO's Work on climate change - Fisheries and Aquaculture 2020. Rome. <https://doi.org/10.4060/cb3414en>

von Biela VR, Arimitsu ML, Piatt JF, Heflin B, Schoen SK Trowbridge JL, Clawson CM (2019) Extreme Reduction in Nutritional value of a Key Forage Fish During the Pacific Marine Heatwave of 2014-2016. *Mar Ecol Prog Ser* 613:171-182.

<https://doi.org/10.3354/meps12891>

Wiebold, K. (2020) Seafood Processing and COVID19. *Alaskan Economic Trends*. 40(11)

<https://labor.alaska.gov/trends/nov20.pdf>

Appendices

Appendix A - IRB Approval



Institutional Review Board
Julie Longua Peterson, Chair

Biddeford Campus
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DATE OF LETTER: March 25, 2022

PRINCIPAL INVESTIGATOR: Jared Fuller
FACULTY ADVISOR: Zachary Miller-Hope, MS

PROJECT NUMBER: 0222-18
PROJECT TITLE: Resilience Through Education: Is There Need For An Alaskan Economic-Educational Framework?

SUBMISSION TYPE: Exempt Project
SUBMISSION DATE: 2/21/2022

ACTION: Determination of Exempt Status
DECISION DATE: 3/25/2022

REVIEW CATEGORY: Exemption Category # 2(ii)

The UNE Institutional Review Board (IRB) for the Protection of Human Subjects has reviewed the materials submitted in connection with the above referenced project and has determined that the proposed work is exempt from IRB review and oversight as defined by 45 CFR 46.104.

Additional IRB review is not required for this project as submitted. However, if any changes to the design of the study are contemplated (e.g., revision to the protocol, data collection instruments, interview/survey questions, recruitment materials, participant information sheet, and/or other IRB-reviewed documents), the Principal Investigator must submit an amendment to the IRB to ensure the requested change(s) will not alter the exempt status of the project.

Please feel free to contact me at (207) 602-2244 or irb@une.edu with any questions.

Best Regards,

Bob Kennedy, MS
Director, Research Integrity

Appendix B - Survey Recruitment Materials



Help us by answering a few questions about your community!

Would additional career education for your communities youth broaden your hiring opportunities? This research project is asking if there is interest in adding additional resources to Alaskan youth to help them find careers in the state.

- Approved research by the University of New England's Institutional Review Board
- Just 10 questions and less than 10 minutes to complete
- Completely anonymous, private, and confidential
- Give your opinion about how we can enhance Alaskans opportunities
- Help a grad student cross the finish line

Leading a business or know someone willing to help take this survey?
Learn more at resilienceinalaska.blogspot.com or contact jfuller3@une.edu



Help us by answering a few questions about your community!

Would additional career education broaden your opportunities within your fishing community? This research project is asking if there is interest in adding additional resources to Alaskan youth to help them find careers in the state.

- Approved research by the University of New England's Institutional Review Board
- Just 10 questions and less than 10 minutes to complete
- Completely anonymous, private, and confidential
- Give your opinion about how we can enhance Alaskans opportunities
- Help a grad student cross the finish line

Are you a student 18 years of age or know one willing to help take this survey?
Learn more at resilienceinalaska.blogspot.com or contact jfuller3@une.edu

Community Interview Form

This interview form is designed to capture opinion information about the community, the current pulse of the economy, and the future of the area.

Please read the Participant Information Sheet:
Participant Information Sheet

Information Sheet Version Date: 03/25/2022

IRB Project #: 0222-18

Title of Project:

Resilience Through Education: Is there need for an Alaskan economic-educational framework?

Principal Investigator (PI): Jared Fuller

PI Contact Information:

jfuller3@une.edu, 2149235675

INTRODUCTION

This is a project being conducted for research purposes.

The intent of the Participant Information Sheet is to provide you with pertinent details about this research project.

You are encouraged to ask any questions about this research project, now, during or after the project is complete.

Your participation is completely voluntary.

The use of the word 'we' in the Information Sheet refers to the Principal Investigator and/or other research staff.

