THE VALUE OF COMMERCIAL FISHERIES NEAR BRISTOL BAY, ALASKA

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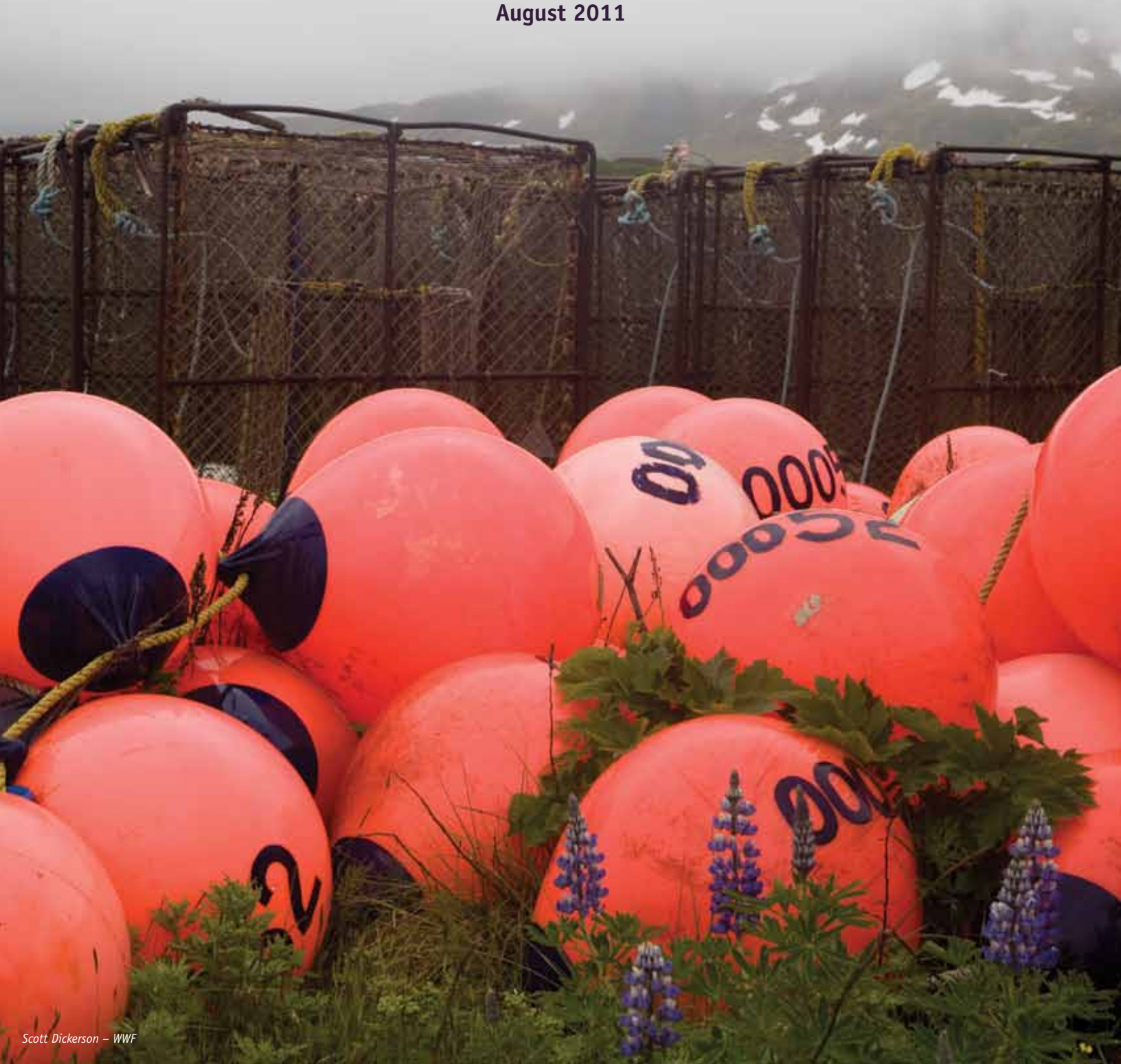

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EXECUTIVE SUMMARY

Bristol Bay Alaska is one of the world's last remaining wild places. Its highly productive marine ecosystems support the largest sockeye salmon run in the world, as well as chum salmon, Chinook salmon, Sockeye salmon, Red King crab, Pacific halibut and other commercially valuable species. The economic, social, cultural, and ecological well-being of the region depends on the health of its fisheries. Climate change and potential infrastructure projects related to oil, gas, and mineral development in the region, however, now threaten its pristine ecosystems. Understanding the economic value of Bristol Bay's fisheries, therefore, is more important now than ever before.

This study estimates the dollar value of the total economic activity supported by Bristol Bay's commercial fisheries, from harvest to processing to retail. The total economic value of economic activity is determined using a value-chain analysis supplemented by input-output modeling. This study finds that healthy and productive fisheries in Bristol Bay generate economic activity equivalent to $4.1–$5.4 billion dollars annually.

The health of Bristol Bay fisheries is not only economically important to the region, but to the nation and the globe. The men and women who fish in Bristol Bay's waters reside in states beyond Alaska. The processors and wholesalers who process the catch are located off-shore and on-shore in and beyond Alaska. The seafood products sold by retailers are purchased by consumers the world over.

This study's estimates of the dollar value of economic activity supported by Bristol Bay fisheries captures only one dimension of the total economic value of the region. It makes no attempt to monetize the value of biodiversity and ecosystem services, recreation and scenic amenities, or cultural and social significance. Nevertheless, our estimates of the economic value of commercial fisheries in Bristol Bay provide strong economic support for protecting this unique and valuable ecosystem.

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1] INTRODUCTION

Southwest Alaska's Bristol Bay boasts magnificent scenery, highly productive marine ecosystems, and bountiful fisheries. The area is home to the largest sockeye salmon run in the world and also supports strong runs of chum salmon, Chinook salmon, and Coho salmon. Bristol Bay provides nursery grounds for commercially valuable Red King crab and Pacific halibut. It is a staging area and wintering ground for tens of millions of birds, and a feeding ground and migration corridor for many marine mammals, including five endangered species.

As salmon populations plummet worldwide and development and population pressures encroach on the world's last remaining wild areas, Bristol Bay's abundant natural wealth assumes global significance. Development has left Bristol Bay largely untouched thus far, but climate change, off-shore oil and gas development, and mining threaten to irrevocably diminish its natural productivity and the subsistence and commercial livelihoods of those who depend on it.

The Bristol Bay region's economic, social, cultural, and ecological well-being is tied to healthy marine ecosystems. Grizzly bears, traditional subsistence lifestyles, commercial fisherman, seafood processors and retailers, sports fishing enthusiasts, and tourism all depend on its fisheries, especially salmon. The myriad of economic, cultural, ecological, and social values supported by Bristol Bay is impossible to estimate in its entirety. These values are at risk, if proposed infrastructure projects related to oil and gas development proceed. Figure B.1 in Appendix B maps potential oil and gas lease areas near Bristol Bay. These projects can potentially disrupt pristine habitats, impact fish and wildlife populations, and pollute the watershed.

This study demonstrates the economic contributions of one of the largest and most significant industries in the region – commercial fishing. It provides a range of estimates of the total dollar value of commercial fisheries, from harvest to processing to retail. These estimates comprise only one component of the total economic value of Bristol Bay, the component that can be most readily monetized. It excludes the value of biodiversity and ecosystem services, recreation and scenic amenities, cultural and social significance. Nevertheless, these estimates of the economic value of commercial fisheries in Bristol Bay provide strong economic support for protecting this unique and valuable ecosystem.

In the section that follows, we examine commercial fisheries in our base study area at glance, identifying key species and economic impacts. In section 3, we discuss our methodology and analysis. In section 4 we present our results and conclusions.

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2] BRISTOL BAY COMMERCIAL FISHERIES AT A GLANCE

2.1. Base Study Area Defined

Bristol Bay and surrounding waters support many large and valuable fisheries. The base study area for this analysis includes the marine waters of the North Aleutian Basin and adjacent waters identified as at risk from potential oil, gas, and mineral related infrastructure (Figure 1). Specifically, it includes the marine waters contained within the following Alaska Department of Fish and Game statistical areas:

- All statistical areas south and east of 59 lat and 165 long, but north of the Aleutians.[1]
- Those statistical areas represented on Chart 9 – Alaska Peninsula and Chignik south of the Aleutians based on the fact that there will be shipping and potential spill and infrastructure impacts on that area.[2]
- Statistical areas 655530, 655500, 655430, 655410, 655407, 655409, 665500, 665430, 665410, 675430, 675400, 675333, 685331, 685332, and 685400.[3]
- All state waters that fall within or are adjacent to the above described regions.

2.2. Commercial Fisheries: Landings

The base study area encompasses commercial fishing activity that spans different management agencies, management plans, and spatial scales. In 2008, the base study area comprised almost one-third of the total commercial landings in Alaska. Between 2005–2008, the value of ex-vessel landings in the base study area averaged $463 million annually, with five commercial species (salmon, pollock, King crab, Pacific cod, and halibut) accounting for almost 95% of that value (Table 1).[4] Salmon is the largest fishery in the Bristol Bay region, contributing one-third of total landings value. Four species (pollock, salmon, Pacific cod, and herring) account for almost 96% of total pounds landed in the base study area (Table 2).

FIGURE 1. BASE STUDY AREA

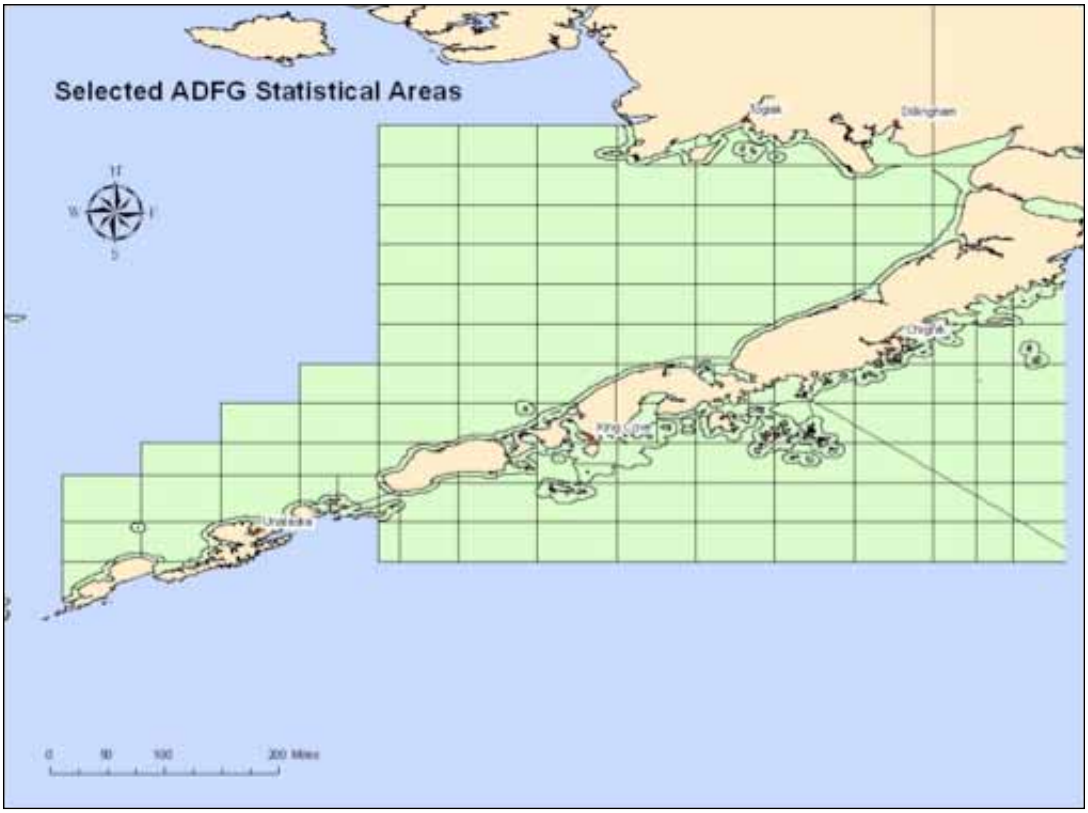


TABLE 1. LANDINGS BY SPECIES GROUP FOR SELECT ADFG STATISTICAL AREAS (MILLIONS $2008)

