November 2016

Modernization of the North Pacific Fishing Fleet

Economic Opportunity Analysis

Prepared for

Port of Seattle®

WASHINGTON MARITIME FEDERATION

Prepared by

McDowell GROUP

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Cover photo sources: Vigor, Port of Seattle, Blue North, Fishermen's Finest.

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Executive Summary

Modernizing the North Pacific commercial fishing fleet has become an increasingly important issue for Washington's maritime industry in recent years. With more than 400 federally permitted vessels over 58 feet, and an average age of 40 years, the need to replace (or refurbish) older vessels represents significant economic opportunity for the region – however, the specific nature and size of this opportunity has been uncertain. The Port of Seattle contracted with McDowell Group, a research and consulting firm based in Alaska and Washington, to conduct the following analyses:

- Profile the North Pacific fishing fleet over 58 feet.
- Identify and describe the factors that influence modernization decisions.
- Estimate the number and type of vessels likely to be replaced or substantially modified over the next decade.
- Estimate the total value of these major modernization projects and the resulting economic impact on Washington State.

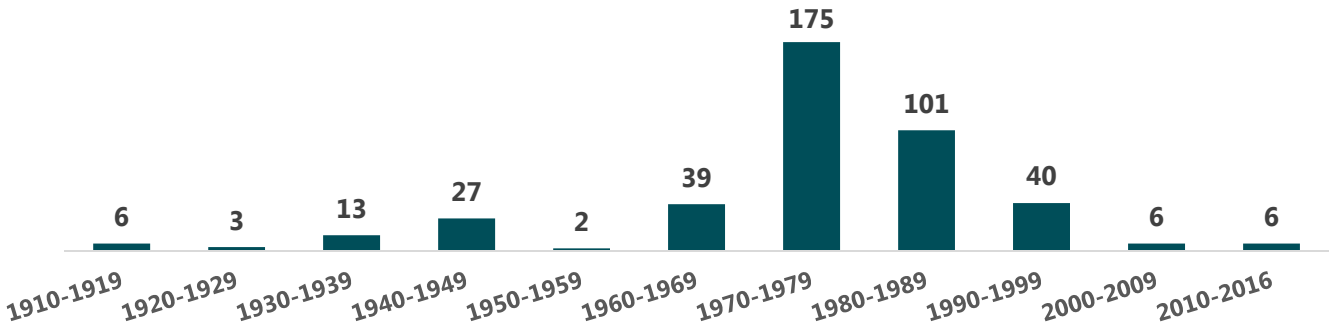
Source: Aleutian Spray Fisheries.

An important source of information for the study was a series of 45 interviews with a wide variety of stakeholders, including vessel owners, seafood companies, shipyards, marine architects, regulatory agencies, and lending institutions. Other data sources included the National Marine Fisheries Service, North Pacific Fisheries Management Council, and the Commercial Fisheries Entry Commission, among others. Following are key findings from the study.

Fleet Composition

- **The North Pacific fishing fleet consists of 414 federally permitted vessels of over 58 feet in length.** These are among more than 5,000 vessels over 30 feet engaged in commercial fishing activity off the coast of Alaska. Vessels in the North Pacific fleet average 40 years old, but ages range widely.

Chart ES-1. North Pacific Fishing Fleet >58', Number of Active Vessels by Decade Built, 2016



Source: Commercial Fisheries Entry Commission. Excludes five vessels due to unknown age.

- **The North Pacific fleet represents a wide range of size (both number of vessels and vessel length) and revenue generation.** Average vessel length ranges from 96 feet for smaller trawlers, to over 400 feet for floating processors. Average 2014 gross revenues ranged from $2 million for Bering Sea/Aleutian Island (BSAI) trawl vessels to $16 million for American Fisheries Act (AFA) catcher/processors.
- **Current average vessel replacement costs likewise vary widely by fishery,** ranging between $15 and $130 million.

Chart ES-2. North Pacific Fishing Fleet >58', Average Gross Revenue per Vessel, 2014 ($millions)

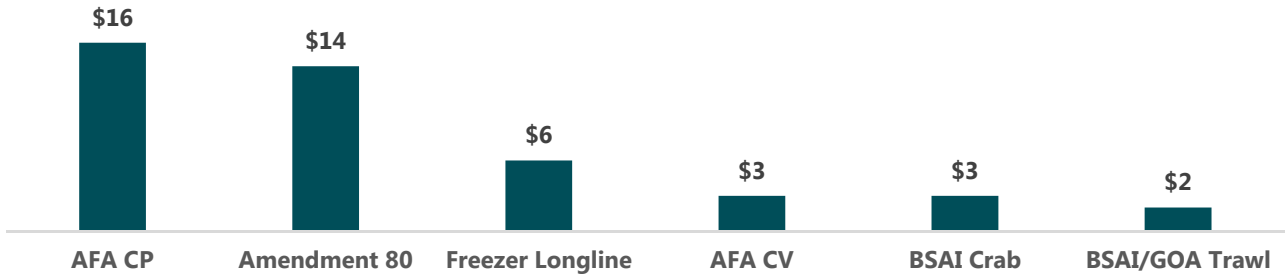
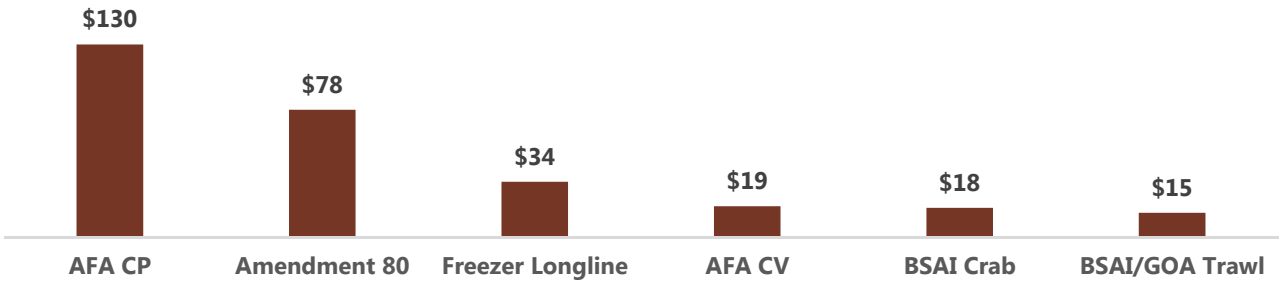


Chart ES-3. North Pacific Fishing Fleet >58', Average Cost of a New Vessel ($millions)



Notes: AFA: American Fisheries Act; CP: Catcher/processors; CV: Catcher Vessels; BSAI: Bering Sea Aleutian Islands; GOA: Gulf of Alaska. The AFA mothership category was excluded because of a lack of revenue data.
Source: NMFS SAFE Economic Status Report 2014, CFEC, McDowell Group estimates.

- **Fleet modernization is already underway.** Since 2000, 19 North Pacific fishing vessels over 58 feet have been built or significantly modified. Nine of these were either Amendment 80 or freezer longline vessels. About one-third of these vessel projects occurred in Washington shipyards.

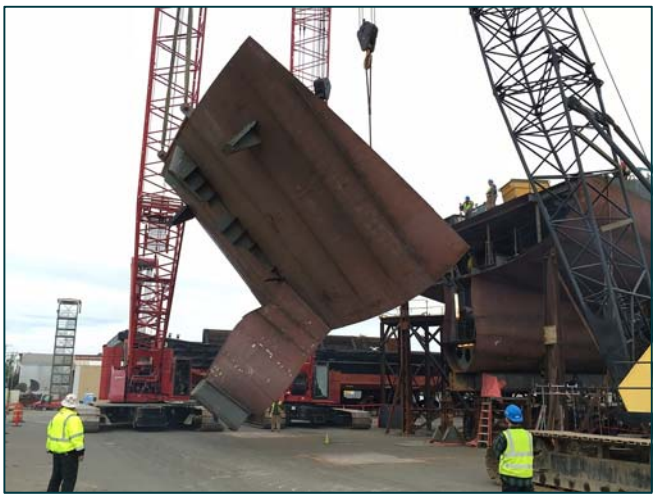
Source: O'Hara Corporation.

Source: Dakota Creek Industries.

Key Factors Affecting Fleet Modernization

Source: Vigor.

- **A key impetus for modernization is the opportunity to add new, more sophisticated processing capacity, as well as increase fuel efficiency.** Reducing fish waste and better utilizing harvested volume is one of the most effective ways to increase vessel earnings. Modern hull designs and propulsion equipment offer the opportunity to save more than 30 percent on fuel cost.
- **The ability for individual fisheries to produce revenues needed to support the cost of a new vessel is a constraint to modernization.** Significant differences exist among the various North Pacific fisheries, with some more profitable than others.
- **Owners of catcher vessels with no on-board processing and limited opportunity to add value to their harvest are less motivated to modernize.** In these situations, well-maintained vessels that are 50 years old or older may continue to be financially viable to operate.
- **Fisheries rationalization — conversion from open access fisheries to quota allocation — has made modernization more attractive to both fishermen and commercial lenders.** Vessel owners are motivated because they have a more certain stake in the fishery, and lenders are more interested because harvesting rights (typically in the form of transferable quota) make future earnings more predictable and can also be used as collateral in many instances.
- **A variety of other factors influence the modernization decision.** For example, costs associated with safety regulations and general maintenance are typically lower for newer vessels. The added safety and amenities of new or modified vessels make it easier to attract and retain high quality crew, especially with an aging workforce.
- **Community Development Quota groups have become an increasingly important player in North Pacific fisheries.** These non-profit groups, which represent 65 Alaska communities, have an ownership stake in 20 percent of active North Pacific commercial fishing vessels.


Source: Dakota Creek Industries.

Financing Vessel Construction

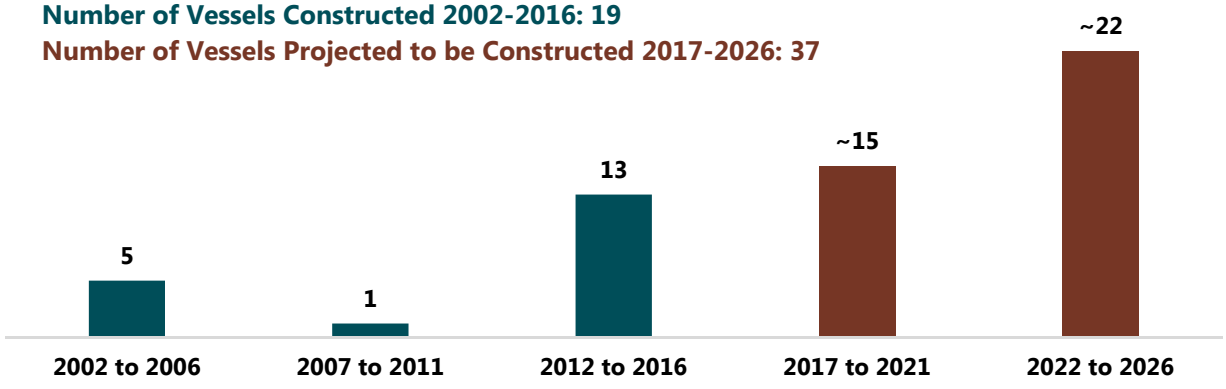
- **Fishing vessels represent a challenging lending environment for commercial lenders.** They must assess a variety of risks associated with the borrower, the fisheries the borrower participates in, the shipyard that will build the vessel, and finally the attractiveness of alternative loans they could make with the same capital.

- **The terms of commercially available financing are an impediment for many vessel owners, particularly those for which annual vessel earnings are a relatively small proportion of the cost of a new vessel.** This is particularly true of crab vessels and smaller trawlers, both of which have generated little interest in modernization projects, given the costs involved. Companies that are not able to offer other assets as collateral, in addition to the vessel, are also at a disadvantage.
- **The most common terms extended to a borrower interested in building a new vessel is a loan less than 12 years and an interest rate of between 5 to 7 percent as of October 2016.** Some government programs or lending cooperatives can offer longer terms and lower interest rates, with some limitations.

Timeline of Fleet Modernization

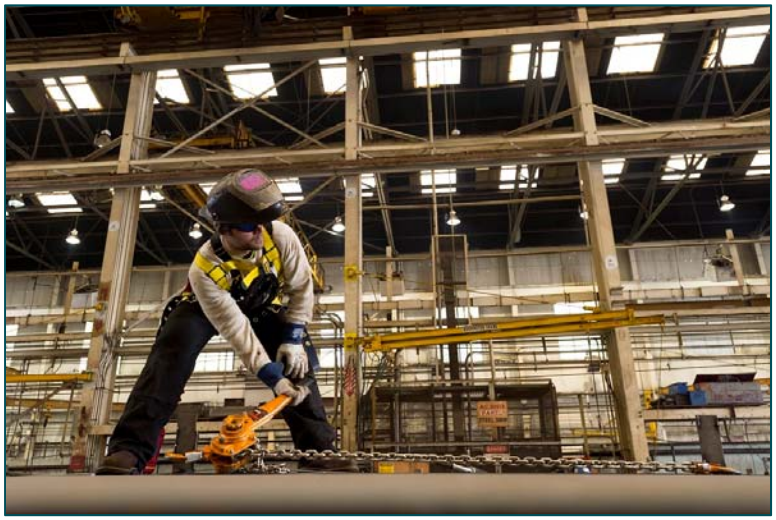
- **The estimated replacement value of the entire North Pacific commercial fishing fleet of vessels over 58 feet in length, including recent builds, totals approximately $11.3 billion.** The cost to replace vessels in the fleet exceeding 30 years old is about $9.0 billion. Of these vessels, the replacement costs of those built over 40 years ago is $4.4 billion.
- **Results of this analysis indicate $1.6 billion in modernization projects will be completed within the next ten years, assuming no significant changes in financing options.** Consolidation is anticipated in every fleet. In some cases, vessels will be retired without replacement, and in others two or more vessels will be replaced with a single larger or more efficient vessel.
- **For modernization of the fleet to occur at a pace greater than seen in recent years (and in addition to other factors), an approach to vessel construction other than the typical "one-off" approach may be required.** For example, multiple purchasers might agree on a single hull configuration so that builders can take advantage of efficiencies of scale. One-off construction is risky for owners, shipyards and lenders, and most recent projects have experienced delays and cost overruns.
- **An average of three new vessels are expected (including major refurb/retrofit) each year between 2017 and 2021.** By 2022 the annual number of projects is anticipated to increase to five per year, continuing at a similar rate into the foreseeable future. This compares with roughly one vessel per year over the last 15 years.

Chart ES-4. Total Number of Vessel Projects by Five-Year Period, Recent Past Vs. Future Projection



Source: McDowell Group estimates.

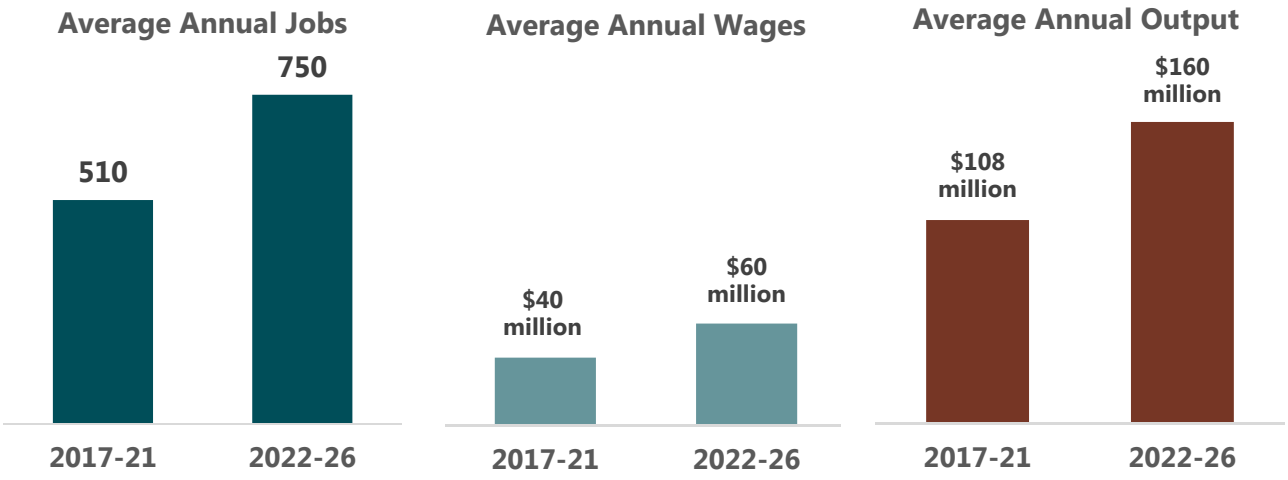
Economic Impact of Fleet Modernization on Washington



Source: Vigor.

- **Approximately 50 percent of all fleet modernization projects are anticipated to take place in Puget Sound.** This somewhat higher rate of market capture (compared to roughly one-third for recent projects) reflects current engagement of the region's maritime industry in identifying and establishing cooperative opportunities to maximize local benefit.
- **An estimated annual average of between $60 and $90 million will be spent on fleet modernization in Washington between 2017 and 2026.** A total of approximately $785 million will be spent over this ten-year period.
- **The total Washington State economic impact resulting from this spending is a projected 510 to 750 annual average jobs with approximately $40 to $60 million in wages, including all multiplier effects.** Annual output will average between $108 million and $160 million in over the next decade, totaling $1.3 billion.

Chart ES-5. Projected Economic Impacts in Washington State from North Pacific Fleet Modernization, 2017-2026



Source: McDowell Group estimates.

Conclusion and Recommendations

Puget Sound is the economic hub of the North Pacific commercial fishing fleet, which produces billions of pounds of sustainably harvested seafood each year. However, to maintain safety, economic viability, and a competitive edge in a global market, modernization of the fleet must occur. While this clearly represents a significant economic opportunity for the Puget Sound region, some factors could increase – or decrease – the potential size of the opportunity.

Source: Port of Seattle.