If you decide to participate, you have the right to withdraw from this research project at any time without penalty.

Data will only be collected at the end of the interview. If at any point you wish to withdraw, the partial information will be deleted and will not be used in this project.

WHAT IS THE PURPOSE OF THIS PROJECT?

The general purpose of this research project is to help determine if there is a demand or need for an educational program designed to help youth learn more about job prospects in their communities, participate within their communities, and gain general knowledge about how economic-educational frameworks might assist communities going forward. Through the use of key informant interviews, various community members and citizens will be able to offer their insight and opinions to produce a dataset which will be summarized and disseminated through the production of a research report.

WHY AM I BEING ASKED TO PARTICIPATE IN THIS PROJECT?

You are being asked to participate in this research project because as a member of a

fishing community your opinion and information about how you believe the region operates is valuable when considering how educational programs might spur possibilities for youth seeking to work within or grow the economic activities of the community. Key opinions could come from industry leaders, educational staff and faculty, community leaders, and the students from the area.

WHAT IS INVOLVED IN THIS PROJECT?

As part of this research project, participants will be asked to take part in a structured interview over phone or Zoom to gather information and potential insights about the research topic. No video or audio will be recorded.

Interviewees will meet with the researcher remotely to discuss their role in the community, their assessment of the state of working prospects for community youth, a forecast of their expertise, and gather information about how they would like to see a potential educational program assist in the development of resources for the community youth. Interviews should last no longer than one hour, maximum. During the conversation, the researcher will take notes as part of the data. Data collected from interviews will be summarized to key points and used in aggregate to provide insights into the research report. Key summaries and notes can be provided back to the participant upon request. There is no intent for follow-on research with participants at this time.

WHAT ARE THE POSSIBLE RISKS OR DISCOMFORTS INVOLVED FROM BEING IN THIS PROJECT?

The risks involved with participation in this research project are minimal and may include concerns about their opinions and reflection about their communities, privacy and confidentiality, and summarization of data as it pertains to the research.

Interview information will be collected with no key identifying information about the participant. Interviewees will be able to provide information to the questions that they wish to provide answers; for questions they do not feel comfortable providing a response, none will be collected. If there is additional information that participants wish to convey, this information will be collected in a way suitable to their wishes. Conversations will be summarized and presented audibly back to the participants in order to confirm the thoughts and opinions collected. The key summaries and notes can be provided to the participant upon request. Data from the interview will only be kept until the completion of the research retention period of 3 years, and will only be presented with key findings

Information collected will only be accessible by the researcher through the duration of the research project.

WHAT ARE THE POSSIBLE BENEFITS FROM BEING IN THIS PROJECT?

There are no likely direct benefits to you by being in this research project; however, the information we collect may help us understand the potential need or demand for an educational program designed to help local youth within fishing communities find ways to expand their potential horizons and assist with local economic growth.

WILL YOU BE COMPENSATED FOR BEING IN THIS PROJECT?

You will not be compensated for being in this research project, but your efforts will be

greatly appreciated.

WHAT ABOUT PRIVACY AND CONFIDENTIALITY?

We will do our best to keep your personal information private and confidential. However, we cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Additionally, your information in this research project could be reviewed by representatives of the University such as the Office of Research Integrity and/or the Institutional Review Board.

The results of this research project may be shown at meetings or published in journals to inform other professionals. If any papers or talks are given about this research, your name will not be used. We may use data from this research project that has been permanently stripped of personal identifiers in future research without obtaining your consent.

The following additional measures will be taken to protect your privacy and confidentiality:

No personally identifiable information will be collected at any point during the interview

Interviews will be conducted such that others will not be able to hear conversations

Participants will be informed they have the right to not utilize video upon request

Only the researcher will have access to the secure-cloud stored, password protected submitted data

Summarized information will be sanitized of any identifying information

Data from the interview will only be kept until the completion of the research retention period of 3 years, and will only be presented with key findings.

Contact information (e.g., name, e-mail address) collected for recruitment purposes will be stored securely and separately from the study data, and will be destroyed at the earliest opportunity during the project.