	2005	2006	2007	2008	Average (2005-08)	Cumulative % of total
Salmon	$142.7	$146.7	$159.8	$166.0	$153.8	33.2%
Pollock	$135.7	$126.5	$105.3	$112.3	$120.0	59.1%
King Crab	$88.1	$60.6	$91.0	$100.9	$85.1	77.5%
Pacific Cod	$39.0	$52.9	$49.4	$64.4	$51.4	88.6%
Halibut	$26.8	$29.7	$27.8	$31.4	$28.9	94.9%
Sablefish	$13.0	$15.5	$15.7	$14.7	$14.7	98.1%
Tanner Crab	$1.4	$0.9	$3.1	$3.9	$2.3	98.6%
Herring	$4.2	$3.8	$2.8	$3.3	$3.5	99.3%
Flatfish	$0.9	$1.2	$2.0	$1.2	$1.3	99.6%
Dungeness Crab	$0.6	$0.4	$1.3	$1.1	$0.9	99.8%
Scallops	-	$0.6	$0.4	$0.3	$0.3	99.9%
Rockfish	$0.3	$0.3	$0.3	$0.3	$0.3	99.9%
Other Species [5]	$0.4	$0.2	$0.2	$0.4	$0.3	100.0%
Atka Mackerel	$0.0	$0.0	$0.0	$0.0	$0.0	100.0%
Ling Cod	$0.0	$0.0	$0.0	$0.0	$0.0	100.0%
Total	**$453.1**	**$439.6**	**$459.0**	**$500.1**	**$463.0**	–

Source: Alaska Commercial Fisheries Entry Commission

TABLE 2. LANDINGS BY SPECIES GROUP FOR SELECT ADFG STATISTICAL AREAS (THOUSAND POUNDS)

	2005	2006	2007	2008	Average (2005-08)	Cumulative % of total
Pollock	1,039,076	955,297	819,118	565,685	844,794	63.6%
Salmon	243,071	241,943	270,608	263,574	254,799	82.7%
Pacific Cod	150,697	139,280	106,988	117,729	128,674	92.4%
Herring	46,495	47,778	35,328	43,876	43,369	95.7%
Flatfish	11,459	17,332	25,066	20,415	18,568	97.1%
King Crab	18,139	15,541	20,147	20,104	18,483	98.5%
Halibut	8,217	7,462	6,272	7,417	7,342	99.0%
Sablefish	5,719	6,080	6,124	5,118	5,760	99.5%
Other Species	3,294	2,875	2,850	4,397	3,354	99.7%
Tanner Crab	740	688	1,875	2,300	1,401	99.8%
Rockfish	894	1,305	1,125	772	1,024	99.9%
Atka Mackerel	1,476	1,352	629	16	868	100.0%
Dungeness Crab	437	278	653	510	470	100.0%
Scallops	0	71	50	56	44	100.0%
Ling Cod	0.673	0.594	0.762	0.341	0.593	100.0%
Total	**1,529,717**	**1,437,283**	**1,296,832**	**1,051,970**	**1,328,950**	–

Source: Alaska Commercial Fisheries Entry Commission

Harvest is conducted by permit holders. Permit holders in the base study area largely reside in Alaska, Washington, Oregon, and California (Table 3). Approximately 70% of the average landings value in the base study area over the period 2005-2008 was held by permit holders residing outside of Alaska. This demonstrates the potential geographic extent of the economic impacts of Bristol Bay commercial fisheries; revenues earned by out-of-state permit holders can contribute to spending and to the tax base in nearby states.

Case Study of Salmon Permit Holders

The Bristol Bay salmon fishery offers an instructive case study of the distribution of earnings of permit holders and the geographic extent of impacts associated with commercial harvests in the base study region. Data compiled from the Commercial Fisheries Entry Commission online database reveals that 3165 salmon permits were issued for Bristol Bay salmon permit areas in 2008. Alaska residents accounted for approximately 56% of permit ownership. Permits were also held by individuals residing in 45 U.S. states, Canada, and New Zealand.[6]

Table 4 summarizes the average earnings per permit holder per permit types for the states where ten or more permit holders reside. The data shows that the value of Bristol Bay salmon permits extends well beyond Bristol Bay.[7]

Examining the distribution of salmon permit holders within the base study region demonstrates the regional impacts of commercial harvests. The boroughs/census areas of Bristol Bay and Dillingham are the terrestrial areas most closely associated with the base study area. Less than 20% of S03T permits and just over 30% of S04T permits are held by these 'regional' residents (Table 5).

TABLE 3. AVERAGE VALUE OF TOTAL LANDINGS BY RESIDENCY OF PERMIT HOLDER

State	Landings value (millions $)	% of total landings
Alaska	$143.00	31%
Washington	$241.00	52%
Oregon	$43.00	9%
California	$13.00	3%
Other	$23.00	5%

Source: Alaska Commercial Fisheries Entry Commission

TABLE 4. SALMON PERMITS BY STATE OF RESIDENCE 2008

State	# of permits	Total gross earnings	Average gross earnings/ permit
AK	1780	$76,353,887	$42,895
WA	837	$49,847,151	$59,555
CA	157	$8,356,421	$53,226
OR	142	$7,144,183	$50,311
ID	36	$1,767,436	$49,095
MN	29	$1,346,680	$46,437
MT	28	$1,301,295	$46,475
CO	18	$657,771	$36,543
AZ	12	$636,997	$53,083
UT	10	$508,681	$50,868

Source: Authors' calculations based on permit data from Commercial Fisheries Entry Commission online database

2.3. Commercial Fisheries: Processing, Wholesale, and Retail

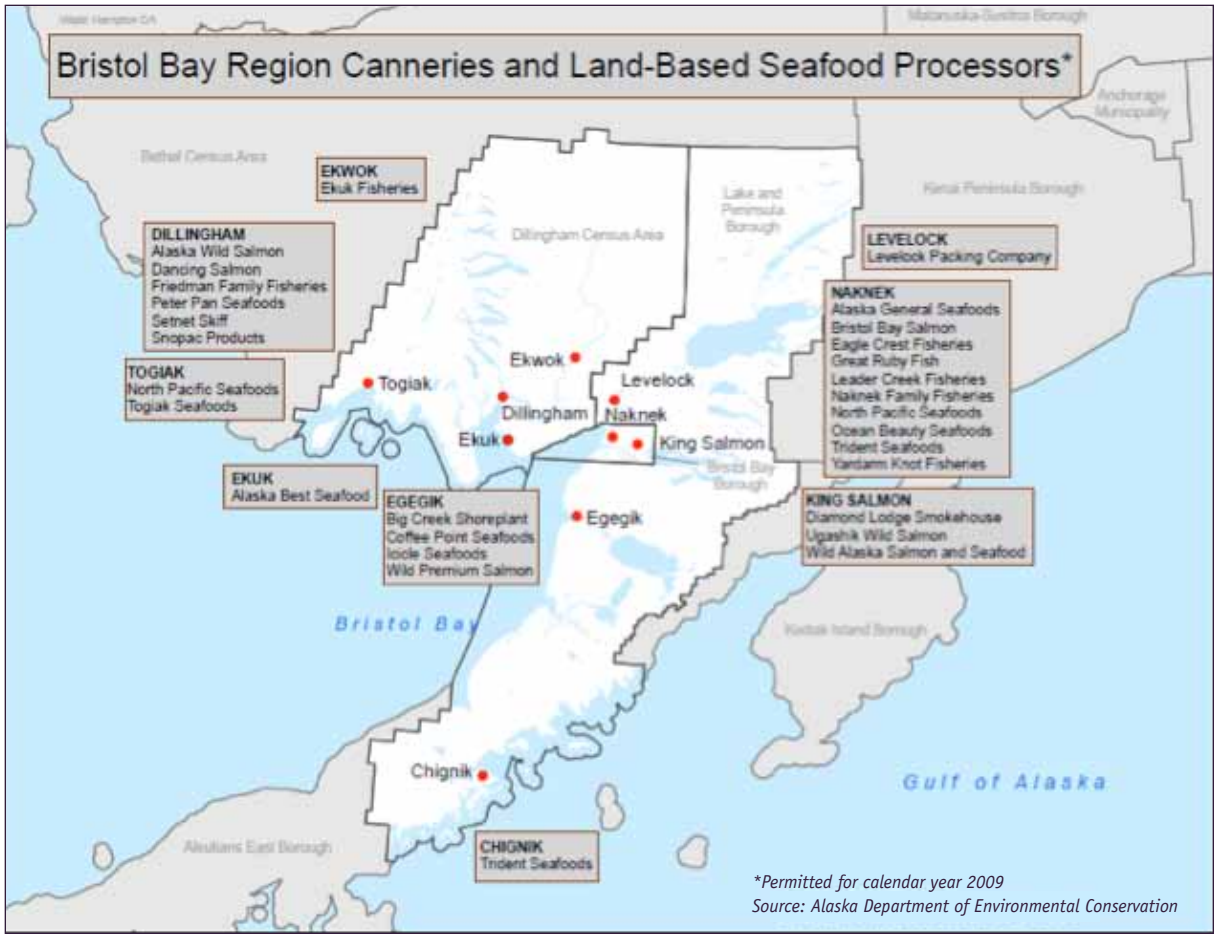
Commercial fisheries contribute economic value along the supply chain from harvest to consumption. After harvest, permit holders sell their catch to processors and wholesalers. Seafood processing is a major component of Alaska's seafood industry. Commercial processing of seafood harvested in the base study area may occur: 1) on-shore in terrestrial areas associated with Bristol Bay (i.e., Bristol Bay Borough, Lake and Peninsula Borough and Dillingham Census Area); 2) at-sea on processing ships; or 3) on-shore beyond the base study area (inside or outside of Alaska). The base study area contains off-shore processors that harvest their own catch directly. Since 1990, catcher/processors that fish exclusively off-shore and do not deliver to Alaska ports have not been required to fill out fish tickets. This makes it difficult to estimate the harvests by these vessels and the wholesale values associated with processing those harvests.

TABLE 5. NUMBER OF PERMIT HOLDERS FOR KEY BRISTOL BAY FISHERIES FROM THE REGION (2008)

		Bristol Bay		Dillingham		Total Permits		Region as a % of total	
Fishery	Area	Permits	Fished	Permits	Area	Permits	Fished	Permits	Fished
Salmon	S03T	57	50	270	227	1,863	1,469	18%	19%
	S04T	118	100	202	123	980	850	33%	26%
	TOTAL	**175**	**150**	**472**	**350**	**2,843**	**2,319**	**23%**	**22%**

Source: Authors' calculations based on permit data from Commercial Fisheries Entry Commission online database

FIGURE 2. BRISTOL BAY CANNERIES AND SEAFOOD PROCESSORS



Wholesale value (also commonly called 'first wholesale value') typically refers to the value of seafood products after processing. Following processing, seafood is then typically distributed to retailers or restaurants where it finally reaches consumers. This final level of distribution is referred to as 'retail' and it includes food stores, the food service industry, and non-edible industrial products resulting from secondary processing.[8]

Commercial fisheries' landings from the base study area are distributed worldwide. Figure B.5 in Appendix B details 24 recipient countries of salmon processed by one Bristol Bay salmon processor. This is but a small portion of total exported Alaskan salmon. An annual U.S. export list of salmon (excluding Atlantic salmon) in 2008 shows as many as 88 importing countries in one year (NMFS 2011a). It is clear that distribution and sales from base study area fisheries not only concern Alaska or even just the U.S., but impact international markets as well.[9]

2.4. Summary Characteristics of Base Study Area

The base study area for this analysis includes the marine waters of the North Aleutian Basin and adjacent waters that are at potential risk from oil, gas, and mineral development. The base study area, therefore, comprises a greater area than what often is referred to as "Bristol Bay". It encompasses commercial fishing activity that spans different management agencies, plans, and spatial scales. The base study area is incredibly productive, with 1.3 billion pounds of fish on average harvested annually. This is equivalent to almost one-third of total commercial landings in Alaska. Salmon is the largest fishery in the base study region, accounting for 33% of the landings value and the largest share of harvest related employment. Other major fisheries include pollock, King crab, Pacific cod, and halibut, which combined account for an additional 62% of landings value.