Some factors are difficult to control, such as global seafood prices, harvest volumes, and interest rates. Other factors, however, can be influenced with concerted efforts, including:

- **Advocacy and support for:**
  - preservation of Puget Sound's working waterfront
  - improvement in transportation infrastructure
  - workforce development and affordable housing
  - collaboration among vessel owners, shipyards, and lenders
  - maritime industry in Seattle, Olympia, and Washington, D.C.
- **Financing assistance:**
  - loan guarantees and reduced mooring rates for vessels constructed/modified in Washington
  - education of the banking community on the fishing fleet
- **Facility improvements:**
  - increased dock space for the North Pacific fleet
  - upgrades to Fishermen's Terminal and Pier 91
  - improve services and facilities on Harbor Island

It is incumbent upon Puget Sound stakeholders to encourage leadership and participation in the fleet modernization effort, generating economic activity in the region for many years into the future.

Introduction

The need to modernize the North Pacific fishing fleet that prosecutes federally managed fisheries has become a pressing topic for Washington's maritime industry in recent years. In 2016, the fleet of vessels over 58 feet numbers 414 and averages 40 years in age – the economic opportunity suggested by these numbers is inarguable. Several new developments have put momentum behind the growing need to "recapitalize" including: the rationalization of federally managed fisheries to sustainably manage the resource into the future; the removal of legislation prohibiting new builds in certain fisheries; changing Coast Guard regulations; introduction of new onboard technologies increasing product utilization and efficiencies; and the successful completion of several new vessels and major modifications, to name a few.[1] On the other side, however, are significant barriers: a challenging lending environment; fluctuations in seafood markets; the high cost of new vessels; and potential environmental changes, for example.

These opportunities and challenges all contribute to the underlying questions facing the Pacific Northwest's maritime industry: How many of these vessels are likely to be replaced or significantly modified in the coming years? What are the associated economic impacts of this activity? How can the Pacific Northwest retain these opportunities, rather than lose them to competing maritime economies elsewhere in the U.S.?

To examine these questions, the Port of Seattle contracted with McDowell Group, a research and consulting company with a long history in North Pacific seafood and maritime sectors. An overview of project methodology and definitions for acronyms and key terms is provided below.

Methodology

Scope

This report examines commercial fishing vessels over 58 feet engaged primarily in federally managed fisheries, including catcher vessels, catcher/processors, support vessels, and motherships.[2] This length (the maximum length allowable for Alaska salmon seining vessels) was selected in order to focus the scope of the study on larger vessels, which are facing more constraints in terms of modernization. These larger vessels tend to be older, more expensive to replace, and require greater shipyard capacity and sophistication – and, modernization of these larger vessels promise a larger economic impact per vessel. Additionally, larger vessels have stronger ties to Washington: while most vessels 58 feet and under are homeported in Alaska, most vessels over 58 feet are homeported in Puget Sound.

[1] The term "rationalized" refers to economic theory which has informed the design of management systems to align the short-term interests of market participants with "rational," long-term efficiency of a market.
[2] https://alaskafisheries.noaa.gov/permits-licenses?field_fishery_pm_value=Federal+Fisheries+Permits+%28FFP%29%2FFederal+Processor+Permits+%28FPP%29

These vessels were categorized per fishery, as follows:

- Amendment 80
- AFA CV (American Fisheries Act Catcher Vessels)
- AFA CP (American Fisheries Act Catcher/Processors)
- AFA Motherships
- BSAI Crab (Bering Sea and Aleutian Islands)
- Freezer Longline
- Other Trawlers
- Other (pot, jig, scallop, longline, support)

Interviews

An important source of information for this study was a series of interviews with 45 key informants in the maritime industry. These contacts represented seafood companies, fishermen, shipyards, processing companies, lending institutions, naval architects, fisheries associations, the Coast Guard, and the North Pacific Fisheries Management Council. The interviews gathered information on drivers and barriers associated with modernization; specific plans for new builds and upgrades; costs of new construction; the lending environment; and the regulatory environment, among other subjects. Results of the interviews were used throughout the analysis. A full list of interview contacts is included in the Appendix.

Data Sources

The North Pacific fleet inventory created for this study was based on several sources. Data on groundfish vessels was largely compiled from the National Marine Fisheries Service (NMFS) Federal Fisheries Permit and NMFS Groundfish LLP database, and divided into individual fisheries by program designations or listed endorsements by gear type. This data was combined with the Commercial Fisheries Entry Commission (CFEC) vessel database, which covers any vessel entering Alaska ports for deliveries, supplies, or fuel. Crab vessel information is based on NMFS Federal Crab Vessel Permits, adjusted based on industry input, catch share program reviews, and the North Pacific Fishery Management Council (NPFMC) Fishing Fleet Profiles. Data on revenue and harvest volumes for select programs came from the NMFS Stock Assessment and Fishery Evaluation Report for the Groundfish Fisheries of the Gulf of Alaska and Bering Sea/Aleutian Islands Area: Economic Status of the Groundfish Fisheries.

To avoid duplication of vessels (where one vessel participates in multiple fisheries), the study team attributed each vessel to its primary fishery. The following protocol was followed.

- Vessels active in the AFA sector are defined as AFA vessels.
- Vessels active in both the Amendment 80 and AFA sector are defined as AFA vessels.
- Freezer longline vessels that also harvest crab are defined as BSAI Crab vessels.
- Vessels active in the BSAI crab fishery and other fixed gear fisheries are defined as BSAI Crab vessels.
- Trawl vessels active in the GOA/BSAI region, and not in other previously mentioned categories, are defined as Other Trawl vessels.
- Fixed gear (longline, jig, pot) catcher vessels not included in any previous category were placed in the Other Fixed Gear category.
- All vessels falling outside the previous protocol were placed in an unduplicated Other Vessels category.

Information was also gathered from trade publications and websites including Fishermen's News, IntraFish, and SeafoodNews. Some data was inflation-adjusted using national CPI figures. For example, some NMFS data is presented in 2010 values and was adjusted to 2014 values when appropriate.

Modeling

A model was developed to quantify the pace and magnitude of investment in modernization over the next ten years. Model inputs include assumptions about the likelihood of investment in new-builds in each of the fleets, the cost of replacing vessels in each fleet, and other factors pertinent to determining the intensity of reinvestment in each of the fleets. A model was also used to predict the direct, indirect, and induced economic impacts in Puget Sound associated with vessel construction at local shipyards.

All estimated vessel costs are derived from interviews with vessel owners, naval architects, and trade publications. Estimated costs were averaged (by fishery) to arrive at the values presented in this report.

Abbreviations and Acronyms

ADF&G	Alaska Department of Fish and Game
AKFIN	Alaska Fisheries Information Network
AFA	American Fisheries Act
BSAI	Bering Sea/Aleutian Islands
CDQ	Community Development Quota
EEZ	Exclusive Economic Zone
GOA	Gulf of Alaska
H&G	Headed and gutted
IFQ	Individual Fishing Quota
MSC	Marine Stewardship Council
NMFS	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council
TAC	Total Allowable Catch

Glossary of Terms

Ex-Vessel Value	The amount paid to fishermen by a processor for harvested seafood, typically per round pound.
Ex-Vessel Volume	The weight of seafood before any processing.
First Wholesale Value	The value of a processed product when sold by a processor to an entity outside of their affiliate network. Typically refers to the value of product as it leaves Alaska.

First Wholesale Volume	The weight of processed or packaged product, in net weight terms, produced for sale to another buyer outside of the primary processor's affiliate network. Typically refers to the volume of processed product leaving Alaska.
Fixed Gear	Refers to pot, longline, and jig commercial fishing gear.
Total Allowable Catch	The total amount of a target species that can be harvested in a given time period.
North Pacific Fleet	Refers to the domestic fleet engaged primarily in federal fisheries off the coast of Alaska.

Overview

Vessels operating in federally managed North Pacific fisheries are the largest commercial fishing vessels in the nation. Many operate year-round, in the Bering Sea/Aleutians Islands (BSAI) or in the Gulf of Alaska (GOA), fishing in multiple fisheries or tendering for salmon. Some vessels also spend time harvesting and processing seafood in near-shore Alaska fisheries, while others participate in commercial fisheries off the West Coast.

Vessel Inventory

In 2016, more than 5,000 vessels over 30 feet in length engaged in commercial fishing activity off the coast of Alaska.[3] Of those vessels, 414 (8.2 percent) were over 58 feet and federally permitted.[4] This report examines commercial fishing vessels over 58 feet engaged primarily in federally managed fisheries, including catcher vessels, catcher/processors, support vessels, and motherships.[5]

The table below provides the number of vessels, average age, length, and revenue by vessel category, with a small amount of duplication. To avoid duplication later in modeling efforts and to create an accurate picture, vessels operating in multiple fisheries were allocated to their primary fishery.[6] For this reason, the number of current vessels by fishery are slightly different in subsequent chapters of this report.

Table 1. Current North Pacific Fleet Over 58 Feet, by Vessel Category

Category	Number of Current Vessels	Average Year Built	Average Length (feet)	Average Revenue per Vessel ($millions)
AFA CV	86	1978	119	$2.8[2]
AFA CP	16	1974	285	$15.9[2]
AFA Motherships	3	1970	435	n/a
Amendment 80	18	1980	178	$13.5[2]
BSAI Crab	103	1979	125	$2.7
Freezer Longline	29	1978	144	$5.8[2]
Other Trawl	37	1978	97	$1.5
Other[1]	~105	1966	79	n/a

[1]Other vessel types include pot, jig, scallop, and longline catcher vessels as well as support vessels.
[2]Revenue is CPI-adjusted from 2010 values.
Notes: This table includes a small number of duplicate vessels and primarily includes vessels that made deliveries in the specific fishery. Depending on the data source, year built usually refers to when the keel was laid, not when the vessel was completed.
Source: CFEC vessel database, NMFS SAFE Economic Status Report 2014, AKFIN.

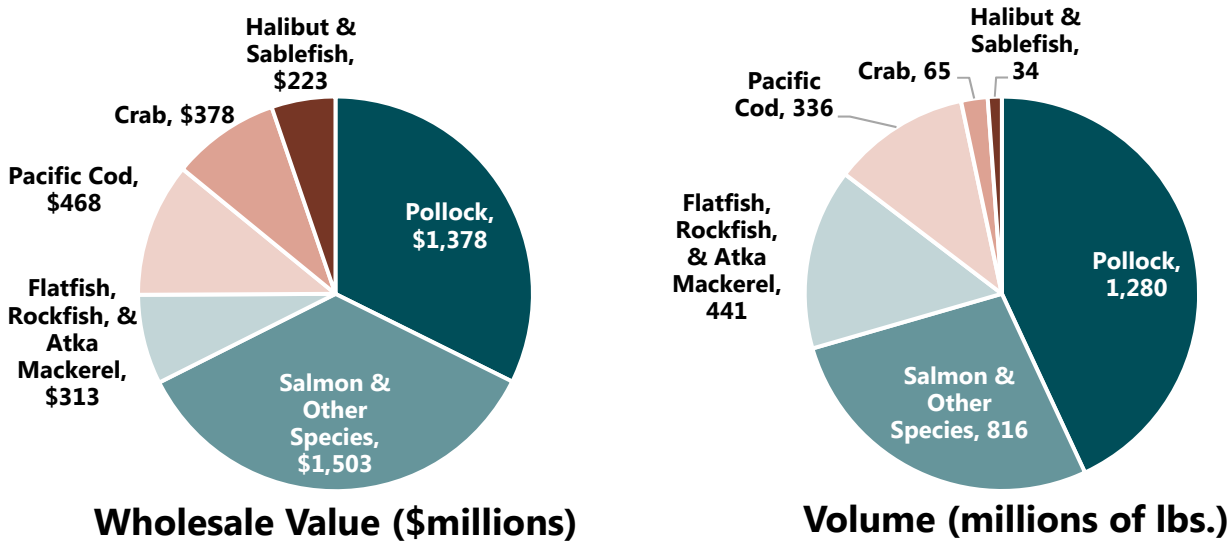
Seafood Value and Volume

In 2015, nearly 3 billion pounds of seafood worth $4.3 billion in first wholesale volume and value (volume and value after primary processing) was harvested in waters off the coast of Alaska. Pollock is the largest component,

[3] Note: This total includes support vessels such as tenders and freighters.
[4] CFEC Database.
[5]https://alaskafisheries.noaa.gov/permits-licenses?field_fishery_pm_value=Federal+Fisheries+Permits+%28FFP%29%2FFederal+Processor+Permits+%28FPP%29
[6] Details on how a vessel's primary fishery was determined can be found in the Introduction and Methodology chapter.

accounting for 32 percent of total value ($1.4 billion) and 43 percent of overall volume (1.3 billion pounds). Other groundfish, including flatfish, Pacific cod, Atka mackerel, and rockfish, accounted for 18 percent of total value ($781 million) and 26 percent of volume (777 million pounds). Crab, sablefish, and halibut – three of the highest-value species – accounted for only 3.3 percent of volume (98.9 million pounds), but 14 percent of total value ($601 million). Salmon, herring, and all other species totaled 35 percent of value ($1.5 billion) and 28 percent of volume (816 million pounds).[7]

Chart 1. First Wholesale Value and Volume for Alaska Seafood, 2015



Source: NFMS SAFE Economic Status Report 2015.

Management of Sustainable Fisheries

Fisheries in the North Pacific Ocean are considered among the most sustainably managed in the world. North Pacific fishery managers rely on stock assessments and other biological considerations to effectively manage the fishery. Supported with science-based management practices, many of the large-scale commercial fisheries in the North Pacific have undergone significant management changes to ensure long-term sustainability.

Most fisheries have been "rationalized," meaning fishermen have access to a portion of the annual total allowable catch (TAC), instead of racing to harvest the maximum amount of fish in the shortest amount of time. Rationalized fisheries have been shown to increase both fishermen safety and product value while reducing overfishing and bycatch.[8]

The North Pacific Fisheries Management Council (NPFMC) oversees fishery management for the Exclusive Economic Zone (EEZ, 3 to 200 miles offshore). Members of the Council represent both public and private sector interests from Alaska, Oregon, and Washington. NPFMC develops fishery management plans which guide the sustainable harvest of species in the EEZ.[9] Key individual programs are detailed in the following sections.

[7] NFMS SAFE Economic Status Report, 2015.
[8] https://www.st.nmfs.noaa.gov/Assets/economics/catch-shares/documents/Catch_Shares_Report_ExecSumm.pdf
[9] http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=228

American Fisheries Act Fleet

Fleet Composition and Activity

The American Fisheries Act (AFA) fleet consists of catcher/processors, catcher vessels, and motherships, which harvest and process Alaska pollock in the BSAI region, one of the largest single species fisheries in the world. In 2014, the AFA fleet landed 2.4 billion pounds of pollock products worth $502 million.[10]

Pollock is a versatile fish that yields a variety of products, including fillets, surimi, roe, minced fish, and fish meal.[11] Catcher vessels deliver whole fish to shoreside facilities in Dutch Harbor, Akutan, and other sites, or to nearby motherships which are floating processing vessels with no harvesting capability. Catcher/processors harvest and process pollock into a variety of products based on available on-board technology.

Source: Port of Seattle.

Congress signed the AFA into law in 1998 to increase American ownership of fisheries assets engaged in U.S. fisheries, rationalize the pollock fleet, and increase safety and utilization rates.[12] Cooperatives were formed with catcher vessels and processing plants, catcher/processors, and motherships.

The annual quota is split into four primary sectors. Following a 10 percent allocation to the Community Development Quota (CDQ) program, 50 percent of the remaining quota is allocated to the inshore sector (catcher vessels delivering to shoreside processors), 40 percent to the offshore sector (catcher/processors), and 10 percent to motherships. No processing or harvesting entity in the AFA program is permitted to own more than 17.5 percent of the annual pollock quota, although there is grandfathered quota ownership that is in excess of this cap.

Fleet modernization was constrained until 2014 when Amendment 106 was passed by the NPFMC permitting vessel replacement. This regulatory change has already led to the replacement of some older vessels and is anticipated to result in additional replacements in the near future. The following section details each component of the AFA fleet.

AFA Catcher Vessels

AFA catcher vessels harvest pollock in the BSAI region using midwater trawl gear and deliver it to shoreside facilities primarily in Dutch Harbor and Akutan, and to at-sea processors. Some vessels in this fleet are active in

[10] NMFS SAFE Economic Status Report, 2014. Note: This value includes both ex-vessel value for catcher vessels and first wholesale value for catcher/processors.
[11] Surimi is a seafood product made from mild whitefish which is reformed and flavored to create many products, including imitation crab meat.
[12] http://www.npfmc.org/american-fisheries-act-afa-pollock-cooperatives/

other fisheries, including other groundfish and crab. In 2014, 86 vessels in this fleet harvested 1.5 billion pounds worth $247 million in ex-vessel value, for an average of 17 million pounds worth $2.8 million per vessel.[13]

Surimi and fillets are the highest volume products processed from pollock harvested by the catcher vessel fleet. In 2015, about 36 percent of the harvest was turned into surimi, and 29 percent was turned into fillets, worth approximately $1 per pound and between $1.20-$1.47 per pound, respectively. The remainder goes into H&G, roe, minced, fishmeal, whole fish, and other products.[14]

Source: Global Seas.

STATUS OF MODERNIZATION

The most recent addition to the AFA catcher vessel fleet is the Defender, originally an East Coast commercial fishing vessel.[15] The 170-foot vessel owned by Global Seas was completed in 2016 following a significant conversion at the Patti Marine shipyards in Florida, which included the addition of 230 tons of steel.[16]

In comparison to the catcher/processor sector, the catcher vessel sector has experienced less recapitalization, likely due to its inability to add value through onboard processing. However, it is anticipated that vessels with large amounts of quota are most likely to be upgraded.

VESSEL INFORMATION

The average vessel in this fleet was built in the late 1970s and is 119 feet. Vessels set their trawl nets on schooled pollock and tow from 20 minutes to 10 hours at a speed of 3.5-4.5 knots. Once the net is brought on-board, the fish are placed in refrigerated seawater for preservation until offloaded to a shoreside facility or mothership. Replacing a vessel in this fleet with a new, purpose-built trawler would cost an estimated $19 million.