Data will only be utilized in aggregate within the research paper

WHAT IF YOU HAVE QUESTIONS ABOUT THIS PROJECT?

You have the right to ask, and have answered, any questions you may have about this research project. If you have questions about this project, complaints or concerns, you should contact the Principal Investigator listed on the first page of this document.

WHAT IF YOU HAVE QUESTIONS ABOUT YOUR RIGHTS AS A RESEARCH PARTICIPANT?

If you have questions or concerns about your rights as a research participant, or if you would like to obtain information or offer input, you may contact the Office of Research Integrity at (207) 602-2244 or via e-mail at irb@une.edu.

* Required

1. I have read the participant information sheet, I am over the age of 18, and I am willing to participate in the study: *

Mark only one oval.

- Yes Skip to question 2
- No Skip to section 2 (Interview Form)

Interview Form

We're sorry you are unable to participate. If you have not read the Participant Information Sheet, are not 18 years of age or older, or do not wish to participate, please consider suggesting this information to a person that might be able to support this research. Thank you.

If you have other questions please contact jfuller3@une.edu or look at the blog at resilienceinalaska.blogspot.com.

Interview Form

This survey is designed to ask questions about the state of local jobs, interested in hiring from your community, and willingness to participate in a potential summer program to help students gain exposure, education about the "blue economy", and learn more about work in the community. The summer program would allow participants to learn about the oceans and work related to the local community, teach skills and get hands-on experience with field trips, and provide education to get a heads up on the future of the "blue economy" all to help with future careers. Collected data is anonymous, not identifiable, and will be deleted after the research is conducted.

2. Which community are you from?

Mark only one oval.

- Aleutians East Borough
- Kodiak Island Borough
- Metlakatla Tribal Community

3. I have read the participant information sheet and I am willing to participate in the study:

Mark only one oval.

- Industry
- Education
- Community Leader

4. Can you summarize your position?

5. Likert - Do you agree with the following statement: I think the current state of the local economy is strong.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

6. Likert - Do you agree with the following statement: I think the community would benefit from an educational program designed to help youth learn more about career paths in the local community?

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

7. Do you see economic opportunity for youth within the community? Why or why not?

8. What are the current barriers to economic development in the community?

9. What do you think would best benefit the community based on your previous response?

10. What do you see as the future for your area of expertise with regards to future opportunities for the local youth?

11. What do you see as the future of the local community and its economy?

12. If there was a special program, what would you like to see it provide the community?

This content is neither created nor endorsed by Google.

Google Forms

Community Industry Survey

This survey is designed to ask questions about the state of local jobs, interested in hiring from your community, and willingness to participate in a potential summer program to help students gain exposure, education about the "blue economy", and learn more about work in the community.

The potential summer program would allow participants to learn about the oceans and work related to the local community, teach skills and get hands-on experience with field trips, and provide education to get a heads up on the future of the "blue economy" all to help with potential careers.

PARTICIPANT INFORMATION SHEET

Information Sheet Version Date: 03/25/2022

IRB Project #: 0222-18

Title of Project : Resilience Through Education: Is there need for an Alaskan economic-educational framework?

Principal Investigator (PI): Jared Fuller

PI Contact Information: jfuller3@une.edu, 2149235675

INTRODUCTION

This is a project being conducted for research purposes.

The intent of the Participant Information Sheet is to provide you with pertinent details about this research project.

You are encouraged to ask any questions about this research project, now, during or after the project is complete.

Your participation is completely voluntary.

The use of the word 'we' in the Information Sheet refers to the Principal Investigator and/or other research staff.

If you decide to participate, you have the right to withdraw from this research project at any time without penalty.

Data will only be collected at the end of the survey. If at any point you wish to withdraw, the partial information will be deleted and will not be used in this project. Completed surveys may not be withdrawn.

WHAT IS THE PURPOSE OF THIS PROJECT?

The general purpose of this research project is to help determine if there is a demand or need for an educational program designed to help youth learn more about job prospects in their communities, participate within their communities, and gain general knowledge about how economic-educational frameworks might assist communities going forward. Through the use of key informant surveys, various community members and citizens will be able to offer their insight and opinions to produce a dataset which will be summarized and disseminated through the production of a research report.