Commercial landings from the base study area are also distributed worldwide. Distribution and sales from base study area fisheries impact international markets as well. The economic impacts of commercial fisheries in the base study area, therefore, have broad geographic reach. This suggests that the health of Bristol Bay fisheries is economically significant not only to Alaska but to the nation as a whole.

3] METHODS AND ANALYSIS

The objective of this analysis is to demonstrate the economic contributions of commercial fisheries in the base study area, from harvest to consumption. To do this, we use a value chain analysis, supplemented by input-output modeling. This approach allows us to capture the value contributed along subsequent steps in the value-chain, from harvest through processing, wholesale, and retail; as well as the value of related economic activities.

The study focuses on three major stages in the chain; 1) harvest ⇨ 2) processing and wholesale ⇨ 3) retail and consumption. At each step along the value-chain, there is value added to the commercial fishery input. We estimate the value of the commercial fishery input upon the completion of each forward linked step in the value-chain. We refer to the value at each step along the value-chain as landings value, wholesale value, and retail value respectively.

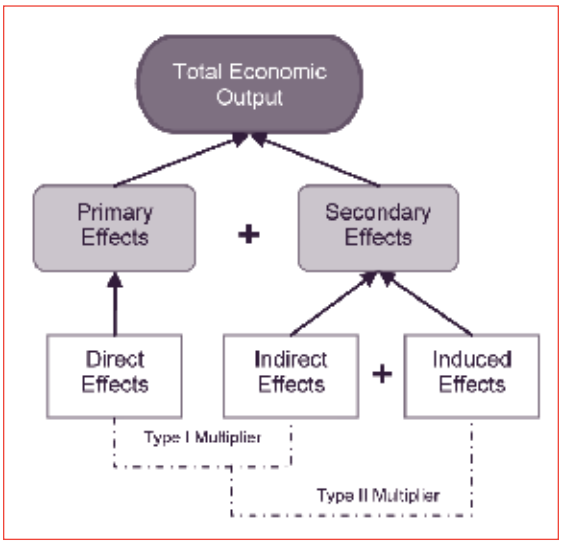
In a value-chain analysis, the value-added is cumulative across all steps; upstream steps capture the value of all previous steps and should not be treated additively. This process is best illustrated by way of example. Assume a commercial fisherman is paid $1.00 for one fish harvested from the base study area. The fish (fishery input), therefore, has a landings value of $1.00. The processor who purchased the fishery input will process it, adding value, and sell it to a retail outlet for $2.00; thus the wholesale value of the fishery input is $2.00. The retailer, the final step in the value chain, may add labeling or prepare the fishery input as part of a meal, adding further value, and sell it to the final consumer for $3.00, the final retail value. The entire process from harvest through to retail sale and consumption transforms $1.00 in landings into $3.00 in consumer product.

The value-chain analysis, however, captures only one dimension of the economic value of commercial fisheries. It does not measure economic activity linked to every step along the supply chain. There other businesses and sectors that support harvest, wholesale and processing, and retail activities. For example, to catch the fish initially, the fisherman purchased gear, bait, and other supplies and hired a crew. All of this activity was supported and paid for by sales made to processors. Processors also purchase supply inputs, employ workers, and maintain equipment. Those activities are supported by sales made to retailers. Commercial fishermen, processors, and retailers each have suppliers downstream which benefit indirectly from sales; these effects constitute the indirect economic impacts of commercial fishing.

The economic contributions of commercial fisheries, however, do not end there. Fishermen and their crew; bait and tackle shop owners and their employees; processors and their workers and suppliers; and retailers all have income to spend at other businesses due to commercial fishing. This induced economic activity is an important contribution of commercial fishing. In areas of the world where commercial fisheries have been closed due to historic overfishing, the ripple effects through the regional economy are generally very apparent. Businesses fail to thrive when a major industry that supports the local economy is in a state of decline.

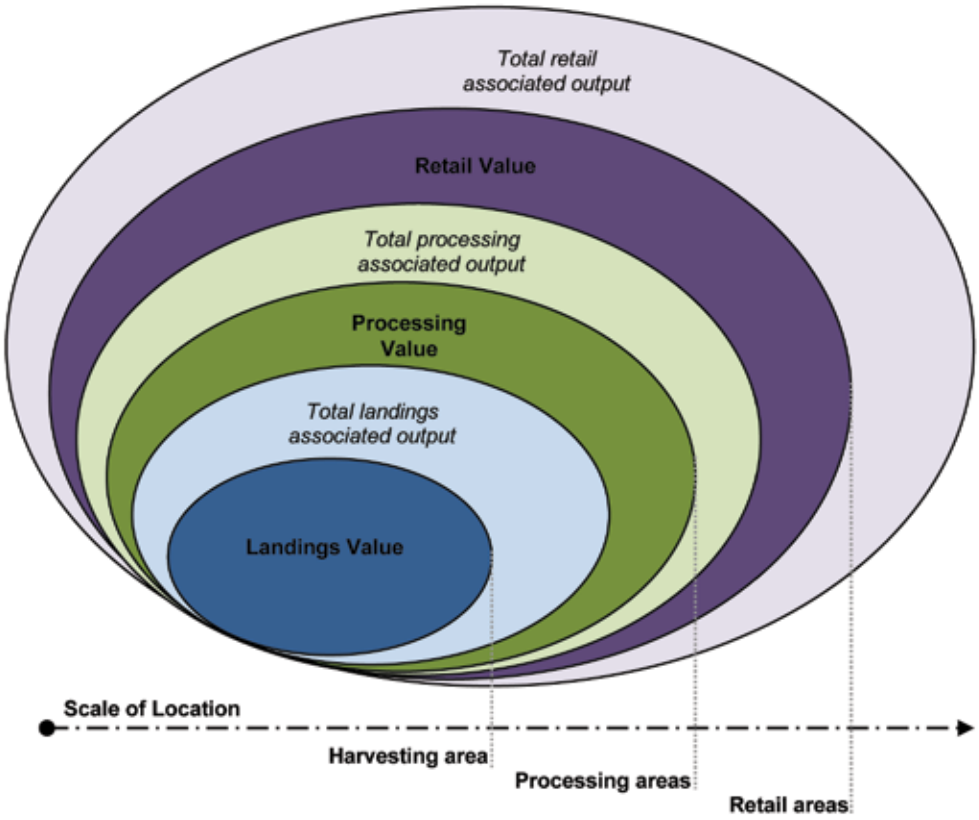
Induced effects and indirect effects are referred to in this analysis as the secondary economic impacts from commercial fishing. To calculate indirect and induced effects, an economic multiplier is used. For example, a multiplier of 1.5 implies that $1.00 of primary economic activity generates an additional $0.50 in indirect and/or induced economic activity, for a total economic output of $1.50. The total economic output, therefore, includes direct, indirect, and induced economic effects (Figure 3).[10] Multipliers are derived from input-output models that describe the industrial structure of an economy – the inputs to various sectors and the distribution of outputs – at a particular scale.[11] Typically, the larger the region impacted by the activity, the greater the multiplier effect. Moreover, the greater the multiplier effect is, the greater the impact on the region's economy.

FIGURE 3. MULTIPLIER EFFECTS



Our analysis of the total value of commercial fisheries in the base study area proceeds as follows. First, we estimate the economic value of commercial harvests using landings data. We then apply the appropriate multipliers to estimate the secondary impacts (indirect and induced economic activity) associated with that harvest. Second, we estimate the value added by processing and wholesale. We estimate wholesale value using two different approaches: 1) the application of related processing margins; and 2) the use of a seafood specific economic-value added model. We then apply the appropriate multipliers to estimate the secondary

FIGURE 4. ANALYSIS OF THE ECONOMIC VALUE OF COMMERCIAL FISHERIES



impacts of processing and wholesale. Lastly, we estimate value added by the retail sector using the same economic-value added model. Secondary impacts are again determined using appropriate economic multipliers. Throughout the analysis, we present a range of values to reflect the uncertainties in this analysis and to demonstrate the sensitivity of results to key modeling choices.[12] Unless otherwise noted, all estimates reported in this study are in real dollars ($2008).

Figure 4 depicts the forward and backward linkages captured by this multi-step value-chain and associated economic impact analysis. The three steps in the value chain (harvest, processing, and retail) are color coded to reflect the total economic output associated with each step; blue shades, for example, represent the total economic impacts from harvesting. The economic impacts are cumulative as we move from harvest to retail and cannot be summed. The scale of the geographic region impacted by the economic contributions of commercial fisheries expands outward as we move along the value chain.

3.1. Landings Value and Value of Associated Economic Output

Our analysis begins with average landings value in the base study region. Between 2005-2008, the landings value in the base study region averaged $463 million dollars annually (Table 1). This is the primary economic impact from commercial harvest. As discussed previously, the landings value supports additional economic activities, the magnitude and value of which can determined through the application of an economic multiplier.

We reviewed the literature that estimates multiplier effects from commercial fishing activities to identify a range of potential multiplier values to use in this analysis (Appendix A). Most studies employ state-level multipliers rather than national multipliers, on the assumption that most of the economic impacts from commercial fishing manifest on a regional scale. Given the wide geographic reach of Bristol Bay commercial fisheries, in terms of where permit holders reside, where labor is sourced from, and where retail products are sold, it may be that a national-level multiplier could be justified. To use state-level multipliers as we do in this analysis, therefore, ensures conservative estimates of the total economic output associated with commercial harvest. Multipliers derived for other states or regions, or for specific fisheries, do not necessarily reflect the specific input-output configurations of our base study region. At best, these multipliers indicate a likely range within which the total economic value of commercial fishing in the base study area may lie.[13]

The two studies most directly relevant to our analysis come from the McDowell Group (2010) and Hackett et al. (2009). McDowell Group (2010) developed a set of multipliers, "specifically tailored to handle the aspects of Alaska's commercial seafood industry" (p. 6). They estimated a multiplier of 1.60 for the Prince William Sound commercial salmon fishery.[14] While the salmon fishery is but one of many fisheries in the base study area, it is the largest and most valuable, accounting for 30% of the landings value ($154 million dollars) on average. Applying McDowell Group estimates we show that the Bristol Bay salmon fishery alone supports an estimated $246 million annually in total economic output for the state of Alaska (Table 7).

Hackett et al. (2009) created a modified input-output model for California commercial fisheries and calculated multipliers at the state and regional level by operational configuration. Their operational configuration for salmon can be applied to the salmon fishery in Bristol Bay. Table 8 presents estimated total annual output for the Bristol Bay commercial salmon fishery using Hackett et al. multiplier value.