Table 2. AFA Catcher Vessel Descriptive Statistics, 2014

Number of Vessels	86
Est. Replacement Cost	$19 million
Average Harvest Volume by Vessel	17.1 million lbs.
Average Revenue by Vessel	$2.8 million
Average Length	119 feet
Minimum Length	73 feet
Maximum Length	180 feet
Average Year Built	1978
Earliest Year Built	1949
Most Recent Year Built	2006

Note: Revenue is CPI adjusted from 2010 numbers.
Source: NMFS SAFE Economic Status Report 2014, CFEC Vessel Database.

AFA Catcher/Processors

In 2014, the AFA catcher/processor fleet was composed of 16 active vessels that harvest and process pollock on-board. In 2014, this fleet harvested an estimated 981 million pounds worth $255 million dollars at the first

[13] NMFS SAFE Economic Status Report, 2014.
[14] NFMS SAFE Economic Status Report, 2015.
[15] https://www.undercurrentnews.com/2016/02/04/global-seas-refits-pelagic-vessel-for-pollock-with-quality-focus/
[16] http://www.fishermensnews.com/story/2016/08/01/features/new-170-foot-trawler-conversion-fv-defender-brings-modern-ideas-to-the-bering-sea/408.html

wholesale level.[17] One vessel is also in the Amendment 80 fleet, which allows it to engage in additional BSAI groundfish trawl fisheries. Some of the catcher/processors in this fleet can harvest 880,000 pounds daily, and stay on the fishing grounds for weeks at a time.

Source: Fishermen's Finest.

Surimi and fillet production are the primary (by volume) products processed by this fleet. However, most vessels in this fleet also have the capacity to produce fish meal and fish oil. In 2015, surimi accounted for 34 percent of production (by volume) with prices averaging $1.26 per pound at the first wholesale level. Fillets accounted for 30 percent of production (by volume) with prices between $1.39 and $1.58 per pound.[18] The remaining products processed by catcher/processors in this fleet include roe, mince, and fish meal, depending on the vessel's unique processing capabilities. Pollock processed by this fleet typically generates a market premium because of the reduced time between harvesting and processing encountered by other fleets.[19]

The catcher/processor fleet is represented by the Pollock Conservation Cooperative (PCC) where selling and leasing of quota is widely practiced. In 2015, the two largest PCC quota shareholders were American Seafoods (47.4 percent) and Trident Seafoods (18.6 percent).[20] The remaining quota is held by Glacier Fish Company (17.0 percent), Arctic Storm (5.0 percent), Arctic Fjord (4.9 percent), Starbound (4.3 percent) and Northern Hawk (2.7 percent).

Table 3. AFA Catcher/Processor Descriptive Statistics, 2014

Number of Vessels	16
Est. Replacement Cost	$130 million
Average Harvest Volume by Vessel	61.3 million lbs.
Average Revenue by Vessel	$15.9 million
Average Length	285 feet
Minimum Length	199 feet
Maximum Length	376 feet
Average Year Built	1974
Earliest Year Built	1941
Most Recent Year Built	1989

Note: Revenue is CPI-adjusted from 2010 numbers.
Source: NMFS SAFE Economic Status Report 2014, CFEC Vessel Database.

STATUS OF MODERNIZATION

Until Amendment 106 was passed in 2014, there was not a mechanism for permanent permit or vessel transfer within the fleet. Most of the recent upgrades include factory upgrades, such as a fish oil plant.

- Glacier Fish Company has three vessels (Pacific Glacier, Alaska Ocean, and Northern Glacier). They have expressed interest in replacing the Pacific Glacier and upgrading the Alaska Ocean.[21]
- The Starbound, owned by Aleutian Spray Fisheries, was upgraded with a 60-foot midsection for a fishmeal and fish oil plant.

[17] NMFS SAFE Economic Status Report, 2014.
[18] Ibid.
[19] NFMS SAFE Economic Status Report, 2015.
[20] http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/CoopRpts2014/PCC_HSCC_AFA14.pdf
[21] https://www.undercurrentnews.com/2016/02/22/sources-glacier-building-iquique-us-trawler-plans-pollock-vessel/

- Confidential interviews with companies in this sector indicate at least two new replacement vessels should be anticipated in the next few years.

VESSEL INFORMATION

Vessels in this fleet average 285 feet, and most were built in the early 1970s. However, many vessels in this fleet were substantially rebuilt in the mid-1980s in foreign shipyards, including Norway, Germany, and South Korea. The Anti-Reflagging Act of 1987 ended this practice.[22] Following a buy-out of nine vessels and additional vessels retiring, the fleet has consolidated to its existing size of 16 vessels. A purpose-built, new vessel in this fleet would cost approximately $130 million.

AFA Motherships

The AFA identified three specific ships (Ocean Phoenix, Excellence, and Golden Alaska) which are allowed to operate in the mothership sector. Motherships are large vessels with on-board processing capabilities but are not configured to harvest fish. Instead, they rely on deliveries from approximately 20 catcher vessels. In 2015, these motherships processed 252 million pounds of pollock.[23] The motherships operate in the Bering Sea for pollock and off the coasts of Washington and Oregon for Pacific whiting (hake).

The ability for motherships to follow a fleet of catcher vessels and reduce the time between harvest and processing often increases the quality of products, resulting in a market premium over shoreside processed seafood. In 2015, roe processed at-sea was worth $2.64 per pound compared with inshore sector roe worth $1.55 per pound.[24,25] Product lines differ vessel to vessel, but all produce surimi, roe, H&G, fillet, fishmeal, and fish oil.

STATUS OF MODERNIZATION

The three vessels have multiple owners, including foreign ownership, but still have met the AFA requirements for 75 percent U.S. vessel ownership. Maruha Nichiro, a large Japanese seafood company, owns shares in all three motherships. Premier Pacific Seafoods owns shares in both the Ocean Phoenix and the Excellence. The CDQ group, Yukon Delta Fisheries Development Association, owns 30 percent of the Golden Alaska, and has their catcher vessels deliver directly to the mothership. Recent upgrades to these three vessels include:

- $10 million was spent on Ocean Phoenix to install H&G pollock processing capabilities in 2004.[26]
- Golden Alaska was modified for H&G, mince, and fish oil for $8 million in 2008 and can produce up to 770,000 pounds a day.[27]
- The owners of the Excellence are considering upgrades to diversify its product lines to include pollock fillet blocks.[28]
- A mothership replacement would cost between $160 million and $200 million.[29]

[22] J. Strong and K.R. Criddle. 2013. *Fishing for Pollock in a Sea of Change: A Historical Analysis of the Bering Sea Pollock Fishery.* Alaska Sea Grant, University of Alaska Fairbanks.
[23] http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/CoopRpts2015/MothershipFleet_AFA15.pdf
[24] NMFS SAFE Economic Status Report, 2015
[25] This value includes roe processed by the AFA catcher/processor fleet.
[26] Ibid.
[27] Ibid.
[28] https://www.undercurrentnews.com/2016/01/06/premier-pacific-moves-to-diversify-with-aims-to-produce-pollock-block/
[29] Ibid.

VESSEL INFORMATION

Motherships operate for 120 to 130 days a year, employ a crew of 100 to 220. They were built between 1964 and 1973 and are between 305 and 635 feet long. The estimated cost to replace a mothership is $170 million, with significant variation depending on the size and complexity of the vessel.

Table 4. Mothership Sector Descriptive Statistics

	Ocean Phoenix	Golden Alaska	Excellence
Length	635	305	367
Year Built	1964	1972	1973

Source: NMFS SAFE Economic Status Report 2014, Cooperative Reports 2015, NMFS FAKR Groundfish LLP 2016, CFEC Vessel Database.

Amendment 80 Fleet

Fleet Composition and Activity

The Amendment 80 fleet consists of catcher/processors primarily harvesting, Atka mackerel, Pacific Ocean perch, Pacific cod, and three flatfish species (yellowfin sole, rock sole, and flathead sole) in the BSAI region. In 2014, 18 vessels from this fleet were active, landing 511 million pounds worth $244 million at the first wholesale revenue, for an average of $13.5 million per vessel.[30]

Source: O'Hara Corporation.

The Amendment 80 catch share program refers to its namesake regulation that was passed in 2008, granting fishing access privileges to a group of 28 catcher/processors operating in the BSAI that were non-American Fisheries Act. The program does not allow an individual or company to own more than 30 percent of the total available quota, with one exception grandfathered in (Fishing Company of Alaska). No single vessel can harvest more than 20 percent of the quota.

The fleet is divided between two quota cooperatives (Alaska Groundfish Cooperative and Alaska Seafood Cooperative). Quota can be moved among the fleet to most efficiently harvest the different species included in this fishery.

Fish harvested by this fleet are processed either as frozen H&G products or as frozen whole fish. H&G Pacific cod commands the highest price at the first wholesale level, averaging $1.43 per pound in 2015.[31] H&G Atka mackerel and rockfish averaged $1.04, and flatfish H&G products averaged $0.82 per pound. Prices for whole fish vary by species, averaging $0.62 per pound. The fleet's products are often exported to China for reprocessing into a wide variety of fillets, kirimi (slices of fish), and other value-added products, before being reimported into Europe, Japan, South Korea, and the United States.[32]

[30] NMFS SAFE Economic Status Report, 2014.
[31] NFMS SAFE Economic Status Report, 2015.
[32] https://www.afsc.noaa.gov/News/pdfs/Wholesale_Market_Profiles_for_Alaskan_Groundifsh_and_Crab_Fisheries.pdf

Retention — the amount of seafood processed versus discarded after harvest — of the fleet's harvest increased from 65 percent in 2008 to 93 percent in 2014.[33] Groundfish Retention Standards — regulations requiring higher retention of groundfish brought onboard — has been reported as a factor possibly increasing the pace of modernization in this fleet. [34]

Table 5. Amendment 80 Descriptive Statistics, 2014

Number of Vessels	18
Est. Replacement Cost	$78 million
Average Harvest Volume by Vessel	28.4 million lbs.
Average Revenue by Vessel	$13.5 million
Average Length	178 feet
Minimum Length	110 feet
Maximum Length	295 feet
Average Year Built	1980
Earliest Year Built	1968
Most Recent Year Built	1991

Note: Revenue is CPI-adjusted from 2010 numbers.
Source: NMFS SAFE Economic Status Report 2014, CFEC Vessel Database.

Status of Modernization

A prior barrier to modernization of this fleet was the limitation on replacing existing vessels, until the passage of Amendment 97 by the NPFMC in 2012. Since the passage of Amendment 97 and Groundfish Retention Standards requirements, Amendment 80 fishing companies are building larger, more modern vessels:

- The O'Hara Corporation anticipates replacing both the Defender and the Enterprise with the new 194-foot Araho.[35] Launched in 2016, the Araho was built in Florida, where the O'Hara Corporation has a history of working with the Eastern Shipbuilding Group.[36]
- Iquique U.S. is having a new 262-foot vessel built at the Eastern Shipbuilding Group shipyard, which will replace two of their four existing vessels.[37]
- Fishermen's Finest has a 268-foot Amendment 80 vessel under construction at Dakota Creek Industries which will replace one of their two Amendment 80 vessels.[38]
- U.S. Seafoods completed repurposing of a 233-foot ex-Navy vessel to fish in the Amendment 80 fishery in 2016. The cost of this project was $30 million.[39]
- Ocean Peace "sponsoned" (widened) the Ocean Peace from 36 to 50 feet in Portland, Oregon in 2012.[40] Vigor Industrial conducted this work.

Source: O'Hara Corporation.

[33] Amendment 80 5-Year Review, 2014.
[34] https://www.undercurrentnews.com/2016/06/10/tighter-retention-rules-prompted-united-states-seafoods-vessel-refit/
[35] http://www.freepressonline.com/Content/-bull-Special-Features/Special-Features/Article/The-O-Hara-Fishing-Dynasty/52/78/40589
[36] http://www.easternshipbuilding.com/wp-content/sdaolpu/2015/09/ESG-H175-FV-ARAHO-OHara-Corporation-Launch-Press-Release-Final-R-3.pdf
[37] https://www.undercurrentnews.com/2016/02/22/sources-glacier-building-iquique-us-trawler-plans-pollock-vessel/
[38] https://www.undercurrentnews.com/2015/03/09/alaska-groundfish-fleets-face-big-blow-from-halibut-bycatch-proposals/
[39] https://www.undercurrentnews.com/2016/06/10/tighter-retention-rules-prompted-united-states-seafoods-vessel-refit/
[40] http://www.oceanpeaceinc.com/ftoceanpeace.html

Vessel Information

The typical Amendment 80 vessel is nearly 180 feet in length and was built in the 1980s. Fish are harvested with bottom trawl gear, where a net is towed between one and four hours at a speed of 3-4 knots.[41] Seafood is collected in a "cod-end," which is then brought onboard for processing. A new, purpose-built vessel in this fleet would cost an estimated $78 million.

Bering Sea/Aleutian Islands Crab Fleet

Fleet Activity and Composition

Source: Alaska Bering Sea Crabbers.

The BSAI crab fleet primarily harvests crab species, with some vessels capable of harvesting other groundfish. During the summer, it is common for vessels in this fleet to tender salmon from small harvesting vessels to processing facilities. In 2014, 108 vessels harvested 81 million pounds of crab worth $246 million in ex-vessel value, an average of 750,000 pounds worth $2.7 million per vessel.[42]

Most crab is delivered to processing facilities in Dutch Harbor, Akutan, King Cove, and St. Paul Island and are cooked, frozen, and sorted by crab leg size. In 2014, the most valuable species at the ex-vessel level was king crab ($6.73 per pound), followed by snow crab ($2.51 per pound), and tanner crab ($2.45 per pound).[43,44] A small number of vessels can harvest and process crab on-board. The U.S. and Japan are the main markets for king, tanner, and snow crab, which are sold in restaurants and grocery stores.

Harvest levels can fluctuate significantly in the crab fisheries, and the 2016/17 season will have a reduced harvest across all species. The most significant is the closure of the tanner crab fishery, which could last until the biomass rebounds to a threshold that allows for fishing. The king crab and snow crab TAC were cut 15 and 50 percent, respectively, year-over-year for 2016/17.[45]

The BSAI crab fleet was rationalized in 2005, granting catch share allocations to catcher vessels that harvest tanner, snow, and king crab using pot gear and processors.[46] There are 10 distinct species under this program, with quota allocations managed by cooperatives. CDQ groups are allocated 10 percent of each crab fishery, with many owning additional shares.[47] Depending on the species, vessels are limited to harvesting 2 to 20

[41] NPFMC Fishing Fleet Profiles, 2012.
[42] NMFS Crab Economic Status Report, 2014.
[43] Ibid.
[44] These are average prices for Bristol Bay red king crab, Bering Sea snow crab, and Bering Sea Tanner crab.
[45] http://www.alaskajournal.com/2016-10-07/coming-season-going-hurt-alaska-crabbers#.V_1G7_krJhE
[46] Refers to 10 different managed crab stocks in the BSAI region. Two are CDQ-harvest only. For more information, see the NMFS Crab Economic Status Report 2014.
[47] BSAI Crab 10 Year Review.

percent of the quota. These caps are waived in when a vessel is in a cooperative. The fishery is jointly managed by the State of Alaska and NMFS.

Status of Modernization

Since 2000, just two new vessels have been added to this fleet, the 90-foot Controller Bay (2002) and the 114-foot Victory (2012). Fred Wahl Marine Construction built both vessels in Reedsport, Oregon. Discussions with industry sources provide several theories to explain a lack of modernization. In contrast to the freezer longline and Amendment 80 fleet, where there is opportunity to add value through modernizing onboard processing capacity, the vast majority of crab vessels have no opportunity to add value to their catch, resulting in reduced incentive or ability to reinvest. At the same time, harvest levels are significantly below historical levels, reducing earnings throughout the fleet along with the financial incentive to invest.

Table 6. BSAI Crab Sector Descriptive Statistics, 2014

Number of Vessels	103
Est. Replacement Cost	$18 million
Average Harvest Volume by Vessel	750,000 lbs.
Average Revenue by Vessel	$2.7 million
Average Length	118 feet
Minimum Length	81 feet
Maximum Length	180 feet
Average Year Built	1979
Earliest Year Built	1942
Most Recent Year Built	2012

Source: NMFS Crab Economic Status Report 2014, CFEC Vessel Database.

Vessel Information

The typical crab vessel is around 118 feet in length and built in the late 1970s. The vessels harvest with baited pot gear which sit on the seafloor for 24 to 60 hours at a time. Depending on the species, vessels typically set more than 400 pots.[48] Pots are retrieved, cleaned of crab, and typically moved to another spot before being set again. Crab are stored alive in tanks with circulating water until processed. The average replacement cost of a vessel in this fleet is $18 million.

Freezer Longline Fleet

Fleet Activity and Composition

The freezer longline fleet consists of catcher/processor vessels that harvest in both the BSAI and GOA regions. In 2014, 29 vessels actively fished.[49] Pacific cod is the primary target species (representing over 90 percent of volume) with some vessels also targeting sablefish and Greenland turbot. In 2014, the freezer longline fleet harvested 221 million pounds of cod worth $168 million, for an average of 7.6 million pounds worth $5.8 million in first wholesale value.[50] Since 2010, vessels in this fleet have participated in the Freezer Longline Conservation Cooperative, a voluntary cooperative established by vessel owners to manage the harvest of the Pacific cod quota allocated to the sector and minimize bycatch incurred by the fleet.

The fleet's primary product is H&G cod.[51] The remainder includes fillets and ancillary products such as livers, stomachs, milt, and fish meal. The average utilization rate of this fleet was about 60 percent in 2015, with some

[48] NPFMC Fishing Fleet Profiles, 2012.
[49] NMFS SAFE Economic Status Report, 2014.
[50] Ibid.
[51] NFMS SAFE Economic Status Report, 2015.

newer vessels utilizing up to 90 percent of the product brought on board. Ancillary products have increased in value as markets for the products have developed.

Status of Modernization

The freezer longline fleet has one of the widest vessel age ranges within the North Pacific fleet. In addition to seven vessels built before or during WWII, four vessels have been built since 2000. About half of the freezer longline fleet has some level of CDQ ownership, including five vessels that are 100 percent owned by CDQ entities. Two of the three recent builds in this fleet have CDQ involvement.

Source: Blue North.