WHY AM I BEING ASKED TO PARTICIPATE IN THIS PROJECT?

You are being asked to participate in this research project because as a member of a fishing community your opinion and information about how you believe the region operates is valuable when considering how educational programs might spur possibilities for youth seeking to work within or grow the economic activities of the community.

WHAT IS INVOLVED IN THIS PROJECT?

As part of this research project, participants will be asked either to complete a survey that polls their opinions and knowledge to gather information and potential insights related to the research topic.

Those taking the survey will be asked around 10 questions that will ask about the participant's role in the community, their thoughts on what an educational program might look like, and their willingness to get involved if one were to come to fruition. The online survey should only take about 10 minutes to complete and responses will be completely anonymous. Data collected will only be used in aggregate.

There is no intent for follow-on research with participants at this time.

WHAT ARE THE POSSIBLE RISKS OR DISCOMFORTS INVOLVED FROM BEING IN THIS PROJECT?

The risks involved with participation in this research project are minimal and may include concerns about their opinions and reflection about their communities, privacy and confidentiality, and summarization of data as it pertains to the research.

In order to mitigate these risks, all survey data will be collected anonymously.

Questionnaires and their responses will not have any key identifiers that could link the information back to a participant. Information collected will only be kept until the completion of the research retention period of 3 years, and it will be presented only in aggregate form.

If at any point a participant in the survey finds themselves in a state of discomfort, the survey can be quit and no data will be collected. Participants have the right to skip or not answer any question in the survey for any reason.

Information collected will only be accessible by the researcher through the duration of the research project.

WHAT ARE THE POSSIBLE BENEFITS FROM BEING IN THIS PROJECT?

There are no likely direct benefits to you by being in this research project; however, the information we collect may help us understand the potential need or demand for an educational program designed to help local youth within fishing communities find ways to expand their potential horizons and assist with local economic growth.

WILL YOU BE COMPENSATED FOR BEING IN THIS PROJECT?

You will not be compensated for being in this research project, but your efforts will be greatly appreciated.

WHAT ABOUT PRIVACY AND CONFIDENTIALITY?

We will do our best to keep your personal information private and confidential. However, we cannot guarantee absolute confidentiality. Your personal information may be disclosed if

required by law. Additionally, your information in this research project could be reviewed by representatives of the University such as the Office of Research Integrity and/or the Institutional Review Board.

The results of this research project may be shown at meetings or published in journals to inform other professionals. If any papers or talks are given about this research, your name will not be used. We may use data from this research project that has been permanently stripped of personal identifiers in future research without obtaining your consent.

The following additional measures will be taken to protect your privacy and confidentiality: No personally identifiable information will be collected at any point during the survey Only the researcher will have access to the secure-cloud stored, password protected submitted data Data will only be utilized in aggregate within the research paper

WHAT IF YOU HAVE QUESTIONS ABOUT THIS PROJECT? You have the right to ask, and have answered, any questions you may have about this research project. If you have questions about this project, complaints or concerns, you should contact the Principal Investigator listed on the first page of this document.

WHAT IF YOU HAVE QUESTIONS ABOUT YOUR RIGHTS AS A RESEARCH PARTICIPANT? If you have questions or concerns about your rights as a research participant, or if you would like to obtain information or offer input, you may contact the Office of Research Integrity at (207) 602-2244 or via e-mail at irb@une.edu.

A copy of the Participant Information Sheet (text above) may be found at: <https://docs.google.com/document/d/1FtYJS1c052GypcWUbNpf3unOd2m8mko/edit#heading=h.gjdgxs>

* Required

- 1. I have read the participant information sheet, am over the age of 18, and willing to participate in the study: *

Mark only one oval.

- Yes Skip to question 2
- No Skip to section 2 (Unable to Participate)

Unable to

We're sorry you are unable to participate. If you have not read the Participant Information Sheet, are not 18 years of age or older, or do not wish to participate, please consider suggesting this information to a person that might be able to support this research. Thank you.