Multipliers that can be applied to total fisheries activity in the base study region are taken from Hodges et al. (2000), TECHLAW (2001), and Crosson (2009) as summarized in (Table 6). Hodges et al. (2000) estimated an output multiplier of 1.58 for commercial fishing in Florida. A 2001 study entitled, "The Economic Contribution of the Sport Fishing, Commercial Fishing and Seafood Industries to New York State," estimated an output multiplier of 1.92 for New York commercial fisheries (TECHLAW 2001). Finally, Crosson (2009) conducted an analysis of ocean going commercial fisherman in North Carolina and estimated an output multiplier of 1.45 for these fisheries.

Despite differences between fisheries in these states and in the base study area, they can be used to estimate a range of values of potential economic output resulting from harvest. Table 9 provides estimates of average annual total economic output for all Bristol Bay fisheries based on these multipliers.

Summary

Average annual landings value from 2005–08 for Bristol Bay commercial fisheries was $463 million; $154 million for the salmon fishery alone. Landings value supports secondary economic activity in the base study area and beyond. The total economic value of commercial harvests, therefore, may range from a high of $889 million dollars annually to a low of $673 million dollars annually. The Bristol Bay salmon fishery alone may support total economic activity in the range of $246–$253 million per year.

TABLE 6. ECONOMIC MULTIPLIERS FOR COMMERCIAL FISHERIES

Study	Multiplier	Case study area
McDowell Group 2010	1.6	Prince William Sound
Hackett et al. 2009	1.65	California
Crosson 2009	1.45	North Carolina
TECHLAW 2001	1.92	New York State

TABLE 7. ESTIMATED TOTAL OUTPUT FOR BRISTOL BAY SALMON FISHERY, 1

Salmon	Estimated annual output (2005–08 average)		
	Primary effects	Secondary effects	Total effects
Multiplier	1	0.6	1.6
Value (millions $)	$153.8	$92.3	$246.1

Source: Authors' calculations based on McDowell Group 2010

TABLE 8. ESTIMATED TOTAL OUTPUT FOR BRISTOL BAY SALMON FISHERY, 2

Salmon	Estimated annual output (2005–08 average)		
	Primary effects	Secondary effects	Total effects
Multiplier	1	0.6474	1.6474
Value (millions $)	$153.8	$99.6	$253.4

Source: Authors' calculations based on Hackett et al. 2009

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TABLE 9. TOTAL OUTPUT OF BRISTOL BAY COMMERCIAL FISHERIES USING EXISTING MULTIPLIERS

		Estimated annual output (2005–08 average)		
	All fisheries	Direct effects	Indirect effects	Total effects
Crosson (2009)	Multiplier	1	0.453	1.453
	Value (millions $)	$463.00	$209.70	$672.70
Hodges et al. (2000)	Multiplier	1	0.578	1.578
	Value (millions $)	$463.00	$267.40	$730.40
TECHLAW (2001)	Multiplier	1	0.92	1.92
	Value (millions $)	$463.00	$426.10	$889.10

TABLE 10. SUMMARY OF REGIONAL PROCESSING MARGINS

	Landings value (2007)	Wholesale value (2007)	Processing margin
Northwest and AYK	$7,209,518	$13,999,731	94.2%
Bristol Bay	$82,618,059	$239,528,907	189.9%
Southcentral	$203,004,630	$362,484,552	78.6%
Aleutian & Pribilof Islands	$392,611,159	$821,911,580	109.3%
Kodiak	$129,918,267	$266,272,694	105.0%
Southeast	$213,448,259	$404,779,932	89.6%
At-sea	$523,390,109	$1,518,022,604	190.0%
Total	**$1,552,200,001**	**$3,627,000,000**	**133.70%**

Source: Schug et al. (2009) and Marine Conservation Alliance (2009)

3.2. Wholesale Value and Value of Associated Economic Output

Wholesale value typically refers to the value of seafood products after processing. Estimates of wholesale value for the base study area were not readily available. To determine the value added to commercial landings as they are processed for wholesale, we review existing studies that report both landings value and wholesale value estimates to identify a range of processing margins. We then apply those margins to the landings value for our base study area.

In a report for the Marine Conservation Alliance, Schug et al. (2009) estimated processing margins for Alaska's seafood industry by regions. They estimate total landings value of Alaska commercial fisheries to be near $1.6 billion (in 2007). They estimate the total wholesale value to be $3.6 billion; $2.1 billion for shore-based processing, and $1.5 billion for at-sea processing (Northern Economics 2009).[15] This implies a processing margin of 133.7% (Table 10).

The highest percentage of value added (189.9%) for shoreside processing is attributed to Bristol Bay, though this region is likely not coterminous with the base study region.[16] We use the estimated processing margins for Bristol Bay and for all of Alaska to estimate a range of wholesale values for the base study area (Table 11). We estimate wholesale value for the base study region to range from $1.1 to $1.3 billion dollars annually.

TABLE 11. ESTIMATED ANNUAL WHOLESALE VALUES FOR BRISTOL BAY COMMERCIAL FISHERIES

Landings value (millions $)	Processing margin	Wholesale value (billions $)
$463	189.92% (Bristol Bay)	$1.3
$463	133.67% (Total)	$1.1

Source: Authors' calculations

Estimating Wholesale Value Using NMFS Value-Added Model

The National Marine Fisheries Service (NMFS) has developed an economic value-added model for commercial fisheries. The model calculates the value added at each step in the value chain, beginning with fishermen's landings through the point of final sale to consumers (NMFS 2009). The model relies on primary and secondary data sources to calculate the margin of value added (mark-up) applied at each stage of the value chain (NMFS 2009). The model begins with total landings value from domestic harvest. The final retail value represents all consumer expenditures on seafood products sold through stores and food service outlets and purchases of non-edible industrial products (NMFS 2009). The value paid to fishermen, processors, and wholesalers is embodied in the final retail value. Figure 5 displays the model as adapted to our purposes.[17]

To apply the NMFS value-added model to base study area landings values, we assume basic similarities in how seafood is processed and eventually consumed from the base study area and from U.S. fisheries as a whole. Table 12 details the component of the NMFS model that allows us to estimate the value added to commercial landings values through primary and secondary processing. NMFS describes secondary processors/wholesalers as those who purchase from other wholesalers or processors and make final distributions to retailers or restaurants.

FIGURE 5. VISUAL REPRESENTATION OF NMFS VALUE-ADDED MODEL

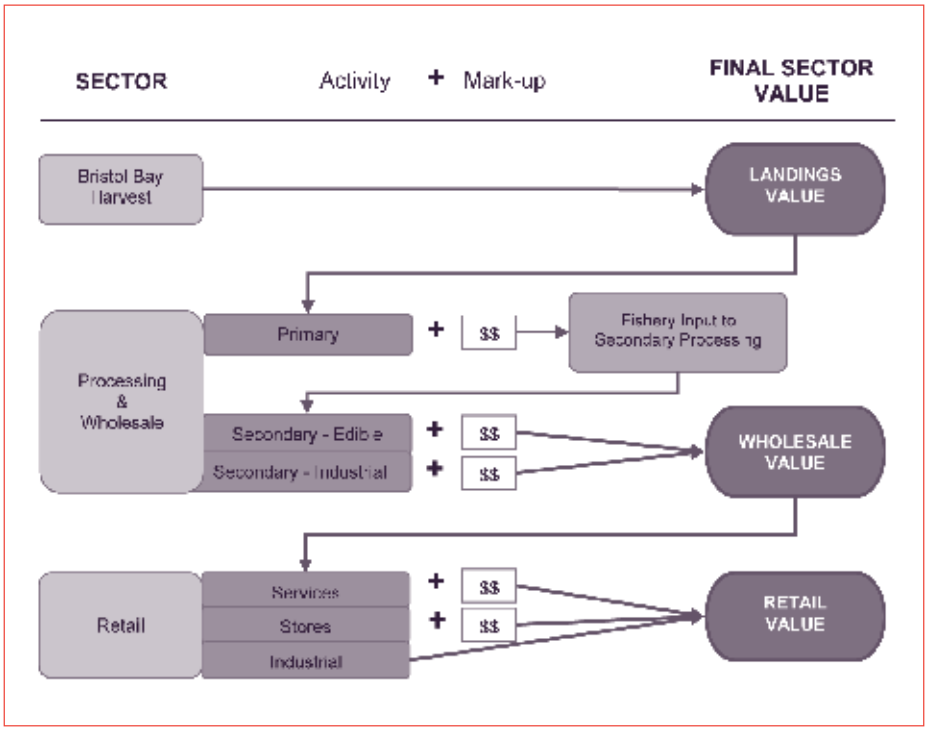

TABLE 12. ESTIMATED WHOLESALE VALUE USING ADAPTED NMFS MODEL

Sector	Activity	Allocation %	Indirect effects	Total effects	Indirect effects	Total effects
Processing & Wholesale	Primary	100%	$463.0	90.3%	$418.2	$881.1
			$463.0			**$881.1**
	Secondary - Edible	98.9%	$871.0	62.7%	$546.2	$1,417.2
	Secondary - Industrial	1.1%	$10.1	62.7%	$6.3	$16.4
			$881.1			**$1,433.7**

Source: Authors' calculations using the NMFS (2009) value-added model

Kevin Schafer / WWF-Canon

WWF-Canon / Elma Okic

To arrive at wholesale values, we input the average annual landings value of the base study area ($463 million) into the model. During primary processing, a mark-up of 90.3% is applied to this fishery input. The NMFS model then apportions 98.9% of the fishery input to secondary processing for edible uses and 1.1% for secondary processing for industrial uses, but applies the same mark-up (62.7%) to both. The model then calculates the final wholesale value of the fishery input after primary and secondary processing at $1.4 billion.

Multiplier Effect

Schug et al. (2009) estimated total economic output associated with seafood processing in Alaska using the IMPLAN input-output model. The multiplier they derive from IMPLAN is equal to 1.6. We apply this multiplier to our estimated wholesale values to generate a range of estimates of the total economic output associated with processing seafood harvested from our base study region (Table 13). The total estimated economic output from processing seafood harvested in Bristol Bay ranges from $1.7 to $2.3 billion dollars.

Summary

The estimated wholesale value of commercial harvests from the base study region ranges from $1.1-$1.4 billion dollars annually. This wholesale value as it is processed supports secondary economic activity in the base study area and beyond. The value of the total economic output associated with fisheries wholesale and processing, therefore, may be as high as $2.3 billion each year. These values include landings value and the value of economic activities associated with harvesting. It is a cumulative estimate of the value of the total economic activity created as fish are harvested, processed, and sold wholesale along the value chain.

3.3. Retail Value and Value of Associated Economic Output

After processing, seafood is typically distributed to retailers or restaurants where it finally reaches consumers. We refer to this final level of distribution as 'retail'. It includes food stores and the food service industry, as well as the non-edible industrial products resulting from secondary processing. We use the NMFS value-added model to produce three estimates of the value added at the retail level based on our three wholesale value estimates presented in section 3.2.