There are two primary modernization approaches used in this fishery: either build a larger, more expensive vessel with additional harvesting and processing capacity; or build a comparably smaller, less expensive vessel which primarily focuses on traditional H&G product. The Blue North and Northern Leader fall into the first category. They are larger vessels (more than 180 feet) with enough room to have additional on-board capacity to process products typically discarded or transshipped for reprocessing. (Blue North is the first vessel in the fleet to have a fillet line.)[52] In addition to the economies of scale realized by having a larger vessel, the additional production capabilities maximize revenue by utilizing more of the harvest. The latter approach is seen in the 136-foot Arctic Prowler, which focuses solely on traditional H&G products for both sablefish and Pacific cod.

In 2014, Amendment 99 was implemented by the National Marine Fisheries Service (NMFS) to support the replacement of aging vessels in the sector with safer, more efficient boats. Amendment 99 increased the maximum vessel length limits of the LLP license assigned to vessels in the fishery to 220 feet and waived certain existing vessel length, weight, and horsepower limits. NMFS described the action as "necessary to promote safety-at-sea by encouraging the replacement of older vessels with newer and more efficient vessels that are able to meet modern vessel safety standards." The agency further noted that the action "is intended to facilitate the increased retention and utilization of groundfish by allowing sector participants to use larger vessels with increased processing and hold capabilities."[53]

Source: Vigor.

[52] http://www.fishermensnews.com/story/2016/10/01/features/welcome-blue-north/420.html
[53] Final Rule for Amendment 99 to BSAI FMP; Federal Register Vol. 79 No. 3; Mon, Jan. 6, 2014.

Since 2013, three new vessels have been introduced into the freezer longline fleet. Each vessel replaced a previous or existing vessel in the fleet:

- The Blue North was finished in 2016 and is designed to have 100 percent utilization of its harvest onboard.[54] Built at Dakota Creek Industries, the 191-foot vessel is estimated to have cost $36 million.[55]
- The Arctic Prowler was built at Vigor Shipyard in Ketchikan in 2013. The 136-foot vessel focuses primarily on H&G cod and has partial CDQ ownership.
- The 184-foot Northern Leader was constructed in 2013 at J.M. Martinac Shipbuilding in Tacoma for approximately $35 million.[56]

Vessel Information

The typical vessel in this fleet is 145 feet and was built in 1979. Vessels set longlines at depths of 30 to 600 fathoms, depending on the species. A longline typically contains over 12,000 hooks and is about eight miles in length. Longlines are retrieved after a minimum soak time of five hours, with the target species weighed, bled, processed, frozen, and packaged for shipment. Most vessels in this fleet have automatic baiters with the newest technology able to bait and set more than 60,000 hooks per day. Crew size differs between vessels, but the average is 20 onboard.[57] The average replacement cost for a new, purpose-built vessel in this fleet is approximately $34 million.

Table 7. Freezer Longline Sector Descriptive Statistics, 2014

Number of Vessels	29
Est. Replacement Cost	$34 million
Average Harvest Volume by Vessel	7.6 million lbs.
Average Revenue by Vessel	$5.8 million
Average Length	145 feet
Minimum Length	110 feet
Maximum Length	194 feet
Average Year Built	1979
Earliest Year Built	1942
Most Recent Year Built	2016

Note: Revenue is CPI-adjusted from 2010 numbers.
Source: NMFS SAFE Economic Status Report 2014, CFEC Vessel Database.

Other Trawl Vessels

Fleet Activity and Composition

This fleet is composed of relatively small trawl catcher vessels based primarily in Kodiak and Aleutian Chain communities. They harvest pollock, Pacific cod, Atka mackerel, and flatfish in the GOA and BSAI region in limited access programs and the Central GOA Rockfish Program. In 2015, approximately 37 vessels harvested 311 million pounds worth $44.4 million at the ex-vessel level, for an average of 8.4 million pounds worth $1.2 million.[58,59] There is a large amount of crossover into other trawl fisheries, including the AFA program. These vessels operate nearly year-round, with some vessels tendering salmon or cod.

This fleet operates primarily under a License Limitation Program implemented in 2000, and is one of the last federal fisheries that is not fully rationalized. The NPFMC is currently considering significant management changes, including a rationalization option.

[54] http://deckboss.blogspot.com/2013/05/freezer-longliners-modernize-their-fleet.html
[55] http://www.seattletimes.com/business/new-fishing-boat-built-in-anacortes-is-safer-more-efficient/
[56] Ibid.
[57] https://www.uscg.mil/d13/cfvs/acsa/ACSA_References/ColorSignedACSA.pdf
[58] CFEC.
[59] This number includes all this fleet's harvests, including any halibut IFQ or fishing with other gear types.

Vessels that fish in the central GOA region also qualify for the Central GOA Rockfish program, a small catch share program for management of the trawl rockfish fishery.[60,61]

Status of Modernization

Minimal activity has occurred in this fleet in terms of modernization. The newest addition to this fleet is the 98-foot Pacific Storm, built in 2002. Individuals active in the fishery cite the pending decision by the NPFMC regarding management changes as the primary reason for the low level of investment. With an uncertain regulatory environment, they are hesitant to invest in newer vessels. Another constraint to upgrading the fleet is low ex-vessel prices.

Vessel Information

This fleet's average vessel was built in 1978 and is 97 feet in length. Vessels use both midwater and bottom trawls. Once a net has been set, towed for a period of time, and brought on-board, most vessels store the fish in refrigerated seawater until delivered to a shoreside processing facility. The estimated cost of a new, purpose-built vessel in this fleet is approximately $15 million.

Table 8. Other Trawl Vessels Descriptive Statistics, 2015

Number of Vessels	37
Est. Replacement Cost	$15 million
Average Harvest Volume by Vessel	8.4 million
Average Revenue by Vessel	$1.5 million
Average Length	97 feet
Minimum Length	64 feet
Maximum Length	171 feet
Average Year Built	1978
Earliest Year Built	1966
Most Recent Year Built	2002

Note: Does not include AFA or Amendment 80 vessels active in these fisheries.
Source: Federal Fisheries Permit Database, CFEC Vessel Database.

Other Fishing and Support Vessels

In addition to vessels covered in previous sections, 105 vessels longer than 58 feet are engaged in smaller fisheries, processing, and/or support activity in North Pacific region. This includes 82 vessels engaged in a variety of fixed gear (longline and pot) fisheries, a scallop dredge vessel, nine floating processors, and a number of support vessels including tenders and freighters.

Other Fishing Vessels

This category includes both longline and pot vessels primarily harvesting cod, halibut, and sablefish in fisheries throughout Alaska, in both federal and state waters. Significant crossover occurs in this fleet, with most vessels active in multiple fisheries and gear types. The fleet totaled 78 vessels in 2016, with an average length of 76 feet. The average vessel was built in 1965. Most vessels in this fleet are homeported in Alaska, making the occasional trip to Puget Sound.

Gross earnings in this fleet vary significantly, averaging $700,000 to $1.5 million and higher depending on the primary species harvested. Vessels primarily harvesting halibut and sablefish typically earn more than vessels limited to Pacific cod.

[60] NPFMC Fishing Fleet Profiles, 2012.
[61] While the Central GOA Rockfish Program is an established catch share program, the majority of the vessels target pollock and other species and are included in other vessel counts in this report.

There are also three vessels that dredge for scallops in the GOA. Two of these vessels crossover into BSAI crab, but the other is a 75-foot wooden vessel built in 1967. The average scallop vessel is 98 feet long and was built in the 1970s.

While this fleet has seen some new vessels in recent years, most of them have measured exactly 58 feet or below – outside of the scope of this study. (Since 2000, 35 of these smaller vessels have been added to the fleet, with most built by Fred Wahl Marine Construction in Oregon.) The newest vessel measuring more than 58 feet is the 78-foot Northern Endurance, built in 2006.

TENDERS, FLOATING PROCESSORS, AND SUPPORT VESSELS

Approximately 30 vessels not previously categorized include tenders, floating processors, and transport vessels. While nearly a third of all vessels identified in the North Pacific fleet have the capacity to tender, data sources indicate eight vessels were tender-only in 2016. These vessels average 110 feet; the average year built is 1973. Nine floating processors handle deliveries from catcher vessels in federal waters.[62] Nine freighters move supplies and processed seafood among ports. Averaging 250 feet, the average vessel was built in the mid-1980s.

Source: Port of Seattle.

[62] https://alaskafisheries.noaa.gov/sites/default/files/reports/16ffp_current_vessel.htm

The age and functional condition of the commercial fishing fleet is the most obvious driver of fleet modernization. However, a range of other factors play a significant role in the pace and magnitude of investment. The relevance of these and other factors to fleet modernization is described in this chapter.

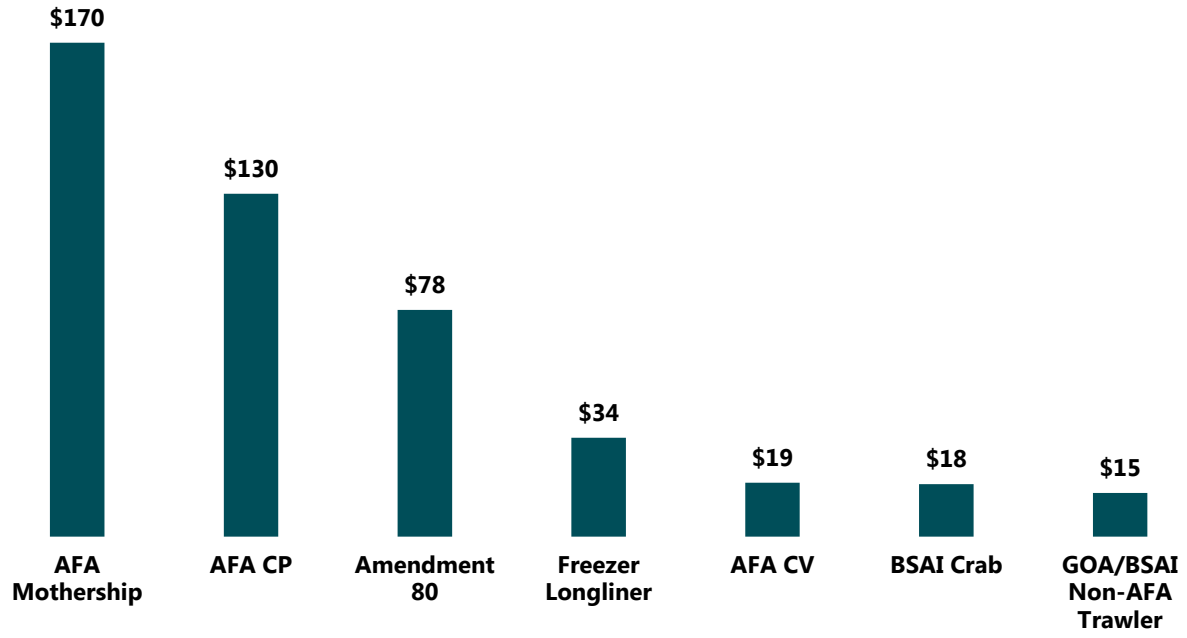
Vessel Replacement Costs

Options available to vessel owners, as they consider how best to sustain or generate a higher return on their aging fishing vessel asset, include: continuing to fish indefinitely without making significant investment in modernization; selling or otherwise tying up their vessel and leasing quota share; reinvestment in major modifications or retrofits for existing vessels; buying a used vessel and retrofitting; designing and constructing a custom-built boat; or selling vessel and quota assets and exiting the industry.

Despite the regulatory and financial benefits of operating new vessels, many owners of well-maintained, older vessels are hesitant to commit to significant reinvestment. The cost of replacement is certainly a major factor in this decision, along with the risks associated with building a new vessel on schedule and within budget.

The cost of new vessels ranges from approximately $15 million for a non-AFA/non-Amendment 80 trawler active in the GOA and BSAI, to approximately $170 million for an AFA mothership. Construction cost estimates presented below represent a mid-point within a range of plus or minus 20 percent (depending on a variety of factors). These estimates are based on information provided by shipyards, naval architects, fishermen, and trade journals.

Chart 2. Estimated Vessel Construction Cost by Vessel Type ($millions)



Source: McDowell Group estimates.

Strategies to Reduce Costs of New Construction

For modernization of the fleet to occur at a pace greater than seen in recent years, a new approach to vessel construction is likely necessary. Typically, individual companies build one-off vessels designed specifically for their own needs. There are substantial risks for owners, shipyards, and financiers associated with these projects. In fact, most recent custom vessels have experienced construction delivery delays and cost overruns.

Another option is for owners to collaborate on basic vessel designs so that shipyards can build a series of vessels with similar hull-shapes and other common major configurations. Representatives of financial institutions say extending financing through a coordinated modernization strategy involving multiple fishing companies and shipyards is more appealing than negotiating a series of one-off projects. While complex to structure for fishermen, who must agree on vessel size and builder, standardization could reduce both construction and finance costs. Further, because it represents a large business opportunity with somewhat lower risk, this approach could attract lenders not typically active in commercial fishing.

Precedent exists for building a series of similar commercial fishing vessels. Both Marco of Seattle and Bender of Mobile built more than 15 vessels of a similar design in the 1970/80s. Skipsteknisk, a Norwegian firm, recently designed several new North Pacific vessels using similar designs for a 262-foot trawler and a 191-foot longline vessel.

Vessel Modifications and Refits

Vessel lengthening, sponsoning, and major equipment refits are also investment options that have been undertaken recently for several North Pacific vessels. All other things being equal, a major vessel modification might cost half the price of a new-build, while increasing the usable life of the vessel.

While a common practice in the fleet has been to convert existing non-commercial fishing vessels to commercial fishing vessels, this practice is expected to be less common going forward. Vessel owners may save money initially, but the long-term benefits of operating a purpose-built vessel are expected to become more attractive. The hull, propulsion, and processing/harvesting equipment on a purpose-built commercial fishing vessel are nearly always more efficient than what can be built from a vessel originally designed for another purpose. With nearly all large-scale North Pacific fisheries rationalized, ownership of quota is anticipated to support vessel owners' ability to make longer-term business decisions.

A factor constraining vessel conversions is the limited number of vessels well-suited for repurposing. Companies engaging in vessel conversions typically have a history of this activity, with one company, United States Seafoods, even having its own facility where conversions can take place. Another company, Global Seas, has experience converting East Coast vessels into AFA catcher vessels, with two completed since 2000.

Fleet Consolidation

In some cases, the best option is to replace two or more older vessels with one new, more efficient vessel. This is the case for at least one Amendment 80 trawler currently under construction. On the other hand, conversations with AFA catcher/processor companies indicate this fleet may experience less consolidation, because with more vessels on the grounds, it is easier to find the fish.

The ability to lease or sell quota within a fishery is a prime reason consolidation occurs. For some fisheries, such as BSAI crab, owners make year-to-year decisions whether to operate their vessel in the fishery and harvest their own quota or simply lease their quota to another vessel owner.

Rationalization of fisheries often results in intentional consolidation to reduce harvesting capacity. For example, following the rationalization of crab in 2005, the fleet size fell more than 60 percent, from 256 to 91 vessels.[63]

Vessel Resale Value

Boat owners will of course consider the market value of their existing vessel, but in most cases resale value is not a driving consideration in the investment decision. There is a limited market for retired commercial fishing vessels, though they may have some remaining service life. Older BSAI crab, AFA CV and Amendment 80 vessels are currently available for between $750,000 and $3.5 million.[64] Some fisheries have specific restrictions on what can be done with a retired vessel.

Some vessels slated for retirement can be used as salmon tenders for short periods in the summer. This is the most likely outcome for soon-to-be-retired BSAI crab and AFA catcher vessels, if they are not scrapped. A small number of vessels may be sold to recreational buyers.

In recent decades, few North Pacific fishing vessels were scrapped when they left the fishery. Minimal facilities exist on the West Coast specifically for scrapping vessels, though drydocks in Puget Sound could provide these services. Some vessels may be towed to other countries for scrapping, where costs are lower (due to lower labor costs and more relaxed environmental regulation).

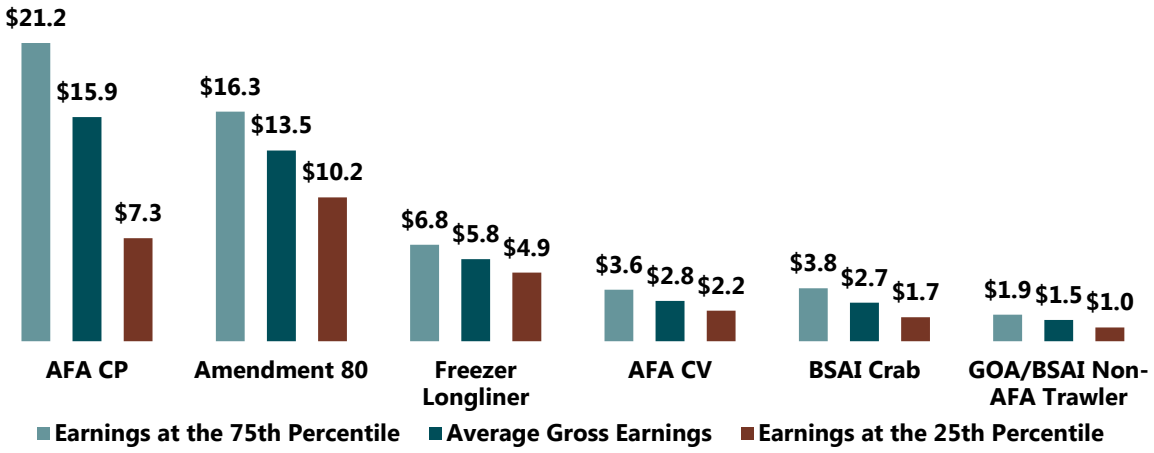
Fishery Revenue Potential

The potential to generate revenues – and more importantly, profits – are critical aspects of any business investment decision. Investment in a new commercial fishing vessel will require some reasonable expectation that basic fishery economics will generate the cash flow sufficient to provide a return on investment, and cover debt service on vessel financing. Minimal data is available concerning the profitability of North Pacific fisheries; however, gross earnings data (available from government sources) provides a broad indication of potential disconnects between the cost of investment and revenues available to pay for that investment.