Participate

If you have other questions please contact jfuller3@une.edu or look at the blog at resilienceinalaska.blogspot.com.

Industry
Questionnaire

This survey is designed to ask questions about the state of local jobs, interested in hiring from your community, and willingness to participate in a potential summer program to help students gain exposure, education about the "blue economy", and learn more about work in the community. The potential summer program would allow participants to learn about the oceans and work related to the local community, teach skills and get hands-on experience with field trips, and provide education to get a heads up on the future of the "blue economy" all to help with potential careers.

2. In which Borough of Alaska are you currently living? *

Mark only one oval.

- Aleutians East Borough
- Kodiak Island Borough
- Metlakatla Tribal Communtiy
- Other: _____

3. Which of the following local industry sectors do you represent? (BLS 20 Broad Sector NAICS Codes)

Mark only one oval.

- Fishing, aquaculture, and mariculture
- Natural Resource Extraction (ex. Mining, Logging, Quarrying, Oil and Gas Extraction)
- Utilities (ex. Power, water, etc.)
- Construction and Specialty Trades (ex. carpentry, electrical, painting, etc.)
- Manufacturing (ex. food production/processing, net building, fabrication, metalworks etc.)
- Wholesale and Retail Trades (ex. sales, stocking, etc.)
- Transportation and Warehousing (ex. air, sea, mail, cargo, warehouses etc.)
- Information and Communication (ex. radio, tv, publications, internet, IT and data processing, etc.)
- Financial Activities (ex. banks, advisors, funding groups, etc.)
- Real Estate and Leasing (ex. buildings, lending, leasing, etc.)
- Professional, Scientific, and Technical Services (legal, consulting, design, engineering, etc.)
- Management of Companies and Enterprises
- Administrative, Support, Waste Management, Remediation (ex. administration, personnel, documentation, security, sanitation and waste services, etc.)
- Educational Services
- Health Care and Social Services
- Arts, Entertainment, Recreation
- Food Services and Accommodations (ex. restaurants, bars, and hotels, etc.)
- Other Services (ex. repair and maintenance services, personal care and beauty, linen services, personal services, grants/NGO, etc.)
- Natural Resource Management (ex. Alaska Department of Fish and Game, National Marine Fisheries Service, etc.)
- Public Administration

4. Are you originally from this community?

Mark only one oval.

Yes

No

5. Are you interested in hiring locally?

Mark only one oval.

Yes

No

6. What is your current hiring status?

Mark only one oval.

I am not hiring

I am currently hiring

7. What level of education do your jobs require? (Please select multiple if there are varying requirements for different positions.)

Check all that apply.

High school completion

Apprenticeship

Trade or vocational school

Associates degree

Bachelors degree

Agreement Section - Likert Scale

Please answer the following with how you agree with the statements. The number 1 corresponds to highly disagree and 5 means you strongly agree with the statement

8. It is easy to hire employees for this line of work.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

9. I am interested in hiring from the local community.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

10. I think a program that helped high school students learn about local career options would be beneficial.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

11. I would be interested in a program that helps students learn skills and have an opportunity to participate in local careers and career development.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

12. I would sign up to help students learn and participate about local careers and career development in such a program.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

This content is neither created nor endorsed by Google.

Google Forms

Community Student Survey

This survey is designed to ask questions about your knowledge of local jobs, interested in working in your community, and willingness or interest to participate in a potential summer program to gain exposure, gain education about the "blue economy", and learn more about work in the community.

The summer program would allow participants to learn about the oceans and work related to the local community, teach skills and get hands-on experience with field trips, and provide education to get a heads up on the future of the "blue economy" all to help with future careers. Participants would get to meet with experts, skilled professionals, and get snacks and program SWAG (ex. clothing, gear, etc.).

Collected data is anonymous and not identifiable.

Information Sheet Version Date: 03/25/2022

IRB Project #: 0222-18

Title of Project:

Resilience Through Education: Is there need for an Alaskan economic-educational framework?