TABLE 13. AVERAGE ANNUAL OUTPUT FROM PROCESSING HARVESTS FROM BRISTOL BAY

	Estimated annual output (2005–08 average)			
		Direct effects	Indirect effects	Total effects
Approach 1: low bound	Multiplier	1	0.6	1.6
	Value (billions $)	$1.1	$0.6	$1.7
Approach 1: high bound	Multiplier	1	0.6	1.6
	Value (billions $)	$1.3	$0.8	$2.1
Approach 2	Multiplier	1	0.6	1.6
	Value (billions $)	$1.4	$0.9	$2.3

Source: Authors' calculations

TABLE 14. ESTIMATED RETAIL VALUE USING ADAPTED NMFS MODEL, LANDINGS VALUE INPUT $463 MILLION

Sector	Activity	Allocation %	Fishery input purchase (millions $)	Mark-up %	Total mark-up value (millions $)	Value of sales by sector (millions $)
Processing & Wholesale	Primary	100%	*$463.0*	90.3%	$418.2	$881.1
						$881.1
	Secondary - Edible	98.9%	$871.0	62.7%	$546.2	$1,417.2
	Secondary - Industrial	1.1%	$10.1	62.7%	$6.3	$16.4
			$881.1			**$1,433.7**
Retail	Services	48.8%	$699.3	182.4%	$1,275.5	$1,974.8
	Stores	50.1%	$718.0	33.4%	$240.0	$957.9
	Industrial	1.1%	$16.4	-	-	$16.4
			$1,433.7			**$2,949.2**

Source: Authors' calculations

TABLE 15. ESTIMATED RETAIL VALUE USING ADAPTED NMFS MODEL, WHOLESALE VALUE INPUT $1.1 BILLION

Sector	Activity	Allocation %	Fishery input purchase (millions $)	Mark-up %	Total mark-up value (millions $)	Value of sales by sector (millions $)
Retail	Services	48.8%	$527.7	182.4%	$962.5	$1,490.1
	Stores	50.1%	$541.7	33.4%	$181.1	$722.8
	Industrial	1.1%	$12.4	-	-	$12.4
			$1,081.8			**$2,225.3**

Source: Authors' calculations

TABLE 16. ESTIMATED RETAIL VALUE USING ADAPTED NMFS MODEL, WHOLESALE VALUE INPUT $1.3 BILLION

Sector	Activity	Allocation %	Fishery input purchase (millions $)	Mark-up %	Total mark-up value (millions $)	Value of sales by sector (millions $)
Retail	Services	48.8%	$654.7	182.4%	$1,194.2	$1,848.9
	Stores	50.1%	$672.2	33.4%	$224.7	$896.8
	Industrial	1.1%	$15.4	-	-	$15.4
			$1,342.2			**$2,761.1**

Source: Authors' calculations

Using the NMFS model with the base study area landings values, we have already determined that the value of Bristol Bay fisheries output after primary and secondary processing is $1.4 billion (Table 15). This wholesale value becomes the input purchase for the retail sector in the model. The NMFS model allocates 48.8% of the wholesale value of seafood to retail services (e.g. restaurants, caterers, schools, hospitals and other institutional food service providers), where the estimated retail mark-up is 182%. It apportions 50% of the wholesale value to retail stores (e.g. supermarkets, grocery stores, and seafood specialty shops), where the mark-up is 33.4%. The model assumes that there is no additional value added to the remaining 1.1% of wholesale value going to industrial products. Beginning with the landings value as the starting fishery input (italicized in Table 14), the total retail value of seafood harvested from Bristol Bay is estimated at $2.9 billion.

To provide a range of retail value estimates, we also run the NMFS value-added model inputting the alternative estimates of wholesale value ($1.1 and $1.3 billion, italicized below) we obtained above by applying processing margins found in the literature. We use these values in the NMFS model as the initial inputs for the retail sector. A wholesale value of $1.1 billion translates into retail value of $2.2 billion (Table 15). A wholesale value of $1.3 billion translates into retail value of $2.8 billion (Table 16).

Table 17 compares the values from each of the three model runs from lowest to highest. The annual value of fisheries in the base study area, from harvest through processing, retail and consumption is $2.2-$2.9 billion dollars. These estimates reflect the dollar amount final consumers are likely to spend on purchases of seafood (and seafood products) harvested in the base study region.

Multiplier Effect

Retail sales of seafood harvested from the base study area supports additional economic activity. Just as we apply economic multipliers to commercial harvest and processing, we use an appropriate multiplier to estimate the total economic output resulting from retail sales of seafood from the base study area. Multipliers for retail trade were obtained from the Bureau of Economic Analysis (BEA).[18] The multipliers are not seafood specific and represent the multiplier effect of all retail trade types. Multipliers specific to retail trade in seafood could not be obtained.

Since we do not know the exact geographic distribution of where seafood from the base study area is processed and sold, we average the BEA's state multipliers for the fifty U.S. states and District of Columbia to create national multipliers for our analysis. We then apply these multipliers to our retail value estimates of base study area seafood.

The total economic activity supported by retail sales of seafood harvested in the base study region ranges from $4.1–$5.4 billion dollars (Table 18). These estimates include the value of seafood landings, wholesale, and retail, as well as the additional economic activity supported by each of those steps along the value chain. This range is comprehensive of the total economic value of Bristol Bay commercial fisheries from harvest to final sale to consumers.

TABLE 17. SUMMARY AND COMPARISON OF WHOLESALE VALUE AND RETAIL VALUE ESTIMATES

	Wholesale value (billions $)	Retail value (billions $)
Retail value one	$1.1	$2.2
Retail value two	$1.3	$2.8
Retail value three	$1.4	$2.9

Source: Text

TABLE 18. ESTIMATED TOTAL ECONOMIC OUTPUT OF BRISTOL BAY RETAIL TRADE

	Estimated retail value (billions $)	Multiplier	Total economic output (billions $)
Retail value one	$2.2	1.83	$4.1
Retail value two	$2.8	1.83	$5.1
Retail value three	$2.9	1.83	$5.4

Source: Authors' calculations, multipliers adapted from the BEA, Benchmark Series 2002

4] CONCLUSION

This analysis demonstrates the economic value of commercial fisheries in the waters in and around Bristol Bay Alaska, from harvest to consumption. The economic value at each step of the value chain is comprised of the direct value added to the commercial fishery input plus the additional economic activity that it supports. We capture the first component – the direct value added – through a value-chain analysis. We estimate the indirect and induced economic activities using economic multipliers from input-out analyses found in the literature.

The value chain analysis estimates the direct values of the commercial fishery at three distinct steps along the value-chain: harvest, processing and wholesale, and retail. Table 19 summarizes those values.

The direct value of the fishery at every step along the value-chain supports secondary economic activities. For example, the fisherman sells his catch to processors/wholesalers to pay for his crew and supplies. The processor/wholesaler sells his product to retailers to cover the costs of supplies and employees. Retailers sell their seafood to consumers to pay for labor and other inputs. Commercial fishermen, processors, and retailers have downstream suppliers who benefit indirectly from sales; these backward linked economic activities constitute the indirect secondary impacts of commercial fishing. As the fishery input moves along the value-chain, fishermen and their crew; bait and tackle shop owners and their employees; processors and their workers and suppliers; and retailers earn income. To the extent that they spend that income on other consumer goods and services, they induce even more secondary economic activity. The multiplier effect captures the indirect and induced economic activity resulting from each step along the supply-chain. Table 20 summarizes the range of multiplier effects estimated by our analysis.

The value of the total economic activity supported by each stage in the supply chain is found by adding the values of direct and secondary economic activities. Each step along the supply chain is cumulative; the value of total economic activity at the retail level incorporates the direct and indirect values associated with harvest and wholesale.

Healthy and productive fisheries in the base study region generate economic activity equivalent to $4.1–$5.4 billion dollars annually. These estimates provide strong economic support for protecting Bristol Bay's unique and valuable ecosystem. The value of the economic activity we estimate in this report is only one component of the total economic value of Bristol Bay. It does not include other values that are more difficult (if not impossible) to monetize, including biodiversity and ecosystem services; recreation and scenic amenities; and cultural and social significance. These values, as well as the economic activities supported by Bristol Bay fisheries, are in danger of being lost to mounting development pressures in the Bristol Bay watershed.

The economic impacts of Bristol Bay fisheries extend widely; permit holders reside outside of the base study area and in other states; the catch is processed inside and outside of Alaska; and final products are sold to consumers across the U.S. and abroad. Development activities that compromise the productivity of Bristol Bay's fisheries will affect areas far beyond the base study region. The future of Bristol Bay's fisheries, therefore, is of significant national and global importance.

TABLE 19. SUMMARY OF ESTIMATED DIRECT VALUES

	Value (billions $)		
Commercial Harvest (landings value)	$0.463		
Processing & Wholesale (wholesale value)	$1.3	–	$1.3
Retail (retail value)	$2.2	–	$2.9

Source: Text

TABLE 20: SUMMARY OF ESTIMATED MULTIPLIER VALUES

	Direct value	Value of secondary economic activity	Value total economic activity
Commercial Harvest	$0.463	$0.21–$0.43	$0.67–$0.89
Processing & Wholesale	$1.1–$1.4	$0.6–$0.9	$1.7–$2.3
Retail	$2.2–$2.9	$1.9–$2.5	$4.1–5.4

Source: Text

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APPENDIX A – Review of Literature

Title	Authors	Year	Region	Type of fishery	Model used	Other important data sources
Economic Impact of Florida's Commercial Fisheries and Aquaculture Industries	Alan Hodges, David Mulkey, Effie Philippakos, and Chuck Adams	2001	FL	Commercial - Researchers assess three SIC industries (canned and cured seafood, commercial fishing, and prepared fresh/frozen seafood)	IMPLAN I-O Model	US Dept. of Agriculture, Marine Research Institute, FL Agricultural Statistics Service
The Seafood Industry in Alaska's Economy	Northern Economics of Anchorage	2009	AK	Commercial Seafood industry	IMPLAN I-O Model	AK Fisheries Science Center of the National Marine Fisheries Service; Research and Analysis Division of the AK Dept. of Labor and Workforce Development, Commercial Fisheries Entry Commission, AK Dept. of Fish and Game Commercial Operators Annual Report, seafood industry representatives
NOAA Technical Memorandum NMFS-NE-188, Northeast Region Commercial Fishing I-O Model	Scott R. Steinback and Eric M. Thunberg	2006	Coastal states from ME to NC	Commercial - Researchers delete IMPLAN's commercial fishing sector and seafood processing sector and add 18 harvesting sectors based on gear type and vessel size, a wholesale seafood dealer sector, a sub-regional processing sector, a medium bottom trawl bait supplying sector, a fish exchange sector, and a mid-water trawl bait supplying sector	Modified IMPLAN I-O Model based on Tanjuakio, Hastings, and Tytus (1996) that can accept gross output changes as entries	US Economic Census, County Business Patterns data, average Fulton Market margin, federal Northeast vessel trip reports, dealer weigh-out slips, permit applications
An I-O Analysis of Maine's Fisheries	Hugh Briggs, Ralph Townsend, and James Wilson	1982	ME	Commercial - Researchers remove fisheries harvesting from the forestry/fisheries sector (yielding a forestry sector), remove fisheries processing from the food processing sector (yielding a food except fish processing sector), and add 5 fisheries harvesting sectors, 4 fisheries processing sectors, and a household consumption sector	Modified 1963 U.S. Multiregional I-O Model	1963 U.S. Multiregional I-O Model, household consumption expenditures, fishery sales, interviews with industry and government personnel
Multiplier Values for the Fishing and Fish Processing Industries in the UK and in Scotland: An I-O Analysis	Gunilla Tegelskär Greig	1999	UK and Scotland	Commercial	Open I-O Model	Fishermen's Handbook, UK Survey of the Sea Fish Processing Industry, real cost and earnings figures, Office of National Statistics
1997 Hawaii Fishery Input-Output Model and Methodology	Aaron Peterson	2005	HI	Commercial, recreational, and charter - Researchers asses six sectors (tuna longline, swordfish longline, small boat, recreation boats, expense boats, and charter fishing) plus an out-of-state visitor charter fishing sector	Modified 1992 Hawaii Fisheries I-O Model	1992 HI Fisheries I-O Model, 1997 HI State I-O Model, 1993 survey of longline fisheries (Hamilton et al. 1996), 1995-6 cost-earnings survey (Hamilton and Huffman 1997), 2000 charter boat patron survey (O'Malley et al. 2001)
The role of the Alaska seafood industry: a social accounting matrix (SAM) model approach to economic base analysis	Chang K. Seung and Edward C. Waters	2006	AK	Commercial (including seafood processing industry)	Social accounting matrix (SAM) Model [19]	