Annual gross earnings vary significantly across the North Pacific fleet. Public records indicate AFA catcher processors earned an average of $16 million per vessel in 2014, with 25 percent of the fleet earning $21.2 million or more and 25 percent earning $7.3 million or less. Vessels active in GOA/BSAI Non-AFA trawl fisheries made the least, averaging $1.5 million per vessel.[65]

[63] BSAI Crab 10 Year Review.
[64] Dock Street Brokers, accessed online on 10/13/2016.
[65] Earnings for AFA motherships are not included because of confidentiality concerns resulting from the small number of ships.

Chart 3. Estimated Gross Earnings by Percentile by Fishery, 2014



Source: SAFE Groundfish Report, CFEC, McDowell Group estimates.

Comparing revenue data with construction cost information illustrates that catch values (revenues) may, for many fishermen, be insufficient to justify incurring the cost of new vessel construction, certainly for those in the bottom quartile of earners.

With respect to revenue, another important consideration is the potential for modern vessels, especially those with expanded processing capacity, to earn more through greater product utilization, as discussed in the next section.

Fisheries Rationalization

Over the last 20 years, nearly all large-scale North Pacific fisheries have transitioned to a fisheries management regime commonly known as "rationalization." The term "rationalized" refers to economic theory which has informed the design of management systems to align the short-term interests of market participants with "rational," long-term efficiency of a market.

Rather than race to harvest seafood as quickly as possible, in rationalized fisheries fishermen received access privileges to harvest a certain portion of the season's TAC. Quota is typically "transferable," which means it can be bought, sold, or leased. Fisheries transitioned into a rationalized management plan have experienced reduced overfishing and bycatch.[66]

Within rationalized programs, fishermen have more discretion about when they fish, avoiding bad weather and in general operating with higher safety margins. Seafood quality has also improved as processors anticipate a steady supply of fish rather than larger volumes of fish landed over short periods. In addition, processors can take the time to more fully utilize the fish and not just focus on high-value products. As an example, following

[66] https://www.st.nmfs.noaa.gov/Assets/economics/catch-shares/documents/Catch_Shares_Report_FINAL.pdf

the passage of the AFA, average recovery rates increased from 20 percent to 40 percent, as processors extracted more product from every harvested pollock.[67]

While rationalization can have a broad range of socioeconomic impacts, many in the seafood industry view this regulatory transition as a vital precursor to fleet modernization. Rights to fishing quota reduces revenue uncertainty for vessel owners and for their lenders. Quota can also be used as collateral when a borrower is seeking financing.

Table 9. Key North Pacific Commercial Fishing Sectors, by Year Rationalized

Sector	Year Rationalized
Alaska Halibut and Sablefish	1995
American Fisheries Act	1999
Bering Sea/Aleutian Island Crab	2005
Amendment 80	2008
Freezer Longline[1]	2010
Central Gulf of Alaska Rockfish	2012

[1]In 2010, the freezer longline sector entered into a voluntary cooperative, resulting in de facto rationalization.
Source: NMFS, 2015.

Five key North Pacific fishing sectors have been rationalized since 1995. The relatively small Central GOA Rockfish fishery was the most recent, with major changes occurring in 2012.

On-Board Processing Opportunity

Quota privileges create a strong financial incentive to utilize as much of the fish as possible. This dynamic has been observed in the past five years where new construction and significant modifications have occurred primarily in fisheries where vessels engage in on-board processing. For example, among the AFA catcher/processors, the Starbound was lengthened to add fishmeal capacity. The Blue North and Northern Leader (freezer longline) were constructed with enhanced on-board processing capacity. In the future, most new Amendment 80 and pollock catcher/processors are expected to have improved utilization capacity relative to the vessels they are replacing. In contrast, the trawl and pot catcher vessel fleets in the groundfish and crab fisheries, which do no onboard processing, have seen minimal reinvestment.

Community Development Quota Program

Approximately 20 percent of vessels active in North Pacific fisheries are owned in full or in part by one of Alaska's Community Development Quota (CDQ) groups, and the groups therefore have a good deal of influence over when and how fleet modernization occurs. Established in 1992, the six groups, which together represent 65 communities in Western Alaska, are allocated 10 percent of the annual groundfish and crab quota, and 100 percent of some halibut areas.[68] In 2016, these allocations represented nearly 440 million pounds of seafood, including approximately 300 million pounds of pollock.[69]

CDQ groups are non-profit entities with for-profit subsidiaries that own vessels, processing facilities, and other seafood-related assets. Revenue generated by the for-profit entities must be reinvested in commercial fishing-related enterprises or in-region economic development efforts. The CDQ groups have acquired ownership

[67] Criddle, Keith R., James Strong. Dysfunction by design: Consequences of limitations on transferability of catch shares in the Alaska pollock fishery. Marine Policy 2013; 40:91-99.
[68] https://alaskafisheries.noaa.gov/sites/default/files/reports/annualmatrix2016.pdf
[69] https://alaskafisheries.noaa.gov/sites/default/files/reports/annualmatrix2016.pdf

stakes in approximately 74 commercial fishing vessels (excluding vessels less than 58 feet and support vessels) with total revenues of more than $330 million. CDQ groups are part-owners in two of the three newest freezer longliners and at least one of the newest Amendment 80 vessels.

Table 10. Community Development Quota Group Vessel Ownership and Revenue, 2015

CDQ Entity	Number of Vessels	Total Revenue in 2015
Aleutians Pribilof Island Community Development Association	18	$60.6 million
Bristol Bay Economic Development Corporation	19	$25.6 million
Central Bering Sea Fishermen's Association	13	$65.9 million
Coastal Villages Region Fund	14	$93.1 million
Norton Sound Economic Development Corporation	17	$49.1 million
Yukon Delta Fisheries Development Association	6	$44.4 million

Note: Not all vessels are 100 percent owned by CDQ entities. Includes seven duplicated vessels. Tender vessels, support vessels, and vessels less than 58 feet are excluded.
Source: CDQ group annual reports, NMFS CDQ Program Summary.

In the early years of the program, the CDQ groups generated revenue primarily by leasing quota. Over time, groups have purchased or built vessels to harvest their own quota. In addition, CDQ groups are actively purchasing quota in addition to their allocation. In some crab fisheries, CDQ groups own up to 60 percent of available quota.[70] Growth in CDQ ownership of North Pacific fishing assets is anticipated to continue.

Because of their assigned quota and links with community well-being, CDQ groups are generally more inclined to have longer business planning and investment decision time horizons than other private companies. This makes them somewhat more likely to invest in new vessels.

Examples of CDQ vessel ownership and industry involvement are provided in the appendix.

Vessel Operating Costs

Cost Advantages of Newer Vessels

An immediate benefit of replacing an older boat with a modern commercial fishing vessel is greater efficiency and lower costs per pound of product harvested and handled. Lower fuel costs, more efficient and varied processing equipment, increased crew comfort and safety, faster cruising speeds, and other benefits can result from investment in a modern vessel.

With modern hull designs and advanced propulsion equipment, new vessels are typically more energy efficient than older vessels. Sources interviewed for this study estimate savings of up to 30 percent or more. These savings are an important incentive for building a new vessel, especially in trawl fisheries where fuel costs can be 30 to 50 percent of operating cost.

[70] BSAI Crab 10 Year Review.

New vessels typically offer quieter, more spacious crew quarters, which can increase crew retention and attract more qualified crew, both of which drive down the cost of training new employees and can improve personnel efficiency.

Further, newer equipment is less prone to breaking and periods of expensive down-time. Finally, new vessels may require fewer crew members and offer the opportunity to increase the variety of products produced on-board.

Impact of Aging Owners and Crew

A steadily increasing average age of vessel owners, deckhands, managers, and skilled trades workers has a variety of implications for fleet modernization. Independent vessel owners 50-60 years old may have little appetite to commit to a loan term of ten years or more. With retirement in mind, older vessels owners may be more inclined than younger fishermen to make do with their existing vessel for a few more years.

Source: Fishermen's Finest.

For larger fishing companies, the age of owners is not the same potential impediment to reinvestment, but the effect of aging deckhands remains a factor. One large commercial fishing company that owns multiple vessels across North Pacific fisheries has a median deckhand age of 53 years. Better working conditions, enhanced crew safety, increased privacy, internet access, and other quality of life improvements may be especially important to retain current workers and attract new workers. Retaining this workforce and reducing the negatives associated with being at-sea for extended periods have been considered in some recent vessel replacements, per interviews conducted for this study.

At the same time, it should be noted that the same aging trends have created shortages of workers in skilled trades such as welding, pipefitting, and electricians. If those shortages become severe, they could restrict the capacity of shipyards to undertake widespread vessel construction.

Seafood Market Conditions

One of the most important factors affecting fleet modernization is the value of seafood harvested and processed by the fleet. Many factors affect this value, including consumer demand and preferences, currency rates, substitutes, and total supply.

An important condition of all Alaska seafood markets is sustainability. Nearly all the North Pacific fisheries are certified through third party auditors to ensure the sustainability of the resource. These fisheries typically exceed international sustainability guidelines put forth by the Food & Agriculture Organization of the United Nations. The Marine Stewardship Council and the Alaska Seafood Marketing Institute's Responsible Fisheries Management Program are two of the internationally recognized sustainable certification programs often used to identify trusted seafood sources.[71] Many retail chains require seafood certification, and consumers identify Alaska's products to be responsibly sourced.

In terms of specific species, Pollock, Pacific cod, flatfish, and other groundfish typically account for nearly 80 percent of the wholesale volume produced by all fisheries up to 200 miles off Alaska's coast.[72] Each are high volume fisheries yielding relatively low prices. These fisheries have accounted for 52 percent of value in recent years (2014-2015).

Approximately 89 percent of Alaska groundfish and crab is sold to export markets and competes against seafood products from around the globe.[73] Compared to historical levels, the U.S. dollar has generally been valued higher against most of the key currencies it competes against or sells to (Japan, Europe, Russia, and China). This dynamic tends to depress export values as a strong U.S. dollar makes U.S. products relatively expensive. The following sections describe markets for the key species of the North Pacific, followed by a discussion of the impacts of seafood market conditions on modernization.

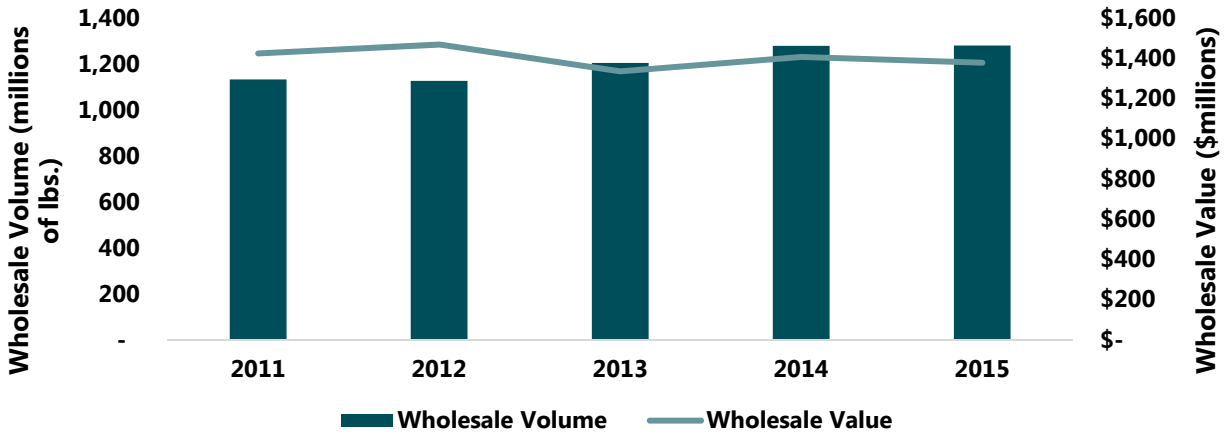
[71] For more information on sustainable fishery management in the North Pacific: http://www.alaskaseafood.org/wp-content/uploads/2015/10/Sustainability-Brochure-2.pdf
[72] http://www.afsc.noaa.gov/News/pdfs/Wholesale_Market_Profiles_for_Alaskan_Groundifsh_and_Crab_Fisheries.pdf
[73] Ibid.

Pollock

From 2011 through 2015, the average annual first wholesale value for pollock was approximately $1.4 billion with average volume of about 1.2 billion pounds.[74] The value of Alaska pollock products has trended lower in recent years, a result of high global abundance and currency rates. Alaska pollock competes against other pollock (primarily from Russia) and against substitutes such as tilapia and other whitefish.

Key markets for Alaska pollock products are Europe, U.S., and Japan, where fillets, surimi, and roe are all important products. Pollock ex-vessel prices across all gear types have been declining over the last five years, from $0.17 per pound in 2011 to $0.15 in 2015.[75]

Chart 4. First Wholesale Value and Volume for Alaska Pollock, 2011-2015



Note: Values have been adjusted to 2015 dollars. Includes a small amount of harvest in the Gulf of Alaska.
Source: NMFS SAFE Economic Status Report 2015.

[74] NMFS SAFE Economic Status Report, 2015.
[75] Ibid.

Pacific Cod

From 2011 through 2015, the average annual first wholesale value for Pacific cod was stable at approximately $466 million from a first wholesale volume averaging 332 million pounds.[76]

The most important retail markets for Pacific cod are the U.S., Europe, and Japan. Alaska product competes with cod harvested in the North Atlantic by European and Russian fishermen. Recent declines in Atlantic cod quotas have led to slight price increases.[77] The Euro's exchange rate against the dollar has been lower in the last few years. Pacific cod ex-vessel prices across all gear types have been declining slightly, from $0.30 in 2011 to $0.27 in 2015.[78]

Chart 5. First Wholesale Value and Volume for Pacific Cod, 2011-2015

Note: Values have been adjusted to 2015 dollars.
Source: NMFS SAFE Economic Status Report 2015.

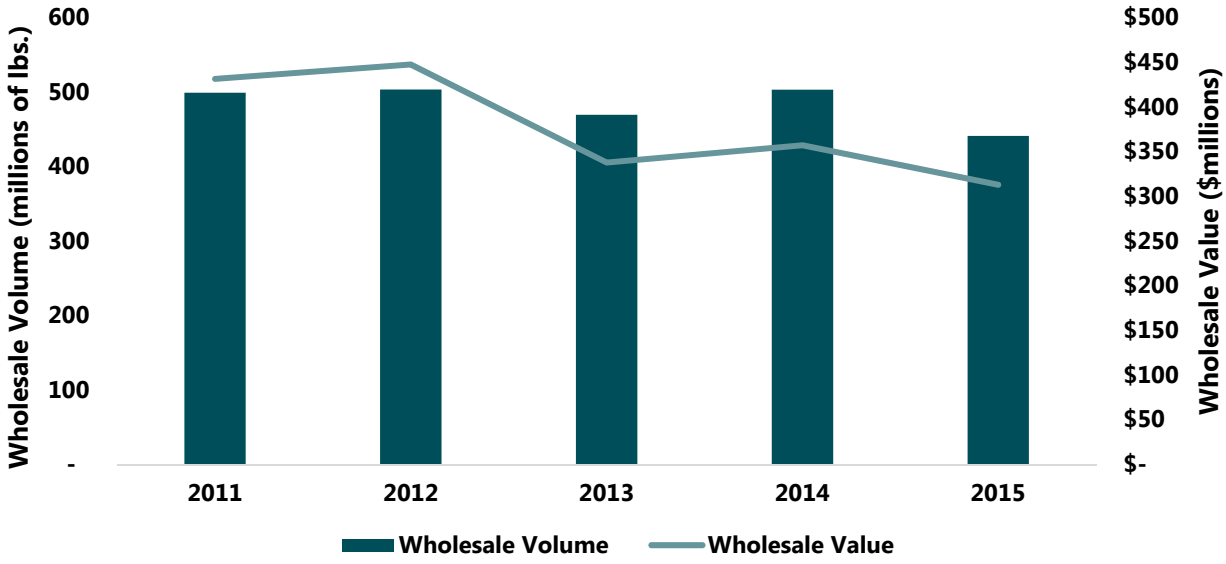
[76] NMFS SAFE Economic Status Report, 2015.
[77] https://www.undercurrentnews.com/2016/08/29/sources-rise-in-pacific-cod-prices-set-to-continue/
[78] NMFS SAFE Economic Status Report, 2015.

Flatfish and Other Groundfish

From 2011 through 2015, first wholesale value for flatfish and other groundfish has averaged approximately $377 million annually from 483 million pounds of first wholesale volume.[79] Because most of this volume is exported to China for reprocessing, the strong U.S. dollar has been a particular challenge for fleets harvesting these species. Europe and the U.S. are the largest markets for twice-frozen flatfish. Japan is the largest market for Atka mackerel and rockfish, followed by Korea.

Ex-vessel prices for flatfish, Atka mackerel, and rockfish in 2015 were $0.14, $0.26, and $0.20 per pound, respectively.[80] The total value of the harvest has been trending down over the past several years. The total first wholesale value in 2015 was about one-third below the 2012 level, a decline of nearly $140 million.

Chart 6. First Wholesale Value and Volume for Flatfish and Other Groundfish, 2011-2015



Note: Values have been adjusted to 2015 dollars. Other groundfish includes Atka mackerel and rockfish species.
Source: NMFS SAFE Economic Status Report 2015.

[79] Ibid.
[80] Ibid.