Principal Investigator (PI): Jared Fuller

PI Contact Information: jfuller3@une.edu, 2149235675

INTRODUCTION

This is a project being conducted for research purposes.

The intent of the Participant Information Sheet is to provide you with pertinent details about this research project.

You are encouraged to ask any questions about this research project, now, during or after the project is complete.

Your participation is completely voluntary.

The use of the word 'we' in the Information Sheet refers to the Principal Investigator and/or other research staff.

If you decide to participate, you have the right to withdraw from this research project at any time without penalty.

Data will only be collected at the end of the survey. If at any point you wish to withdraw, the partial information will be deleted and will not be used in this project. Completed surveys may not be withdrawn.

WHAT IS THE PURPOSE OF THIS PROJECT?

The general purpose of this research project is to help determine if there is a demand or need for an educational program designed to help youth learn more about job prospects in their communities, participate within their communities, and gain general knowledge about how economic-educational frameworks might assist communities going forward. Through the use of key informant surveys, various community members and citizens will be able to offer their insight and opinions to produce a dataset which will be summarized and disseminated through the production of a research report.

WHY AM I BEING ASKED TO PARTICIPATE IN THIS PROJECT?

You are being asked to participate in this research project because as a member of a fishing community your opinion and information about how you believe the region operates is valuable when considering how educational programs might spur possibilities for youth seeking to work within or grow the economic activities of the community.

WHAT IS INVOLVED IN THIS PROJECT?

As part of this research project, participants will be asked either to complete a survey that polls their opinions and knowledge to gather information and potential insights related to the research topic.

Those taking the survey will be asked around 10 questions that will ask about the participant's role in the community, their thoughts on what an educational program might look like, and their willingness to get involved if one were to come to fruition. The online survey should only take about 10 minutes to complete and responses will be completely anonymous. Data collected will only be used in aggregate.

There is no intent for follow-on research with participants at this time.

WHAT ARE THE POSSIBLE RISKS OR DISCOMFORTS INVOLVED FROM BEING IN THIS PROJECT?

The risks involved with participation in this research project are minimal and may include concerns about their opinions and reflection about their communities, privacy and confidentiality, and summarization of data as it pertains to the research.

In order to mitigate these risks, all survey data will be collected anonymously.

Questionnaires and their responses will not have any key identifiers that could link the information back to a participant. Information collected will only be kept until the completion of the research retention period of 3 years, and it will be presented only in aggregate form.

If at any point a participant in the survey finds themselves in a state of discomfort, the survey can be quit and no data will be collected. Participants have the right to skip or not answer any question in the survey for any reason.

Information collected will only be accessible by the researcher through the duration of the research project.

WHAT ARE THE POSSIBLE BENEFITS FROM BEING IN THIS PROJECT?

There are no likely direct benefits to you by being in this research project; however, the information we collect may help us understand the potential need or demand for an educational program designed to help local youth within fishing communities find ways to expand their potential horizons and assist with local economic growth.

WILL YOU BE COMPENSATED FOR BEING IN THIS PROJECT?

You will not be compensated for being in this research project, but your efforts will be greatly appreciated.

WHAT ABOUT PRIVACY AND CONFIDENTIALITY?

We will do our best to keep your personal information private and confidential. However, we cannot guarantee absolute confidentiality. Your personal information may be disclosed if

required by law. Additionally, your information in this research project could be reviewed by representatives of the University such as the Office of Research Integrity and/or the Institutional Review Board.

The results of this research project may be shown at meetings or published in journals to inform other professionals. If any papers or talks are given about this research, your name will not be used. We may use data from this research project that has been permanently stripped of personal identifiers in future research without obtaining your consent.

The following additional measures will be taken to protect your privacy and confidentiality: No personally identifiable information will be collected at any point during the survey Only the researcher will have access to the secure-cloud stored, password protected submitted data

Data will only be utilized in aggregate within the research paper

WHAT IF YOU HAVE QUESTIONS ABOUT THIS PROJECT?

You have the right to ask, and have answered, any questions you may have about this research project. If you have questions about this project, complaints or concerns, you should contact the Principal Investigator listed on the first page of this document.