Title	Authors	Year	Region	Type of fishery	Model used	Other important data sources
A Social and Economic Analysis of Commercial Fisheries in NC Atlantic Ocean	Scott Crosson	2009	NC	Commercial	IMPLAN I-O Model using Type I multipliers only (not Type II)	License and Statistics Section of the NC Division of Marine Fisheries
The Relative Economic Contributions of U.S. Recreational and Commercial Fisheries	Southwick Associates	2006	23 coastal states and the U.S.	Commercial and recreational	Modified Kirkley, Murray, and Duberg (2005) I-O Model	NOAA Fisheries' report on The Economic Importance of Marine Angler Expenditures in the U.S., NOAA Fisheries' Marine Recreational Fisheries Statistics Survey, National Fisheries Institute
Economic Contributions of Virginia's Commercial Seafood and Recreational Fishing Industries: A User's Manual for Assessing Economic Impacts	James E. Kirkley, Thomas J. Murray, and John Duberg3	2005	VA	Commercial, recreational, and CPFV - Researchers add commercial sectors based on 30 locations (plus statewide), 11 species, and 5 user groups (harvesters, processors, distributors, restaurants, and grocers) and add recreational sectors based on 20 locations (plus statewide), 14 species, and 3 fishing modes (charter/party boat, shore/pier/beach, and private/rental boat)	Modified IMPLAN I-O Model based on Tanjuakio, Hastings, and Tytus (1996) that can accept gross output changes as entries	US Economic Census, County Business Patterns data, average Fulton Market margin, federal Northeast vessel trip reports, dealer weigh-out slips, permit applications
An I-O Analysis of Maine's Fisheries	Hugh Briggs, Ralph Townsend, and James Wilson	1982	ME	Commercial - Researchers remove fisheries harvesting from the forestry/fisheries sector (yielding a forestry sector), remove fisheries processing from the food processing sector (yielding a food except fish processing sector), and add 5 fisheries harvesting sectors, 4 fisheries processing sectors, and a household consumption sector	Modified IMPLAN I-O Model	VA Marine Resources Commission, National Marine Fisheries Service
The Economic Contribution of the Sport Fishing, Commercial Fishing and Seafood Industries to New York State	TechLaw Inc. and Thomas J. Murray & Associates, Inc.	2001	NY	Commercial, recreational, and seafood industry - Researchers asses commercial sector by species or gear type (inshore lobster, offshore lobster, mollusks/shellfish, surf clam dredges, inshore fisheries, multi-species trawlers, longline, Great Lakes, and aquaculture), assess recreational sector by type of expenditure (head and charter boat fees, marina fees, fishing rods/reels/tackle, boats/motors/trailers, and bait) and location of fishing activity (marine and freshwater), and assess seafood sector by segment (Fulton Market wholesalers, wholesalers/distributors, processors, supermarkets/fish markets, and restaurants/food services)	Modified IMPLAN I-O Model	National Marine Fisheries Service, Port Import Export Reporting Service, U.S. Fish and Wildlife Service, U.S. Census, U.S. Bureau of Labor Statistics, NY State Dept. of Environmental Conservation

APPENDIX B – Figures

List of Figures included in Appendix B

FIGURE B.1. PROPOSED OIL AND GAS LEASE AREAS NEAR BRISTOL BAY

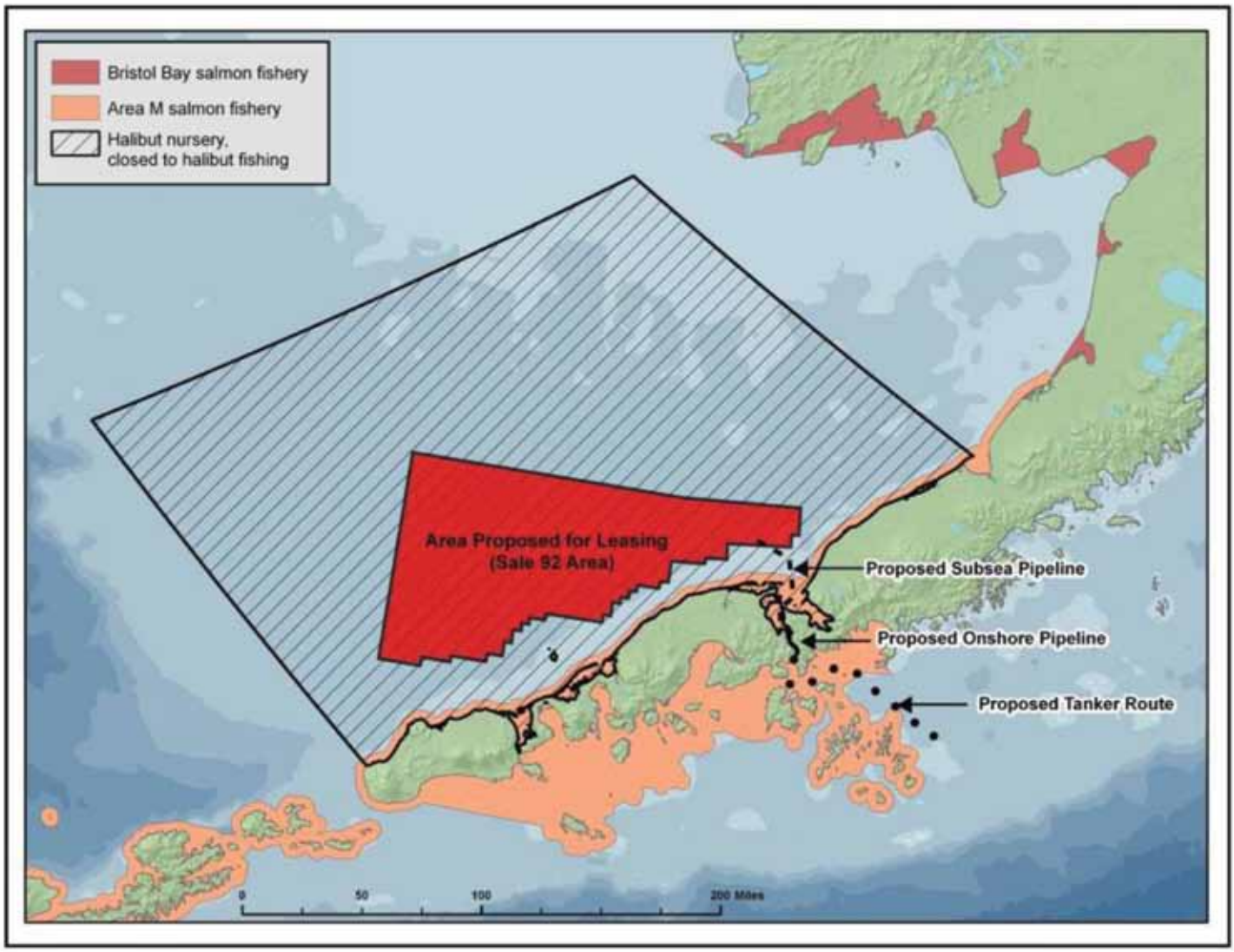


FIGURE B.2. RESIDENCY OF 2008 BRISTOL BAY SALMON PERMIT HOLDERS

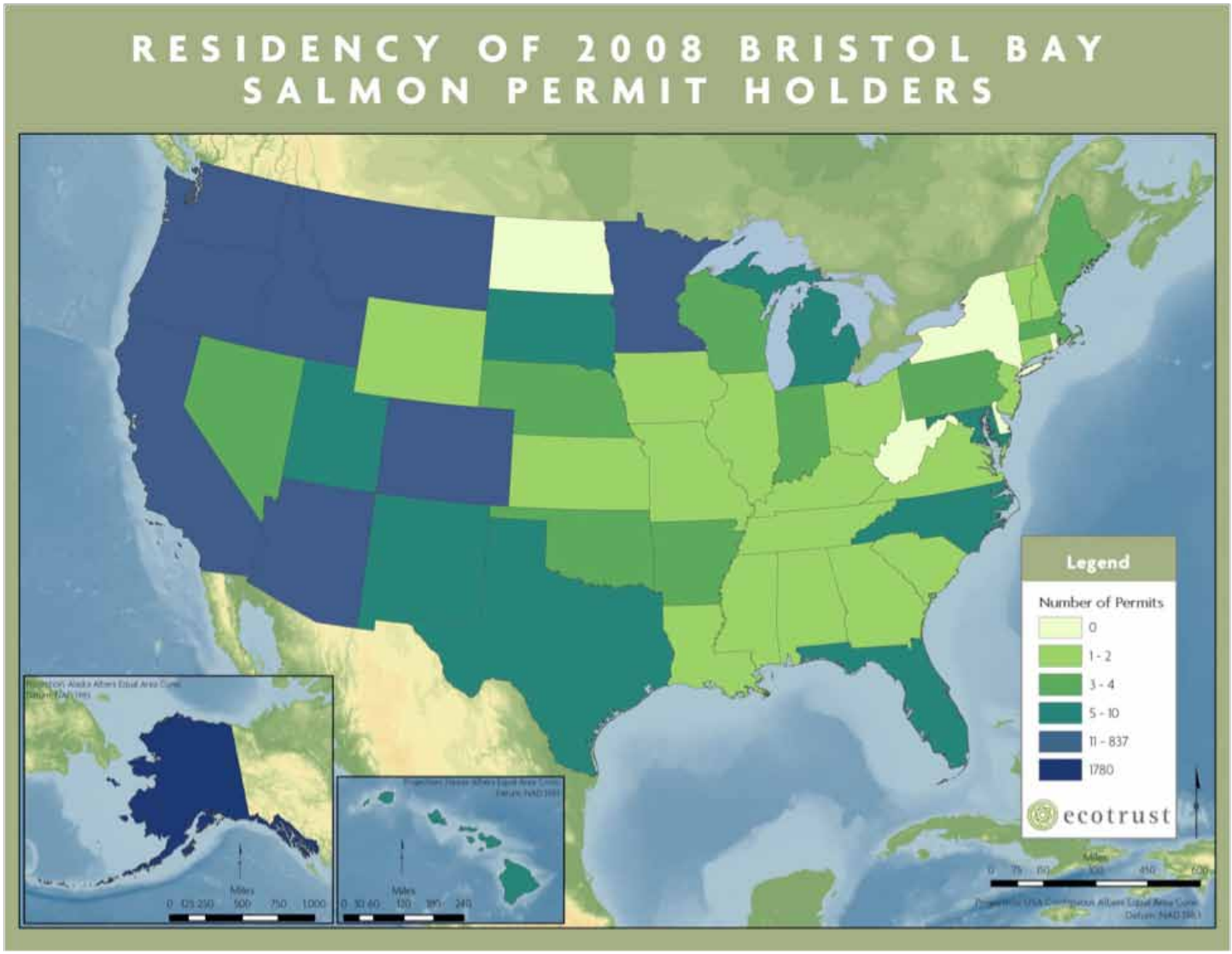


FIGURE B.3. RESIDENCY OF 2008 BRISTOL BAY SALMON PERMIT HOLDERS (ALASKA ONLY)