Halibut and Sablefish

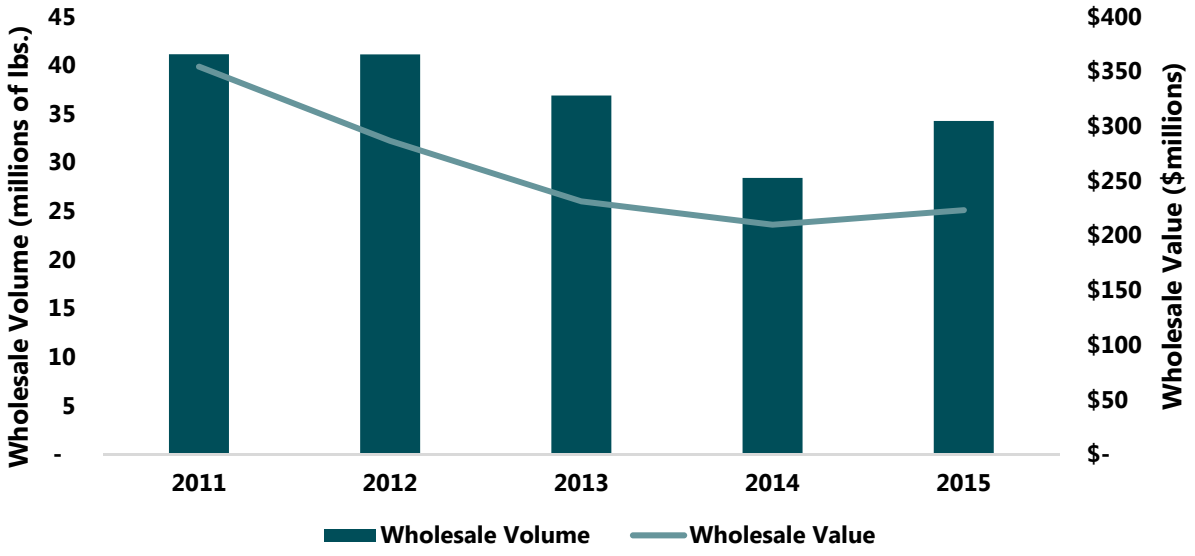
From 2011 through 2015, the first wholesale value for sablefish and halibut has averaged approximately $261 million from 36 million pounds of first wholesale volume.[81] A decline in overall revenue over the 2011 to 2015 period is due primarily to a reduction in quota. Product from Alaska competes with Canadian supply.

Both species are low volume fisheries that command high prices both domestically and in export markets. While the domestic market is the primary destination for halibut, Japan is historically the largest sablefish market, although other markets have grown over the last decade.[82]

A weak Japanese yen (against the dollar) has been an issue for key Japanese imports like sablefish. The yen has recently been strengthening, but that has not yet been reflected in high-value fish markets.[83]

There are significant differences in the ex-vessel price depending on gear type used. While trawl-caught sablefish averaged $1.27 per pound at the ex-vessel level in the BSAI region in 2015, fixed gear harvests drew $3.27 per pound. Longline halibut ex-vessel prices averaged $5.80 per net pound from 2011 through 2015

Chart 7. First Wholesale Value and Volume for Halibut and Sablefish, 2011-2015



Note: Values have been adjusted to 2015 dollars.
Source: NMFS SAFE Economic Status Report 2015.

[81] NMFS SAFE Economic Status Report, 2015.
[82] http://www.afsc.noaa.gov/News/pdfs/Wholesale_Market_Profiles_for_Alaskan_Groundifsh_and_Crab_Fisheries.pdf
[83] https://www.undercurrentnews.com/2015/12/21/dollar-strength-dominates-currency-markets/

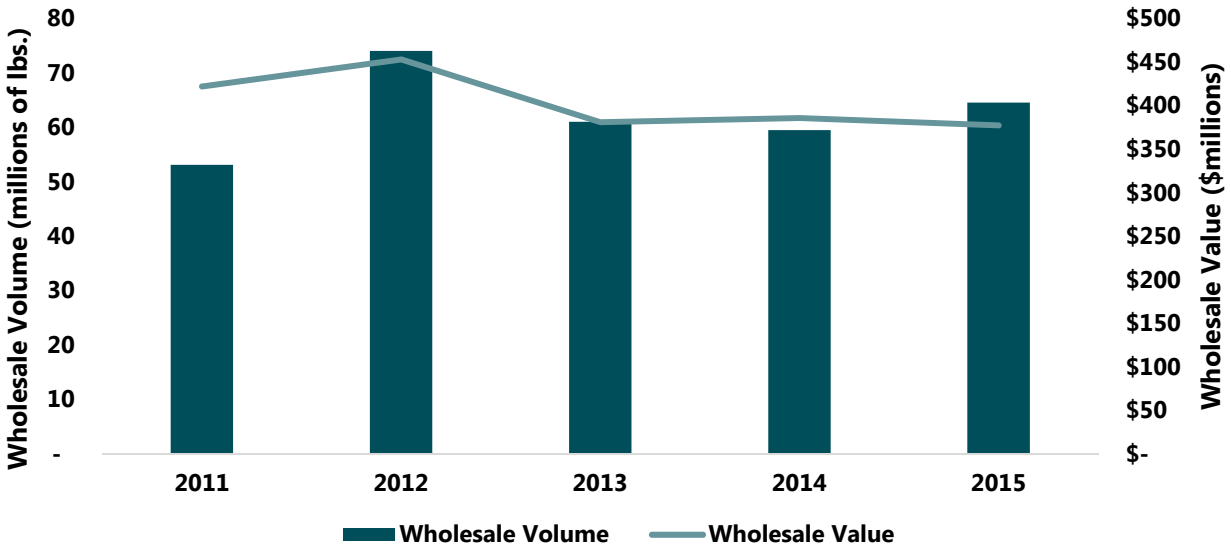
Crab

From 2011 through 2015, the average first wholesale value for crab harvested off Alaska's coast was approximately $404 million from 62 million pounds of first wholesale volume.[84] Key markets are the U.S. and Japan, while Alaska competes with crab from Russia, Argentina, Canada, and Norway.

Significant cuts to crab TACs will reduce catch volumes in the near-term. Although prices are expected to rise, it is likely that total first wholesale value will decline.

In 2015, the average ex-vessel price for red king crab was $7.95 per pound. Tanner and snow crab prices averaged $2.49 and $2.06 per pound, respectively.[85]

Chart 8. First Wholesale Value and Volume for Crab, 2011-2015



Note: Values have been adjusted to 2015 dollars.
Source: NMFS SAFE Economic Status Report 2015.

[84] NMFS SAFE Economic Status Report, 2015.
[85] http://www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisheryshellfish.shellfishcatch_exvessel_crab

Seafood Market Impact on Fleet Modernization

Seafood harvested by the North Pacific fishing fleet competes in a global market. The primary effect of increased competition is a lower price for U.S. seafood products. These lower prices have the potential to either increase or decrease the pace of modernization. In some situations, a lower price for seafood products may push vessel owners to invest in additional processing capacity (e.g., a fish meal plant) or other significant vessel modifications (e.g., lengthening or sponsoning). On the other hand (and likely the more common situation), a low price can constrain modernization as vessel owners do not have the needed capital to engage in modernization projects.

According to interviews, global seafood markets have generally become more competitive as alternative or substitute species are increasingly available. Fishing fleets in Russia, Norway, Greenland, and New Zealand have been expanding with adding new vessels and increasing competition through improved products.

Russia, one of the top competitors for U.S. groundfish and crab, is actively modernizing its fleets, especially in its pollock sector. Along with three new 166-foot trawl vessels currently being constructed in a domestic shipyard, Russia is encouraging its seafood sector to create more value-added products domestically, instead of sending raw materials to China for reprocessing.[86] Most recently, the Russian pollock fleet has been incentivized by a new program which allocates quota to owners of new, domestic-built vessels. Up to 20 percent of quota in some fisheries could go to new vessels.[87] U.S. pollock producers can expect Russia to increase onboard value-added capabilities in the near-term, including frozen-at-sea surimi products and fillet blocks, products typically provided by AFA catcher/processors.[88]

While the impact of Russian modernization may have the most substantial effect on the North Pacific fleet, smaller-scale changes are happening in fleets around the globe. Norway groundfish companies are actively adding new, more advanced vessels, with at least two longline and one trawl vessel under contract in 2016.[89,90] Royal Greenland, a Greenland trawl company, is also considering new vessels.[91] The New Zealand fishing company Sealord is having a 266-foot vessel built in a Norwegian shipyard.

[86] http://en.portnews.ru/news/213526/
[87] http://www.intrafish.com/news/1170869/russia-outlines-plans-for-revamping-pollock-harvesting-processing-sector
[88] https://www.undercurrentnews.com/2016/11/01/low-prices-building-inventories-worries-alaskan-pollock-sector/
[89] https://www.undercurrentnews.com/2016/07/07/worlds-largest-longliner-fleet-adds-two-new-toothfish-vessels/
[90] https://www.undercurrentnews.com/2014/10/24/ramoen-sells-fas-filleting-trawler-orders-newer-model/
[91] https://www.undercurrentnews.com/2016/01/18/royal-greenland-to-look-at-fleet-renewal-after-quin-sea-deal-closes/

Financing Options

Previous sections of this report have discussed factors that influence decisions about whether and when to build or upgrade fishing vessels. Before construction can begin, however, the project must be financed. Most lenders say they view construction of large vessels similar to real estate development projects. The variables that must be evaluated can be more complex, however. The financing needed for individual projects may range from $12-$13 million for a crab vessel, to ten times that amount for a sophisticated catcher/processor. Similarly, the ownership entities that lenders work with may be individual proprietors or large, diversified corporations. Finally, assessing risk for a vessel project can involve more factors than for a traditional real estate project, as described below.

Risk

Because of its complexity, the fishing industry is regarded as a challenging lending environment. The level of investment risk perceived by three key parties — the owner, the builder, and the lender — determine whether projects can go forward.

The owner must be confident the new vessel will pay for itself in earnings and/or cost savings. The builder must be confident the vessel can be built to specification, on budget, and on schedule, and that the owner will have the capital to pay for it. The lender must be confident that both the owner and the builder will perform as advertised, and in addition must believe that financing the project is a better use of its capital than a variety of other investment options that may be available.

More specifically, from the lender's perspective, every vessel construction or major modification involves the following sources of risk:

- **Business risk**: Fishing businesses face risks common to other industries, such as changing consumer preferences, competitor threats, labor issues, and evolving technology. They must also deal with potential changes in resource management regimes, biological and environmental factors that can impact the seafood resource, a complex web of transportation and processing infrastructure, and international monetary policies. Larger lenders may have staff who track industry trends, but most look primarily to borrowers to assess the business risks of a particular project.
- **Borrower risk**: Many bankers say a borrower with a solid business history and a strong balance sheet is the first thing they look for in prospective vessel-financing deals. A stable borrower is especially important because purpose-built fishing vessels often have limited resale value. This typically leads lenders to require other sources of collateral.
- **Builder risk**: A partially constructed vessel has almost no resale value. From a lender's perspective, the riskiest period of vessel financing is during construction, when the list of potential problems is long, ranging from cost and time overruns caused by availability of skilled labor, required materials, and technical capacity to full-scale bankruptcy of the builder.
- **Opportunity risk**: During the period during which a loan is outstanding, that capital is not available to the lender for other investment opportunities. For this reason, and to limit the period during which unforeseen factors could adversely affect the borrower or builder, lenders typically impose strict limits on the length of time (loan term) they are willing to allow before the loan principal is fully repaid.

COLLATERAL

Especially for riskier deals, lenders require the borrower to make assets available as collateral in addition to the vessel being built or upgraded. For fishing companies, the additional collateral often consists of other vessels or real estate. In some cases, fishing quota may also be used as collateral.

Term Length/Amortization Period

A key tool for lenders that need to reduce risk is term length, the amount of time over which the loan must be repaid. Regardless of what a borrower can afford, a combination of banking regulations and institutional policy typically create fairly firm ceilings on the payback periods that can be offered by most financial institutions. Per industry contacts, loan terms extended to fishermen by private banks for construction of new vessels are typically between seven and ten years, with a small number of loans having 15 year terms. The maximum term for most lenders is 12 years, however.

Some loans that include public participation — for example, through programs of the Small Business Administration (SBA), National Oceanic and Atmospheric Administration (NOAA), or Northwest Farm Credit[92] — have terms up to 25 years. (See Financing Programs, below.)

Several recent vessel projects have been financed through Northwest Farm Credit, which reportedly has provided 20-year terms, typically with a balloon payment after 15 years. A balloon payment — a single payment by the borrower at some predetermined date that substantially reduces the amount of outstanding loan principal — lowers the risk for the lender and reduces interest costs for the borrower. However, the borrower must be able to raise the necessary cash, and this can strain the operating finances of the business. Some businesses don't typically have access to enough cash flow for this type of financing.

For some types of fishery, limits on term length can be the biggest barrier to vessel financing. This happens when the economics of the fishery are such that participating vessels simply don't earn enough in an average year to meet the payment schedule lenders require. In these cases, participation in the loan by other entities, either public or private, is necessary for modernization to go forward.

Interest Rates

The other main tool lenders use to offset risk is interest rates, which, along with the amortization period, determine the total cost of a loan to a borrower. The size of the periodic loan payment is determined by the interaction of interest rates and the loan term. Longer terms and/or lower rates mean smaller periodic payments which, as noted, can be a crucial step toward making a project feasible.

The interest rate a lender charges reflects two main factors: the cost of capital to the lender, determined largely by federal interest rates, and the amount of perceived risk in the project. Common reference points for interest rates are the LIBOR — the rate banks charge each other — and the Prime, the lowest commercially available

[92] Farm Credit is a national, borrower-owned, lending network created by the Federal Farm Loan Act of 1916. It consists of approximately 75 independently owned lending organizations and has provided more than one-third of the outstanding credit — $235 billion in loans, leases and related services — to the U.S. agriculture sector. By virtue of its status as a government-sponsored enterprise (GSE), Farm Credit receives federal subsidies under the Farm Credit Act of 1971 and subsequent related legislation. Source: www.farmcreditnetwork.com; www.fca.gov.

rate at any time.[93] The difference (known as the "spread") between the reference rate and the rate offered to a borrower reflects the lender's assessment of the risks unique to the individual project. Spreads between 2 percent and 3.5 percent above Prime are typical of fishing industry deals.

Implications for Financing

The biggest obstacles to large-scale modernization of the North Pacific fleet derive not from doubt about the long-term outlook for the seafood industry, but from mismatches between the payment schedule needed by lenders to justify investment and the typical annual earnings of different types of vessels. Interviews for this report indicate that once a lender is satisfied that the basics of a proposed vessel project are sound, two variables ultimately determine whether the project can go forward: the length of the loan term and the interest rate. Together these two factors establish the payment schedule. Whether a vessel can meet that schedule depends on how much net operating revenue it can produce in the fisheries it can pursue.

The table shows the estimated average costs of different vessel types compared to their average gross earnings.[94] This comparison is an oversimplification of the financing potential of any vessel. Loan payments must be made from net earnings rather than gross, and, as discussed above, many other factors influence replacement decisions. Nevertheless, the comparisons suggest why most of the recent new vessels have been freezer longline and Amendment 80 vessels, which have the lowest ratios of vessel cost to gross earnings at 5.9 and 5.8, respectively. It also suggests why there has been less interest in replacing GOA/BSAI Non-AFA trawlers. Replacement interest in BSAI crabbers has also been low, but that is primarily because the nature of the fishery leaves little opportunity to increase income by switching to a new vessel.

Table 11. Relationship of Gross Earnings to Vessel Replacement Cost

Vessel Type	Average Cost of New Vessel ($million)	Average Annual Gross Earnings ($million)	Ratio of Cost to Gross Earnings
AFA CP	$130	$15.9	8.2
Amendment 80	$78	$13.5	5.8
Freezer Longline	$34	$5.8	5.9
AFA CV	$19	$2.8	6.8
BSAI Crab	$18	$2.7	6.7
GOA/BSAI Non-AFA Trawler	$15	$1.5	10

Source: SAFE Groundfish Report, CFEC, McDowell Group Estimates.

More generally, as industry interviews have indicated, all six vessel types face a potential "financing gap." Even with zero percent interest, to repay a loan for the full cost of a new vessel over what is typically the maximum commercial loan term of 12 years would require 49 percent of average annual gross earnings for freezer longliners and more than 80 percent for GOA/BSAI Non-AFA trawlers. As noted, the actual source of cash for loan payments is not gross earnings, but net earnings. Net earnings (profits after all operating expenses are deducted) are confidential and therefore not available for most vessels. However, they are a relatively small

[93] The London Interbank Offered Rate (LIBOR) or Federal Home Loan Bank (FHLB) rate is used in place of the Prime rate in some cases.
[94] Gross earnings are earnings before payment of operating expenses, including fuel and crew costs.

percentage of gross earnings. For reference, total average annual net earnings for the Amendment 80 fleet from 2008 to 2012 ranged from 15 percent of gross earnings to 28 percent of gross earnings.[95]

In practice, substantial down payments are needed to lower the amount borrowed, and loan schedules may be slightly longer when the loan is collateralized with other assets, for example real estate. Business history and an owner or vessel's fishing rights are also important. Some lenders say they consider fishing rights (typically quota) the most important financing consideration.

Nevertheless, most lenders say they are limited in their flexibility to set fundamental terms such as amortization and interest rate. This means additional sources of capital, longer loan terms, and/or lower interest rates will be necessary to finance at least a portion of fleet modernization. It also means the companies most able to obtain workable financing terms will be those with more assets and those engaged in the more lucrative fisheries. Smaller, more marginal operations will have fewer options.

The next sections of this chapter describe the major government programs currently available to borrowers and lenders to make project financing more feasible.

Financing Programs

In addition to the Farm Credit Network, described above, there are several federal programs that could play important roles in financing North Pacific fleet modernization.

SBA 7(A) AND 504 LOAN PROGRAMS

The SBA provides a variety of financing for new and expanding businesses by guaranteeing loans by private lenders. Fishing vessels qualify in some cases, but typically the owner must first apply to one of the NOAA programs described below. Loans made under the SBA 7(a) program cannot exceed $5 million. The CDC/504 program has a maximum loan amount of $5.5 million. Anecdotal reports indicate these programs are rarely used when financing a commercial fishing vessel or project.

USDA BUSINESS AND INDUSTRY GUARANTEED LOANS

This program is similar to the SBA programs and is primarily intended to support economic development projects in rural areas, defined as areas that do not have a city or town of more than 50,000 inhabitants. However, while the project must create rural economic benefits, the borrower may be located in a larger city. The program is intended for land-based projects but covers "machinery," and fishing vessels are not specifically excluded. Although CDQ groups, for example, appear to satisfy the rural benefit requirement, no examples were identified of the program being used for North Pacific vessels. Loan applications are submitted by the lending institution rather than the borrower. The program guarantees from 60 percent to 80 percent of the loan, up to a maximum loan amount of $25 million or occasionally more with approval of the Secretary of Agriculture.