WHAT IF YOU HAVE QUESTIONS ABOUT YOUR RIGHTS AS A RESEARCH PARTICIPANT?

If you have questions or concerns about your rights as a research participant, or if you would like to obtain information or offer input, you may contact the Office of Research Integrity at (207) 602-2244 or via e-mail at irb@une.edu.

* Required

1. I have read the participant information sheet, I am over the age of 18, and I am willing to participate in the study: *

Mark only one oval.

- Yes Skip to question 2
 No Skip to section 2 (Unable to Participate)

Unable to Participate

We're sorry you are unable to participate. If you have not read, are not 18 years of age or older, or do not wish to participate, please consider suggesting this information to a person that might be able to support this research. Thank you.

If you have other questions please contact jfuller3@une.edu or look at the blog at resilienceinalaska.blogspot.com.

This survey is designed to ask questions about your knowledge of local jobs, interested in working in your community, and willingness or interest to

Student
Questionnaire

participate in a potential summer program to gain exposure, gain education about the "blue economy", and learn more about work in the community. The summer program would allow participants to learn about the oceans and work related to the local community, teach skills and get hands-on experience with field trips, and provide education to get a heads up on the future of the "blue economy" all to help with future careers. Participants would get to meet with experts, skilled professionals, and get snacks and program SWAG (ex. clothing, gear, etc.).

2. Which region of Alaska are you currently living? *

Mark only one oval.

- Aleutians East Borough
- Kodiak Island Borough
- Metlakatla Tribal Communtiy
- Other: _____

3. Which grade level are you enrolled?

Mark only one oval.

- 11th
- 12th
- Other: _____

4. Are you originally from this community?

Mark only one oval.

- Yes
- No

5. Are you interested in eventually finding a career locally?

Mark only one oval.

Yes

No

6. Which of the following apply to you?

Check all that apply.

I plan to graduate high school

I may go to a tech or vocational school

I may go to a college or university

I may not graduate

7. Which of the following local industry sectors are you familiar with? Industry sectors are just lump categories that specific jobs might fall under. Select as many as you are familiar with.

Check all that apply.

- Fishing and mariculture (ex. fishing, growing seaweed/kelp/oysters/etc.)
- Natural Resource Extraction (ex. Mining, Logging, Quarrying, Oil and Gas Extraction)
- Utilities (Power, water, etc.)
- Construction and Specialty Trades (ex. carpentry, electrical, painting, etc.)
- Manufacturing (ex. food production like fish processing, net building, fabrication and metalworks etc.)
- Wholesale and Retail Trades (ex. sales, stocking, etc.)
- Transportation and Warehousing (ex. air, sea, mail, cargo, warehouses etc.)
- Information and Communication (ex. radio, tv, publications, internet, IT and data processing, etc.)
- Financial Activities (ex. banks, advisors, funding groups, etc.)
- Real Estate and Leasing (ex. selling and renting buildings, lending, leasing, etc.)
- Professional, Scientific, and Technical Services (legal, consulting, design, engineering, etc.)
- Management of Companies and Enterprises
- Administrative, Support, Waste Management, Remediation (ex. administration, personnel, documentation, security, sanitation and waste services, etc.)
- Educational Services
- Health Care and Social Services
- Arts, Entertainment, Recreation
- Food Services and Accommodations (ex. restaurants, bars, and hotels, etc.)
- Other Services (ex. repair and maintenance services, personal care and beauty, linen services, personal services, grants/NGO, etc.)
- Natural Resource Management (ex. Alaska Department of Fish and Game, National Marine Fisheries Service, etc.)
- Public Administration

Agreement Section - Likert Scale

Please answer the following with how you agree with the statements. The number 1 corresponds to highly disagree and 5 means you strongly agree with the statement

8. You are interested in learning about local career opportunities.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

9. I would participate in a program that could help me learn more about career options.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

10. I would be interested in a program to learn skills and have an opportunity to participate in local careers and career development.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

11. I would sign up for a program to learn and participate about local careers and career development.

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

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Google Forms

Appendix F - Systems Map