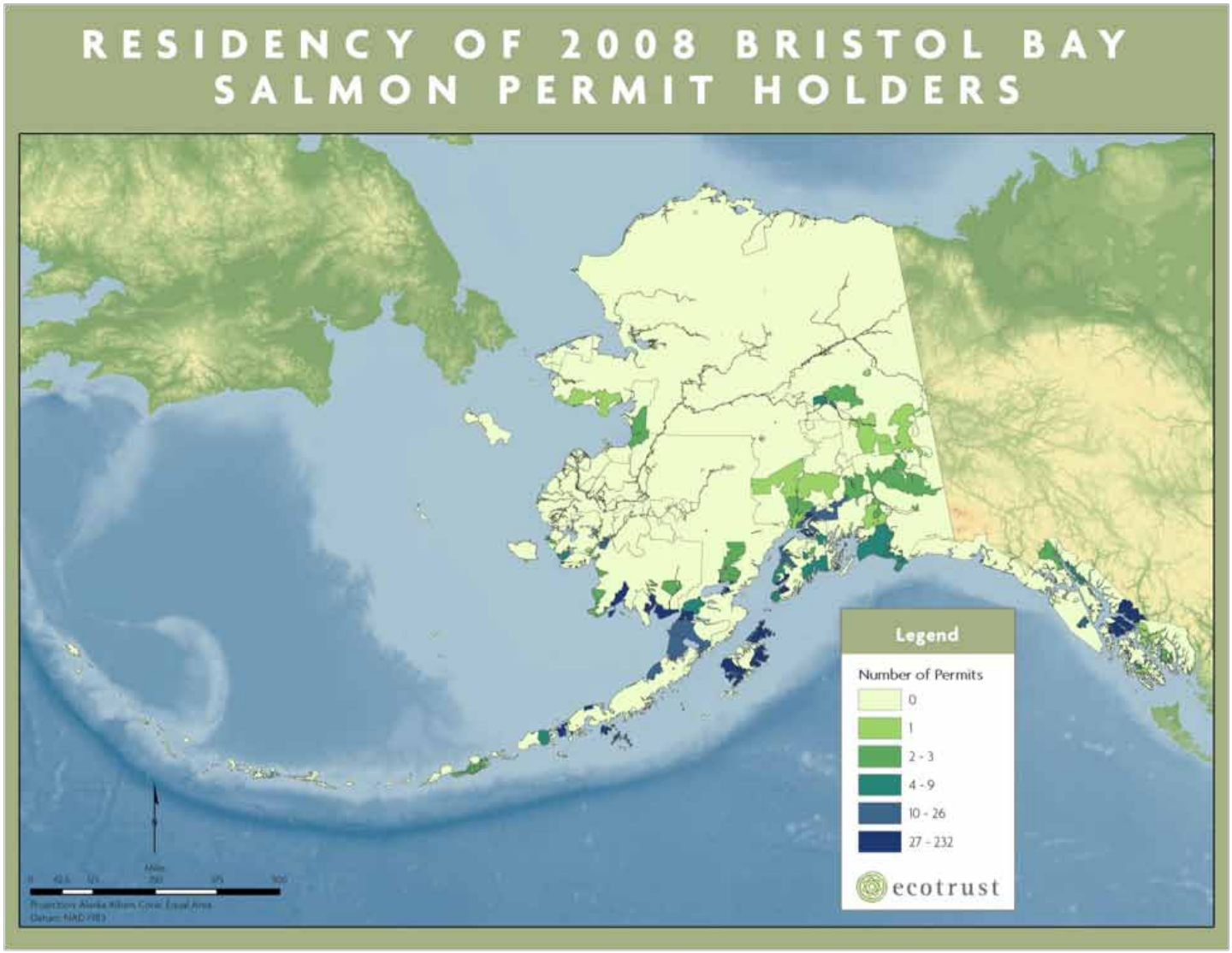


FIGURE B.4. ALASKAN 2008 BRISTOL BAY SALMON PERMIT HOLDERS PER CAPITA

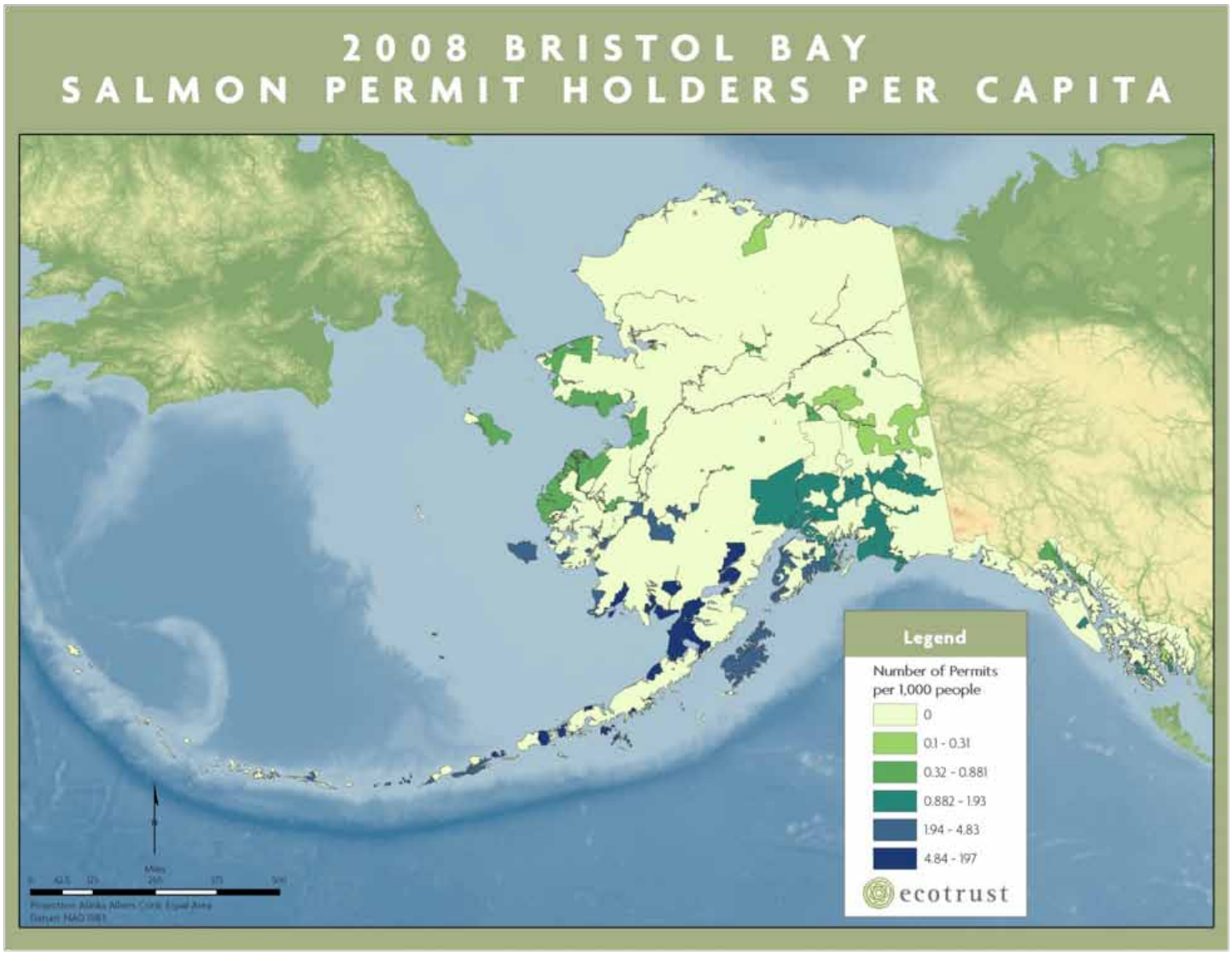
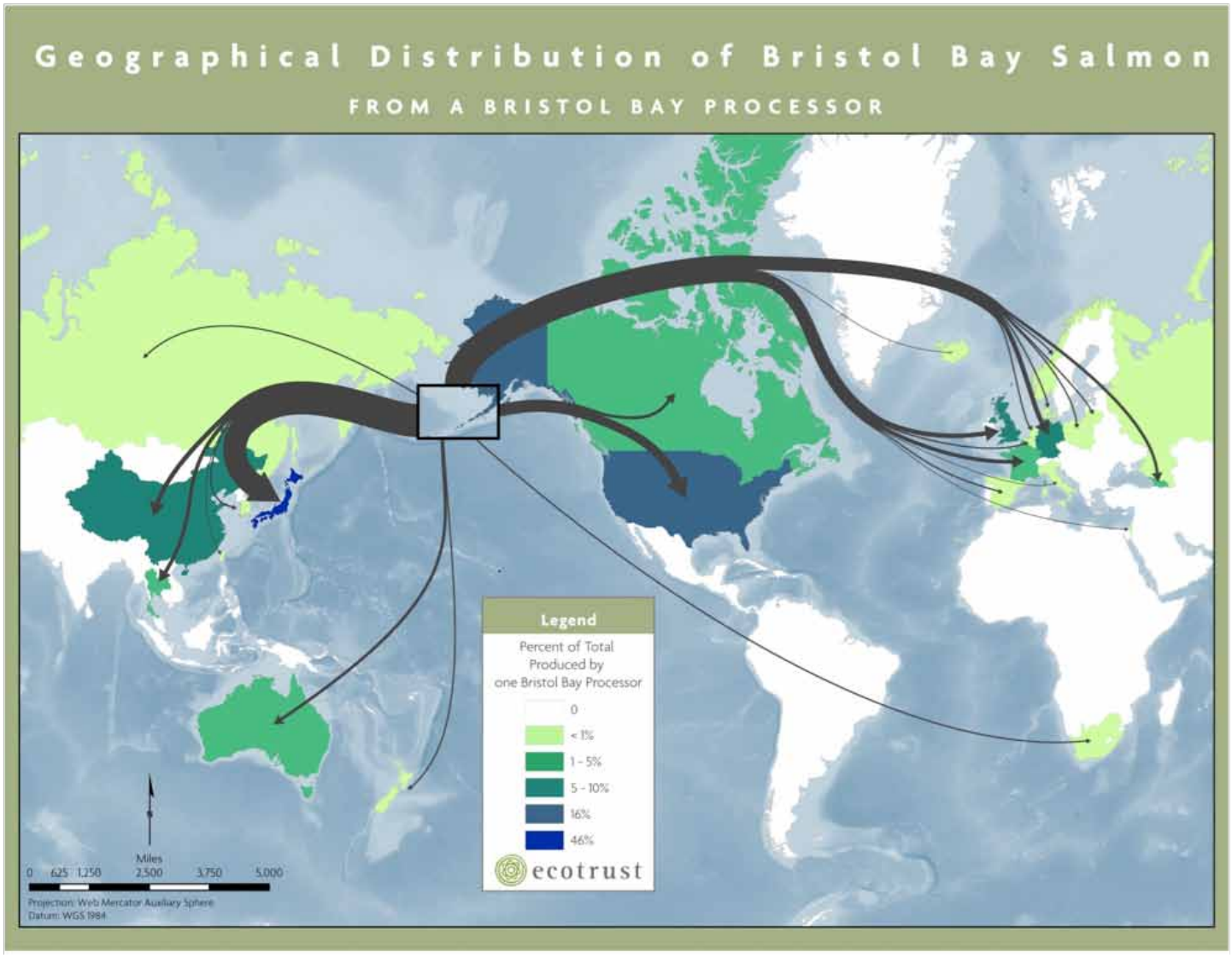