U.S. DEPARTMENT OF TRANSPORTATION, MARITIME ADMINISTRATION (MARAD) – TITLE XI FEDERAL SHIP FINANCING PROGRAM

While not currently available for commercial fishing vessels, this program is an important source of financing for shipbuilding. Its goal is to grow and modernize American vessels and American shipyards. Research vessels,

[95] Amendment 80 5 Year Review, 2014.

ferries, container ships, tankers, tugs, barges, offshore oil rigs, oil support vessels, and floating dry-docks all qualify for financing under the Title XI program. Currently, however, MARAD funding cannot be used to finance fishing vessels. The maximum loan term is the lesser of 25 years or the economic life of the vessel and the program covers up to 87.5 percent of the actual value of the project. Total annual loans have ranged from $23 million in FY 2010 to $1.8 billion in FY 1999. Efforts have been made in the past to allow commercial fishing vessel financing through the program.

U.S. DEPT. OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) – FISHERIES FINANCE PROGRAM

The main source of federal financing for larger fishing vessels is the Fisheries Finance Program (FFP) of the U.S. Department of Commerce (administered by NOAA/NMFS). This program currently does not allow financing of new vessel construction, although this restriction is anticipated to change in the near-term.

The program makes long-term, fixed-rate loans for specified fisheries costs, including existing vessels, individual fishing quota, and buy-back financing to purchase and retire permits or vessels in an over-capitalized fishery. Financing is available for 80 percent of vessel cost with a maximum term of 25 years. The rate is prescribed by program rules at 2 percent above the U.S. Treasury's cost of funds.

Congressional appropriations for FY14 increased FFP's annual loan authority from $59 million to $100 million and removed a prior prohibition against new vessels that increase fishing capacity that had become a substantial obstacle to loan applicants operating in the North Pacific. In June 2014, NOAA proposed modifying the program rules to bring them into conformance with the new appropriation terms.[96] The action was taken because, in the language of the Federal Register, "…the existing fleet of U.S. fishing vessels consists of older vessels which are not optimal in terms of safety, efficiency, and environmental and fuel-efficient operation." NMFS also noted, the following, however:

> NMFS generally does not want to finance the cost of new fishing vessels or reconstruction of existing vessels that materially increase harvesting. NMFS believes it can entertain financing these costs only for vessels participating in limited access fisheries. Where catch limits control the annual harvest, replacement or improvement of vessels does not increase the total catch. The FFP currently does not make vessel loans in any fisheries that are listed as overfished or subject to overfishing.[97]

The proposed rule change does not address interest rates, which typically run an estimated 2 percent higher than Title XI loans for non-fishing vessels made through MARAD.

U.S. DEPT. OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) – CAPITAL CONSTRUCTION FUND

Established in 1936, this program allows qualifying fishermen to place fishing income (including operating earnings and proceeds from the sale of fishing vessels) plus an amount equal to vessel depreciation in a tax-deferred account. The principal and earnings from the account may be used for vessel construction, reconstruction, and improvements. While publicly available data is not available on how often this program is

[96] https://www.regulations.gov/document?D=NOAA-NMFS-2014-0062-0006
[97] Ibid.

used, interviews with fishermen indicate nearly all recent new-builds, retrofits, or significant improvements for the North Pacific fishing fleet have involved this program.

Fishermen using this program must complete a project every 10 years, with a "project" defined as a new vessel construction, reconstruction, or improvements equal to at least 20 percent of the original vessel value. [98] In some cases, the 10-year regulation may influence fishermen to speed up capital expenditures to avoid paying taxes on these savings.

Federal Regulations

Jones Act

Established in 1936, the Merchant Marine Act (commonly known as the Jones Act) requires that commercial ships operating between U.S. ports must be built in U.S. shipyards. This applies to vessels harvesting seafood in U.S. waters. Fishermen and other seafood industry representatives say vessels built in the U.S. cost more than those from some other countries, and that the requirement places them at a disadvantage relative to global competitors. For this reason, the act has been criticized as overly protectionist for the U.S. shipbuilding industry. Others argue, however, that the act is necessary for national security both because it minimizes access to coastal regions by foreign ships and because it helps the U.S. maintain a level of shipbuilding capacity needed to ensure the industry can meet military and other essential maritime needs.

Without a restriction on where ships may be built, for example in the case of a commercial fishing vessel for a company in Iceland or Norway, the new vessel might undergo primary construction in a country where labor cost is low, before being finished in another country where processing and other technologically advanced equipment is installed. This option is not currently available to U.S. fishing companies.

Several efforts to repeal the Jones Act have been mounted over the years. While a repeal would likely have a detrimental impact on Puget Sound shipyards as vessel construction moves overseas, the general perception in the industry is that the Jones Act will not be changed in the near future.

Coast Guard Regulations

Over the last 10 years, Coast Guard regulations regarding construction, operation, and maintenance of commercial vessels have increased in their rigor and scope. Safety is a particular concern, partly in response to loss of life from vessel casualties in the North Pacific. These regulations fall into two primary categories: vessels that are currently operating and newly constructed vessels. The most stringent requirements typically apply to new construction. Though these regulations may move the North Pacific fleet toward modernization, the additional costs associated with compliance can be an obstacle, slowing the pace of reinvestment.

[98] Personal Communication, Richard VanGorder, NOAA, 8/30/2016.

Requirements for New Vessels

Current rules dictate that all commercial fishing vessels over 79 feet must be "classed" and "load lined." A "classed" vessel adheres to standards set forth by classification societies that establish rules for how vessels are constructed and maintained with a primary focus on major systems such as machinery, refrigeration, electrical systems, and fire protection. "Load lining" standards address hull construction, watertight integrity, and stability. Historically, commercial fishing vessels that did not process seafood onboard were exempt from these rules. This exemption was removed in the 2010 Coast Guard Authorization Act.

Source: Fishermen's Finest.

To maintain class, vessels must be inspected regularly by the classing organization. In the event machinery breaks, only replacement parts that have been inspected by the classing organization may be used, and the repair is typically overseen by classing representatives. This presents logistical challenges since much of the fleet operates in remote areas of Alaska. Fishermen report that waiting for delivery of certified parts is a downside of the classing requirement.

Classing is described by some industry participants as a major reason older vessels are not being replaced. It is reported that building a vessel to "class" can cost 10-25 percent more that an un-classed vessel. While many contacts indicated this added expense was manageable and potentially justifiable given the safety benefits, nearly all had reservations about how they would cover the extra cost.

Requirements for Existing Vessels

Following several high-profile vessel losses in the early 2000s which resulted in fatalities, the Alternative Compliance and Safety Agreement (ACSA) was established in 2006. This program applies to Amendment 80 and freezer longline vessels, and has evolved into a de facto classing program for existing vessels that is commonly described as "Coast Guard Class". Vessels in this program are periodically inspected by the Coast Guard, and owners must address deficiencies in hull and machinery conditions or the vessel's seaworthiness.

To address other vessels active in commercial fishing, the 2010 Coast Guard Authorization Act required the Coast Guard to develop an Alternative Safety Compliance (ASC) program generally based upon the 2006 ACSA program. The ASC was to apply to commercial fishing vessels, fish tender vessels, or fish processing vessels over 50 feet operating more than 3 nautical miles from shore and will be 25 years old or older by 2020. However, in 2016, the Coast Guard suspended efforts to expand the program. While uncertainty surrounds the timeline of this program, the industry generally anticipates Coast Guard regulations will continue to increase.

Timeline and Cost of Fleet Modernization

This chapter details the current pace of fleet modernization and presents a forward-looking analysis for the next decade. The cost to fully replace the segment of the fleet that is nearing the end of its useful life, is ill-suited for competitive participation in the commercial fisheries, or is otherwise obsolete, totals well into the billions of dollars.

As this report details, however, many factors influence the number and timing of modernization projects. Age is one indicator (though it does not account for how well a vessel has been maintained). The following table illustrates the approximate replacement cost for the vessels in each fleet that are more than 30 years old and more than 40 years old.

Out of the total fleet of 414 vessels, 320 are more than 30 years old, including 145 are more than 40 years old. Replacing each vessel in these fleets would cost, respectively, $9.0 billion and $4.4 billion.

Table 12. Estimated Cost of North Pacific Fleet Replacement (>58 Feet)

Fleet Name	Total Fleet	No. of Vessels 30+ Years Old	Est. Cost of Replacing All Vessels 30+ Years ($million)	No. of Vessels 40+ Years Old	Est. Cost of Replacing all Vessels 40+ Years ($million)
AFA CP	21	16	$2,080	10	$1,300
AFA CV	102	89	$1,691	29	$551
BSAI Crab	96	75	$1,350	28	$504
Amendment 80	18	16	$1,248	4	$312
Freezer Longline	32	16	$544	7	$238
AFA Motherships	3	3	$510	3	$510
BSAI/GOA Trawl	37	22	$330	11	$165
Other	105	83	$1,245	53	$795
Total Vessels	**414**	**320**	**$8,998**	**145**	**$4,375**

Note: Vessels are unduplicated.
Source: CFEC vessel database, NMFS SAFE Economic Status Report 2014, NMFS Federal Fisheries Permit Database, AKFIN, McDowell Group estimate (Replacement cost).

While age suggests an order of magnitude for the vessels that might ultimately be replaced, in the near term, the myriad of factors described elsewhere in this report will drive the pace and scale of fleet modernization. Availability of financing, fisheries economics, the need to replace obsolete and perhaps unsafe equipment, and the capacity of owners, builders, and lenders to join forces to lower costs and reduce investment risk, are all factors at play.

The following discussion of fleet modernization begins with an overview of investment since 2000. The analysis shifts to a ten-year outlook, followed by an assessment of the rate of investment beyond ten years.

Fishing Vessel Construction Since 2000

Since 2000, 14 vessels over 58 feet have been built for the North Pacific fishing fleet, including two vessels currently under construction. In addition, two vessels were retrofitted to serve as commercial fishing vessels, and at least three vessels of over 150 feet were lengthened, sponsoned, or completely rebuilt. More than one-third (37 percent) of this activity took place in Washington.

Most of these projects occurred in the Amendment 80 and freezer longliner fleets, where five and four vessels were built, respectively. The longest vessel was the Starbound, an AFA catcher/processor, which measures nearly 300 feet after the addition of a 60-foot section to her hull.

Since 2000, the pace of both new builds and major upgrades has accelerated, from an average of less than one project a year to the current average of three. As discussed below, the pace of investment is expected to accelerate.

Table 13. New Construction Since 2000

Vessel Name	Year Built	Length (Feet)	Vessel Type	Shipyard	State
N/A[1]	Under Construction	262	Amendment 80	Eastern Shipbuilding Group	FL
America's Finest	Under Construction	262	Amendment 80	Dakota Creek Industries	WA
Blue North	2015	191	Freezer Longliner	Dakota Creek Industries	WA
Arctic Prowler	2013	136	Freezer Longliner	Vigor Industrial	AK
Araho	2013	194	Amendment 80	Eastern Shipbuilding Group	FL
Coastal Standard	2013	242	Freighter	Dakota Creek Industries	WA
Northern Leader	2013	184	Freezer Longliner	J.M. Martinac Shipbuilding	WA
Victory	2012	114	BSAI Crabber	Fred Wahl Marine Construction	OR
Fierce Leader	2007	63	Multi Species	Fred Wahl Marine Construction	OR
Northern Endurance	2006	78	Longliner	Fred Wahl Marine Construction	OR
Bering Leader	2005	124	Freezer Longliner	Patti Marine Enterprises	FL
Controller Bay	2002	90	Multi Species	Fred Wahl Marine Construction	OR
Pacific Storm	2002	98	Trawler	B&B Boatbuilding	AL
Josie	2002	89	N/A	N/A	N/A

[1] Vessel is owned by Glacier Fish Company.
Note: Excludes some vessels over 58 feet active in non-federal fisheries, e.g., the Paul C Johnson, a 67-foot aluminum tender built in Alaska and operating out of Nome.
Source: CFEC, McDowell Group interviews.

Table 14. Lengthening/Sponsoning/Retrofit Since 2000

Vessel Name	Year Completed	Length (Feet)	Vessel Type	Shipyard	State
Defender	2016	180	AFA CV	Patti Marine Enterprises	FL
Starbound	2016	300	AFA CP	Dakota Creek Industries	WA
Seafreeze America	2016	233	Amendment 80	US Seafoods	WA
Ocean Peace	2012	199	Amendment 80	Vigor Industrial	OR
Bering Defender	2012	174	AFA CV	Patti Marine Enterprises	FL

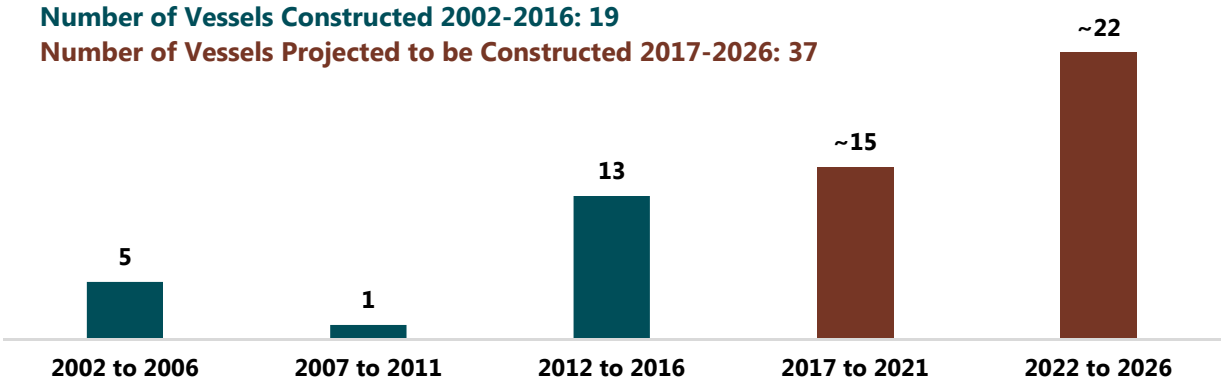
Source: McDowell Group interviews.

Timeline of Fleet Modernization

In the ten-year period immediately following 2016, the rate of new vessel construction is anticipated to increase, particularly in the latter five years, from an average of three per year to an average of five. Fleet sizes are not expected to remain the same over this time, with some degree of consolidation occurring in all fleets.

Chart 15 shows the number of vessel projects in the last 15 years by five-year period (totaling 19 vessels), and the number anticipated in the next 10 years (totaling 37 vessels). On an annual basis, the average number of vessel projects is projected to grow from less than one vessel per year to roughly four vessels per year in the coming decade.

Chart 15. Total Number of Vessel Projects by Five-Year Period, Recent Past Vs. Future Projection



Source: McDowell Group interviews (2000-2016), McDowell Group estimates (2017- 2026).

Modernization activity in the Amendment 80 and freezer longline fleet is anticipated to continue, supported by regulatory certainty, the opportunity to add technology that increases recovery rates, and the general need for newer vessels. Modernization in these fleets will include a small number of retrofitted/repurposed vessels.

The AFA catcher/processor fleet is anticipated to be the target of investment in modernization, with vessel owners attracted by the opportunity to reduce fuel consumption and install cutting edge processing equipment. One of three AFA motherships will be likely replaced, primarily a result of vessel age and the opportunity to increase the mix and efficiency of on-board processing activity.

Minimal activity is anticipated in the AFA catcher and BSAI crab fleet, driven primarily by modest revenues generated by the typical vessel. Many vessel owners are anticipated to simply lease their quota to other vessels instead of operating a vessel themselves. However, a small number of owners in each fleet with sufficient capital are expected to commit to building new vessels.

The remaining fisheries, which include a variety of trawl and fixed-gear vessels, are anticipated to experience some degree of vessel replacement, supported in part by strong halibut and sablefish harvest values and the expected rationalization of the GOA groundfish fisheries.

Cost of Fleet Modernization

The total cost to build the 37 new vessels represented in the table over the next decade is approximately $1.6 billion. The economic impact of this investment in shipbuilding is much larger due to multiplier effects and is considered in the following chapter.

These estimates assume seafood supply-and-demand conditions observed over the last ten years will persist over the next ten years. In the event total allowable catch (TAC) or the value of seafood rises substantially, an increased rate of modernization would be anticipated. Increased access to financing through reduced interest rates or extended terms would increase the pace of modernization. A similar effect would result from increased collaboration among shipyards, fishermen, and lenders which reduces lending risk and vessel cost. Conversely, significant reductions in TACs or seafood value will discourage modernization efforts.

Table 16. Estimated Number of New Vessel Projects Anticipated Between 2017 and 2026

Vessel Type	Fleet Size (2014)	# of New Vessels in 10 Years	Percent of Current Fleet Replaced	Total Investment Required ($millions)
AFA CP	16	4	25%	$520
AFA CV	86	5	6%	$95
AFA Mothership	3	1	33%	$170
Amendment 80	18	4	22%	$312
BSAI Crab	108	6	6%	$108
Freezer Longliner	29	6	21%	$204
BSAI/GOA Trawl	37	3	8%	$54
Other (Fixed Gear & Support)	117	8	7%	$152
Total Vessels	**414**	**37**	**9%**	**$1,615**

Note: Vessels are unduplicated.
Source: CFEC vessel database, NMFS SAFE Economic Status Report 2014, NMFS Federal Fisheries Permit Database, AKFIN, McDowell Group Estimates.

Beyond Ten Years

Beyond 2026, fleet modernization is anticipated to average between three and five vessels per year. Absent significant increases in seafood prices or TACs, the number of vessels participating in the various fisheries of the North Pacific is expected to shrink, with some fisheries impacted more than others. The primary driver of this consolidation will be transferable quota, which will tend to concentrate in the hands of the most successful companies and therefore require fewer vessels to harvest.

Because considerable consolidation has already occurred in the AFA catcher/processor fleet over the past two decades, while the TAC has remained relatively stable, future shrinkage of that fleet is projected to be minimal. For AFA catcher and BSAI crab els, potential exists for consolidation to occur at a higher rate than the rest of the fleet, primarily because of the large number of older vessels active in the fleet. In addition, there is less incentive to invest in new vessels because doing so is unlikely to add significant value to the catch since these vessels do not engage in processing.