FIGURE B.5. SAMPLE GEOGRAPHICAL DISTRIBUTION OF BRISTOL BAY SALMON



APPENDIX C – Estimate Summary Table

Value Chain	Harvesting		Processing & Wholesale		Retail	
	Landings Value	*Multiplier effects*	Wholesale Value	*Multiplier effects*	Retail Value	*Multiplier effects*
Estimates	$463 million	*$673-$889 million*	$1.1 -$1.4 billion	*$1.7-$2.3 billion*	$2.2-$2.9 billion	*$4.1-$5.4 billion*
Methods	Actual landings value from base study area averaged over the four year period 2005-08.	*Using the averaged landings value and applying a range of multipliers adapted (Types I and II) from three separate studies on commercial fishing. The lowest estimate makes up the bottom value in the range, while the highest estimate represents the top. Because multipliers specific to the region were not available, a range of estimates is presented.*	Approach 1: Applying processing margins from the Bristol Bay region and from the state of Alaska between landings and wholesale values to the averaged landings value from the base study area gives a range of estimates from $1.1-$1.3 billion. Approach 2: Plugging the averaged landings value from the base study area into the NMFS economic value-added model gives and estimate of $1.4 for the wholesale value of the base study area.	*Applying a Type II multiplier used to calculate the economic output associated with seafood processing in Alaska to the base study area wholesale value.*	Plugging in all three estimates of the wholesale value into the NMFS economic value-added model for three separate runs. The lowest estimate makes up the bottom value in the range while the highest estimate represents the top.	*Applying national level broad retail multipliers to all three estimates of the retail value. Only Type II multipliers used, producing a range of estimates from $4.1-$5.4 billion.*
Data Sources	Alaska Commercial Fisheries Entry Commission	*Multipliers: Crosson (2009); Hodges et al. (2000); TECHLAW (2001) (ALL IMPLAN)*	Northern Economics (2009); Marine Conservation Alliance (2009); NMFS 2009	*Multiplier: Northern Economics (2009) (IMPLAN)*	NMFS 2009	*Multiplier: BEA 2010 (RIMS II)*
Geography covered included	Terrestrial areas where fish from the base study area are landed, primarily just surrounding the base study area.	• *Regional study area* • *Residency areas of harvesters and suppliers*	Wherever processors are located, largely within the Bristol Bay region surrounding the base study area, but also likely in neighboring states like WA, OR, etc.	• *Regional study area* • *States where main suppliers are located* • *Residency areas of those directly and indirectly employed*	All around the world, any area where seafood from the base study area is sold	*A global scale, wherever retail employees and suppliers (plus their employees) are located.*
Included	• Resident commercial fishermen • Non-resident commercial fishermen	• *Fishermen receiving wages in and out of Alaska* • *Fishery supply stores in Alaska* • *Coastal businesses supplying accommodation, food, recreational, and other needs of those employed by commercial fishing and those selling to commercial fishermen* • *Etc.*	• Processing companies • Wholesale companies • Distribution companies	• *Processing employees* • *Employees in wholesale warehouses* • *Seafood distributor truck drivers* • *Supplier stores* • *Manufacturers of processing equipment* • *Maintenance men servicing equipment* • *Areas where those directly and indirectly spend their incomes* • *Etc.*	• Fish and chips establishment • Catering companies • High-end seafood restaurants • Grocery stores (fish sticks, frozen salmon fillets, etc.) • Specialty food stores (smoked locks, caviar) • Sushi places • Companies preparing airline meals • Etc.	• *Store clerks* • *Servers* • *Caterers* • *Food packaging companies* • *Etc.*

APPENDIX D – Glossary

Backward linkages: Between the industry (i.e., a commercial fishery) and its suppliers (e.g., fuel, bait, ice, and so forth), or (for induced effects) between households and the producers of household goods and services.

Base study area: The marine area from which commercial landings assessed in this report are harvested from; the marine waters contained within specific Alaska Department of Fish and Game statistical areas, which were identified and selected as those areas potentially affected by activities within the North Aleutian Basin Outer Continental Shelf Planning Area; referenced specifically in section 2.1.

Benefit transfer: The method of transferring estimates or results from past valuation studies to the present study, in order to reduce costs, time, and or effort. The applicability of the approach depends on the degree of similarity between the various studies.

Consumer expenditures: Amounts paid for goods or services received or services rendered.

Direct effects: Economic activity occurring in industries directly associated with, in this study, the sale of landings to processors, the sale of wholesale value seafood to retail, and finally the retail sale to final consumers.

Economic activity: The exchange of goods and services.

Economic benefits: Benefits quantifiable in terms of money, such as revenue, net cash flow, net income.

Economic impact: A measure of any resulting increase or decrease in the productive potential of the economy, usually stated in monetary terms or changes in employment.

Economic multiplier: A calculated number used to multiply a dollar amount to get an estimate of economic impact. It is a way of identifying impacts beyond the original expenditure. It can also be used with respect to income and employment.

Economic output: The total value of all goods and services.

Economic value-added: The difference between the value of goods and the cost of materials or supplies that are used in producing them; a measure of which the value of a good has increased due to its processing.

Fishery input: The fish products purchased at one level in the value chain to be used as starting inputs in a higher level to undergo value added processing to be sold at a higher margin.

Forward linkages: Between the industry (i.e., a commercial fishery) and the entities that purchase its output (e.g., processors)

Gross: The total amount before any deductions have been made.

IMPLAN model: A micro-computer-based, input-output modeling system providing or generating economic multipliers to estimate potential economic impacts associated with an increase or decrease in spending in certain economic sectors.

Indirect effects: Sales, income, and employment resulting from various rounds of inter-industry economic activity generated by the initial direct sales.

Induced effects: The sales, income, and employment resulting from household spending of income earned as a result of the original direct sale either directly or indirectly.

Input-output analysis: A systematic method that both describes the financial linkages and network of input supplies and production which connect industries in a regional economy (however defined), and predicts the changes in regional output, income, and employment.

Landings value: The final amount paid to commercial harvesters upon sale of commercial landings to processors.

Long run: A period of time in which all prices, including wages, are flexible, and have achieved their equilibrium levels. This is one of two macroeconomic time designations; the other is the short run. Long-run wage and price flexibility means that all markets, including resources markets and labor markets, are in equilibrium, with neither surpluses nor shortages.

Mark-up: The difference between the sales value and the purchase value of a product, including the cost of materials or supplies purchased from other and the economic value-added.

Net: The total amount once all expenditures and revenues have been accounted for.

Primary effects: The direct effects of economic activity.

Processing margin: The difference between the sales value and the purchase value of a product due to processing, usually expressed as a percentage.

Retail value: The monetary value of seafood available for purchase at the retail level to final consumers.

Revenue: The entire, or gross, amount of income for goods or services before costs have been accounted for.

Secondary effects: The sum of indirect and induced effects.

Short run: A period of time in which some prices, including wages, are rigid, inflexible, or otherwise in the process of adjusting. This is one of two macroeconomic time designations; the other is the long run. Short-run wage and price rigidity prevents some markets, especially resources markets and most notably labor markets, from achieving equilibrium.

Total dollar value: As applied to commercial fisheries in this study, the total monetary value of commercially landed fish after undergoing value-added processing from harvest to the point of final sale at the retail level, including all associated multiplier effects.

Total economic value: The sum of all use and non-use values including both market and nonmarket attributable to that which is being valued.

Type I multiplier: Measures the economic activity due to direct and indirect effects only. Usually resulting estimates are more regionally applicable than those associated with Type II multipliers.

Type II multiplier: Measures the economic activity attributable to direct, indirect, and induced effects. Resulting estimates portray economic activity at a greater scale than Type I multipliers.

Wholesale value: The value of seafood products after undergoing primary and secondary processing, the price at which these products are then sold.

ENDNOTES

[1] See http://www.cf.adfg.state.ak.us/geninfo/statmaps/charts/chart03_bering_sea.pdf; and http://www.mms.gov/Alaska/cproject/NAB214/NAB214_map.pdf

[2] See http://www.cf.adfg.state.ak.us/geninfo/statmaps/charts/chart09_chignik.pdf

[3] See http://www.cf.adfg.state.ak.us/geninfo/statmaps/charts/chart10_aleutian.pdf

[4] Commercial landings data for the base study comes from the Alaska Commercial Fisheries Entry Commission (CFEC). Estimates include commercial harvests only: test fishing, discards, illegal harvests, hatchery, & personal use are excluded. Estimates represent harvests taken from select statistical areas and recorded on fish tickets. Significant harvests may have occurred in Federal waters that were not recorded on fish tickets.

[5] Herring bycatch is included in Other Species.

[6] Please see Appendix B, Figures B.2, B.3, and B.4 for visual representation of permit holders both nationally and for the state of Alaska.

[7] The estimates assume that all permits were active and that within each category of permit type, permit holders earned the same revenue, which is not necessarily the case.

[8] The NMFS value-added model defines consumer expenditures as retail trade from food service and stores as well as wholesale purchases of industrial products (NMFS 2009).

[9] Seafood landed and processed in Alaska makes up a large component of U.S. seafood exports, likely 20% or more (NMFS 2009). NMFS generally assumes that 100% of "non-bait species" harvested in the state of Alaska are domestically processed, after which 93% are exported (Kirkley 2009). After additional exports are made elsewhere in the value chain, approximately 2.5% of seafood commercially harvested from the state of Alaska generally remains domestic. This does not imply that 2.5% of base study area seafood remains in the U.S., as the composition of species commercially harvested in the base study region is not representative of the state as a whole.

[10] Type I multipliers measure only direct and indirect effects. Type II multipliers measure direct, indirect, and induced effects. Type I multipliers generate more conservative estimates while Type II multipliers capture more economic activity on a macro-scale. To provide a range of estimates in our analysis, different multipliers are used. We distinguish between Type I and II multipliers whenever possible. See Appendix A for more details.

[11] HEconomic multipliers are derived from input-output (I-O) models that describe the structure of an economy in terms of the inputs to its various industry sectors and the distribution of the outputs from those sectors. I-O models offer the most comprehensive economic accounting at an economy-wide level. In the United States, two standard I-O modeling systems are commonly used: IMPLAN (IMpact analysis for PLANning, a privately owned computer based I-O modeling system developed by the Minnesota IMPLAN Group, Inc.) and RIMS II (Regional Input-Output Modeling System, a similar I-O modeling system developed by the Bureau of Economic Analysis of the Department of Commerce). The multipliers used throughout this study are directly referenced in the text and are either: 1) taken from closely related studies that used the IMPLAN I-O model; or 2) directly obtained from RIMS II. For more information on I-O modeling in general, please see Miller and Blair (2009).

[12] A succinct estimate summary table including the final estimates, brief methods, data sources used, geography covered, and examples of those affected is included in Appendix C.

[13] Note that all of the multipliers reviewed in this study range from 1.4-1.9. With such a narrow range of estimates of multiplier effects, it is likely that any multiplier selected would result in estimates of total economic value that are very close to accurate.

[14] The study does not specify whether this is a Type I or Type II multiplier.

[15] According to Northern Economics (2009), these estimates "exclude wholesale value of catcher processors, motherships, and shore-based processing plants located outside of Alaska" (p. 50).

[16] Landings data for our base study area excludes harvests made directly by at-sea processors. The processing margin for at-sea processing, therefore, is not relevant to our analysis.

[17] Our adaptation of the NMFS model excludes the foreign trade component, because it is difficult to know exactly how much seafood harvested in the base study area is exported and at what stage in the value chain it is actually exported. NMFS traditionally assumes that only about 2.5% of seafood harvested from the state of Alaska remains within the country after undergoing processing and wholesale processes (Kirkley 2009). Once fishery products are exported, however, they may undergo similar mark-ups during processing at the primary, secondary, and/or retail levels elsewhere. Though our estimates of the final retail value of Bristol Bay fisheries for the U.S. may be high, because we exclude the foreign trade component, the estimates are globally relevant.

[18] The Type II multipliers used here are the Benchmark Series RIMS II (Regional Input-Output Modeling System) aggregated retail multipliers covering 50 states plus the District of Columbia. Benchmark Series multipliers are based on 2002 national benchmark input-output data and 2007 regional data.

[19] A Social Accounting Matrix (SAM) represents all the interactions among buyers and sellers that take place within an economy (national or regional) over a specified time period.

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