While the Amendment 80 fleet needs additional harvest capacity, delivery of several new vessels anticipated in the near-term will reduce the need to operate some of the older vessels active in the sector. The freezer longline fleet is anticipated to experience consolidation as some of its oldest vessels exit the fishery.

Climate Change and Investments

Of all the fishery variables that are difficult to project, one of the most challenging and potentially most far-reaching, is climate change. Scientists have warned that commercially harvested species could experience changes in abundance, distribution, and behaviors, and some or all those effects could be dramatic. The long-term effects in the North Pacific are uncertain and will vary from species to species.[99]

Warming ocean temperatures and ocean acidification are two of the key trends possibly affecting Alaska's fisheries, especially crab and pollock. In the past few years and likely into the future, crab species appear to be in a period of declining biomass, and current fishing efforts will remain reduced. Pollock biomass is tied to water temperatures and is expected to decline if water temperatures stay warmer than average. In addition, the population appears to be moving north and towards Russia in recent years, farther from traditional U.S. fishing grounds. Pacific cod appear to be shifting to deeper, colder waters. Lastly, salmon stocks likely will increase or expand their range, which might lead to more salmon bycatch in the groundfish fisheries.[100]

It is impossible to say what climate change will mean in future decades for TACs, product quality, operating costs, etc. Lenders have expressed some wariness about the short-term implications for crab and, to a somewhat lesser extent, pollock. Beyond that, there appears to be no broadly held consensus on how climate change could affect fleet modernization.

[99] http://www.sciencemag.org/news/2014/07/worsening-ocean-acidification-threatens-alaska-fisheries
[100] Johnson, Terry. 2016. Climate change and Alaska fisheries. Alaska Sea Grant, University of Alaska Fairbanks.

Economic Impact of Fleet Modernization

This chapter begins with a discussion of the economic impacts of the Puget Sound maritime industry to provide context for subsequent impact estimates. This is followed by an overview of how vessel construction affects the broader economy, how those effects can be measured, and economic impact estimates for North Pacific fleet modernization.

Washington's Maritime Industry

Source: Alaska Bering Sea Crabbers.

Washington's maritime industry plays an important role in local economies throughout the state. In addition to new construction or major modifications made to vessels (the focus of this report), the commercial fishing industry supports significant economic activity in Washington and Puget Sound through employment of fishermen and processing workers, and purchases of goods and services including fuel, provisions, legal and professional services, packaging materials, and other supplies. Maintenance of commercial fishing vessels supports significant employment in skilled trades, including diesel mechanics, marine electricians, welders, maritime electronic technicians, painters, sandblaster, and other occupations. As the fleet spends money locally, additional jobs and wages are supported.

A 2012 economic impact study found the state's maritime industry accounted for 2,100 businesses, $4.1 billion in wages, and nearly 58,000 jobs.[101] Of this total, economic impacts associated with the fishing and seafood processing industry totaled $1.1 billion in wages and 15,400 jobs.[102] A 2013 analysis focusing solely on the economic impact of the Port of Seattle found that the commercial fishing industry supports more than 16,000 jobs with $1.3 billion in annual wages.[103] Finally, a 2011 McDowell Group study found that Alaska seafood generated 34,500 jobs and $1.9 billion in labor income in Washington State, including all harvesting, processing, distribution and retail/food service employment. [104]

While each of these studies measures slightly different aspects of the Washington maritime and commercial fishing sectors, it is clear these industries are critical components of the economy. The forward-looking

[101] Community Attributes, *Washington State's Maritime Cluster*, prepared for Economic Development Council of Seattle and King County and Workforce Development Council of Seattle-King County, November 2013.
[102] Ibid.
[103] Martin Associates, *The Port of Seattle's Economic Impact,* prepared for the Port of Seattle, 2013.
[104] McDowell Group, *The Economic Impacts of Alaska Seafood*, prepared for Alaska Seafood Marketing Institute, 2011.

economic impact estimates presented in this chapter are generally separate and additive to existing activity supported by North Pacific commercial fishing, identified in previous studies.

Sources of Economic Impact

One way to describe the impact of fleet modernization is to consider all the economic activity associated with building a new vessel. This economic activity can be categorized as direct, indirect, and induced:

- **Direct effects** include all the jobs and wages at shipyards or otherwise with shipbuilding companies.
- **Indirect effects** include jobs and wages in businesses that provide materials and services to shipyards in support of the shipbuilding projects. This could include a wide range of professional services firms, providers of raw or fabricated materials, or providers of basic supplies needed for day-to-day shipyard operations.
- **Induced effects** include those jobs and wages created when shipyard employees spend their wages in support of their own households. This personal spending flows throughout the economy, on housing, groceries, transportation, health care, recreational activities, and many other goods and services.

Economic impact models provide guidance on the scale of these multiplier effects. IMPLAN is a predictive input-output model of local and state economies, and is widely used in Washington and across the country to measure the economic impact of industrial and commercial activity. The model provides a means to measure employment and labor income effects of money as it flows through various sectors of the economy.

In this report, the economic impact of fleet modernization is measured in terms of employment, labor income, and output:

- Employment is measured in terms of annualized numbers rather than peak or total participation.
- Labor income is a measure of wages, salaries, and benefits.
- Output as defined in this report is a measure of total direct, indirect and induced spending related to the shipbuilding and repair.

Source: Dakota Creek Industries.

Puget Sound Competitiveness

As described in the previous chapter, total direct investment in fleet modernization will total well into the billions of dollars. Near-term, within the next ten years, that investment is expected to total approximately $1.6 billion. How much that and other future spending occurs in Puget Sound will depend on several factors, mainly the cost competitiveness and capacity of the region's shipyards, but also certain logistical and convenience advantages the region offers vessel owners.

Many factors impact Puget Sound's ability to compete with national shipyards for shipbuilding work. Construction cost, environmental regulations, and a desire to support Washington shipyards are key factors which emerged from interviews.

Construction Cost

Among industry contacts interviewed for this report, most agreed that Puget Sound shipyards were generally among the more expensive in the nation, especially when compared against states along the Gulf of Mexico. While taxation, environmental regulations, climate, and other considerations may impact the cost differential, labor costs are evidently the primary factor.

Source: Vigor.

With labor accounting for between 40 and 50 percent of the cost of a new vessel, labor expenditures have a significant impact on a shipyard's competitiveness. Compared to Florida, Alabama, and Louisiana, average labor costs in Washington are about 30 percent higher. Alaska labor rates are somewhat higher than Washington while Oregon rates are slightly lower. These differentials are not expected to change materially in the near-term.

Other yards located in the Great Lakes region, California, and the East Coast have pursued shipyard work associated with the North Pacific fleet. However, minimal work has occurred in these areas in recent years.

Table 17. Annual Average Wages by Key States and Occupation ($000s), 2015

Occupation	WA	AL	AK	LA	OR	FL
Electricians	$63	$43	$80	$47	$67	$40
Plumbers, Pipefitters, and Steamfitters	$61	$40	$70	$46	$73	$37
Welders, Cutters, Solderers, and Brazers	$45	$36	$70	$43	$41	$35
Construction Laborers	$39	$27	$47	$29	$33	$27
All Occupations	$42	$32	$46	$32	$37	$32

Source: Bureau of Labor Statistics, 2015.

Environmental Regulations

Environmental regulations were cited by Washington shipyards as a factor impacting their competitiveness. As federal and state regulations have increased in their rigor over the last decades, shipyards report they have had to devote more time and resources to remaining in compliance. A perception exists among industry participants that Gulf Coast shipyards do not operate within the same environmental protection framework, especially compared to facilities located on Lake Union, which is increasingly a center of non-industrial and residential activity.

Preferences for Puget Sound

Many Washington-based fishing companies see value in having a vessel built in Puget Sound, value that can counter-balance higher construction costs. Long-standing relationships with existing maritime service providers in Puget Sound are one aspect of that value. Alternatively, long-standing relationships between some fisheries companies and familiarity with Gulf Coast shipyards will continue to steer some of the economic benefits of fleet modernization to that region.

Source: Port of Seattle.

Constructing a vessel near fishing company headquarters yields a variety of logistical benefits. A Seattle-based company with a vessel under construction in Anacortes (slightly more than an hour's drive away), can have continuous involvement throughout the project. In contrast, the company would incur costly and time consuming flights to shipyards in other regions, or have an employee relocated near the shipyard to be involved in the process. Additionally, being in the same time zone reduces complications when coordinating various contractors and design groups.

Working with a local shipyard during construction also yields benefits after delivery. A shipyard and crew familiar with a vessel are well positioned to provide cost-effective maintenance and repair services in the future.

Finally, vessel owners see value having a strong local maritime industrial services support sector, and recognize that the viability and quality of that sector depends on their patronage. Puget Sound shipyards are viewed favorably by the commercial fishing industry for their high-quality work.

Summary of Economic Impacts in Washington

For every million dollars spent in Puget Sound on vessel construction, a total of approximately nine jobs and roughly $600,000 in annual labor income are created in the region, including multiplier affects.[105] For example, a $20 million vessel construction project occurring over a two-year period would create an annual average of 90 jobs, total (two-year) labor income of $12 million, and $34 million in total output.

While more than one-third of vessel projects (37 percent) have occurred in Puget Sound shipyards, economic impact figures reflect the assumption that this share will increase to approximately 50 percent for the 2017 to 2026 period. This somewhat higher rate of market capture assumes some success in the region's maritime industry to identify and pursue opportunities to maximize local benefit. The region's actual market share could be higher or lower, depending on the effectiveness of cooperative efforts to increase the sector's competitiveness.

Consistent with the timeline of fleet modernization presented in the previous chapter, the economic impact of fleet modernization is considered in two five-year time periods. While investment is not likely to be uniform over the period, for purposes of this analysis an annual average of just over $60 million in spending is assumed for the 2017 through 2021 period ($315 million total) and $90 million annually for the 2022 to 2026 timeframe ($470 million total). A total of $785 million will be spent over the ten-year period.

Table 18. Total Washington State Economic Impact, 2017 to 2026

Economic Impact	2017 to 2021 Average Annual	2022 to 2026 Average Annual
Employment (Jobs)	**510**	**750**
Direct	236	350
Indirect	118	170
Induced	156	230
Labor Income ($million)	**$40**	**$60**
Direct	$23	$34
Indirect	$9	$13
Induced	$9	$13
Total Output ($million)	**$108**	**$160**
Direct	$63	$94
Indirect	$21	$31
Induced	$24	$35

Note: Values have been rounded.
Source: McDowell Group estimates.

Based on those average annual spending levels, annual average employment of just over 500 workers would be expected for the 2017 to 2021 period and 750 workers for 2022 to 2026 period, including all direct, indirect and induced effects. Labor income is anticipated to average approximately $40 million in the first period before rising to $60 million annually. Total output will average $108 million from 2017 to 2021 before rising to $160 million from 2022 to 2026.

[105] Based on IMPLAN multipliers.

Full Investment in Washington

This supplemental (and hypothetical) analysis demonstrates the possible economic benefit if 100 percent of North Pacific fleet modernization occurred in the Puget Sound region, rather than the 50 percent assumed in the previous estimate. Under this scenario, the annual average employment would range from 1,000 to 1,500 jobs, while labor income would range from just over $80 million to over $120 million annually. Total output would range from approximately $216 million to $319 million annually, with a ten-year total of $2.7 billion.

Table 19. Total Potential Economic Impact, 2017 to 2026

Economic Impact	2017 to 2021 Annual Average	2022 to 2026 Annual Average
Employment (Jobs)	**1,020**	**1,509**
Direct	472	699
Indirect	235	348
Induced	312	462
Labor Income ($million)	**$81**	**$120**
Direct	$46	$68
Indirect	$18	$26
Induced	$17	$26
Total Output ($million)	**$216**	**$319**
Direct	$126	$187
Indirect	$42	$62
Induced	$47	$70

Note: Values have been rounded.
Source: McDowell Group estimates.

Conclusion and Recommendations

As noted previously, Puget Sound shipyards have been capturing about a third of the investment activity associated with modernization of the North Pacific commercial fishing fleet. Over the next ten years and beyond, significant additional economic activity is possible, depending on the ability of industry and policy-makers to maintain and enhance the region's competitiveness.

In interviews with industry participants, contacts were asked to share suggestions about how the region can facilitate modernization of the North Pacific fleet. In general, contacts were very supportive of the Port of Seattle and Washington Maritime Federation facilitating this study, as a first step. Other common themes included advocacy, financing, and facility improvements.

- **Advocacy:**
  - Support preservation of Puget Sound's working waterfront
  - Support improvement in transportation infrastructure
  - Support workforce development
  - Support affordable housing efforts
  - Support increased collaboration among vessel owners, shipyards, and lenders
  - Advocate for the maritime industry in Seattle, Olympia, and Washington D.C.
- **Financing:**
  - Offer loan guarantees for vessels constructed in Washington
  - Offer reduced mooring rates for vessels constructed in Washington
  - Educate the banking community on the fishing fleet

- **Facilities:**
    - Supply increased dock space for the North Pacific fleet
    - Upgrade Pier 91
    - Upgrade Fishermen's Terminal
    - Improve services and facilities on Harbor Island

Appendix

This appendix includes a list of interview contacts and a summary of assets owned by Alaska Community Development Quota groups.

Interview Contacts

McDowell Group thanks the following contacts for their contribution to the study.

Jason Brantley, Bank of America
Cora Campbell, Siu Alaska Corporation
Larry Cotter, APICDA (Aleutian Pribilof Island Community Development Association)
Robert Cuddeback, United States Coast Guard
Sam Cunningham, NPFMC (North Pacific Fisheries Management Council)
Doug Dixon, Pacific Fishermen Shipyard
Bob Dooley, Crab and Groundfish Fisherman
Mark Edwards, Northrim Bank
Eric Engelbrecht, Art Anderson Associates
Arne Fuglvog, Iquique
Kale Garcia, Crab Fishermen
Jim Gilmore, At-Sea Processors Association
Mark Gleason, Washington Maritime Federation
Jeff Green, Alaska Department of Natural Resources
Jim Hemsath, AIDEA (Alaska Industrial Development and Export Authority)
Jake Jacobsen, Inter-Cooperative Exchange
Bob Krueger, Alaska Whitefish Trawlers
Jill Mackie, Vigor Industrial
Stephanie Madsen, At-Sea Processors Association
Sarah Marrinan, NPFMC (North Pacific Fisheries Management Council)
Chris Meade, EPA (Environmental Protection Agency)
James Mize, Premier Pacific
Mike Nelson, Dakota Creek Industries
Bryan Nichols, Jensen/Crowley
John Ockerman, Ockerman Automation
Frank O'Hara, O'Hara Corporation
Vince O'Shea, Pacific Seafood Processors Association
Brent Paine, United Catcher Boats
Jonathan Platt, Jensen/Crowley
Peter Philips, Philips Publishing
Edward Poulsen, Crab Fishermen
Brian Reisenauer, US Bank
Chad See, Freezer Longline Coalition
Hugh Short, PT Capital
Lori Stender, AIDEA (Alaska Industrial Development and Export Authority)
Liz Stout, Dakota Creek Industries
Matt Upton, United States Seafoods
Kristian Uri, Fishermen's Finest
Richard VanGorder, NOAA (National Oceanic and Atmospheric Administration)
Roy Wallace, Banner Bank
Doug Ward, Vigor Industrial
John Waterhouse, Elliott Bay Design Group

Keith Whittemore, Vigor Industrial
Mike Wittman, Northwest Farm Credit
Chris Woodley, Groundfish Forum

Community Development Quota (CDQ) Group Key Assets

Following are key CDQ vessel ownership and industry partnerships listed by CDQ group:

Aleutians Pribilof Island Community Development Association (APICDA)

- Owns 50 percent of three vessels in partnership with Trident Seafoods, the Barbara J, Farwest Leader, and 25 percent of the Golden Dawn, also in partnership with Trident Seafoods.
- APICDA Joint Ventures serves as the managing partner for Alaska Longline, which owns five vessels.
- APICDA Joint Ventures with ten vessels.
- The Starbound, a pollock catcher/processor, harvests 80 percent of APICDA's pollock CDQ quota. APICDA has a 20 percent stake and Aleutian Spray is the majority owner.
- Owns majority shares in Cannon Fish Company, a value-added seafood processing and marketing company in Kirkland, WA. It also owns Bering Pacific Seafoods in False Pass, AK and Atka Pride Seafoods in Atka, AK.

Bristol Bay Economic Development Corporation (BBEDC)

- Owns 7 crabbers and 2 AFA catcher/processors.
- Owns 50 percent of four freezer longline vessels managed by the Alaskan Leader Fisheries company.
- Partners with Dona Martita on five vessels.
- Owns 50 percent of Ocean Beauty, which includes its Seattle distribution division and its specialty division in Monroe, WA.

Central Bering Sea Fishermen's Association (CBSFA)

- Owns 9.9 percent in American Seafoods, which operates AFA pollock catcher/processors.
- Owns between 30 and 100 percent of seven vessels through St. Paul Fishing Company.
- Acquired crab processing and harvesting quota from Icicle Seafoods.[106]

Coastal Villages Region Fund (CVRF)

- Owns 37.5 percent of BSAI Partnership, a six-vessel enterprise which includes NSEDC and Maruha Nichiro.
- Owns 100 percent of 12 vessels which are active in AFA, crab, freezer longline, tendering, and halibut longlining.

Norton Sound Economic Development Corporation (NSEDC)

- Owns a 38 percent stake in Glacier Fish Company, which owns three AFA pollock catcher/processors.

[106] http://www.cbsfa.com/pdf/cbsfa_2014_report.pdf

- Invested in a new cod liver oil plant, Bering Select, in Dutch Harbor, AK in partnership with Clipper Seafoods.
- Holds 37.5 percent of BSAI Partnership, a six-vessel enterprise which includes CVRF and Maruha Nichiro.
- Owns 50 percent of the Aleutian No 1. And Patricia Lee through Siu Alaska Corporation.

Yukon Delta Fisheries Development Association (YDFDA)

- Owns Kiska Sea in partnership with Aleutian Spray.
- Owns portions of the American Beauty (75 percent), Baranof (41 percent), Courageous (90 percent), and Ocean Leader (75 percent).
- Holds a 30 percent share in the Golden Alaska, a pollock mothership.