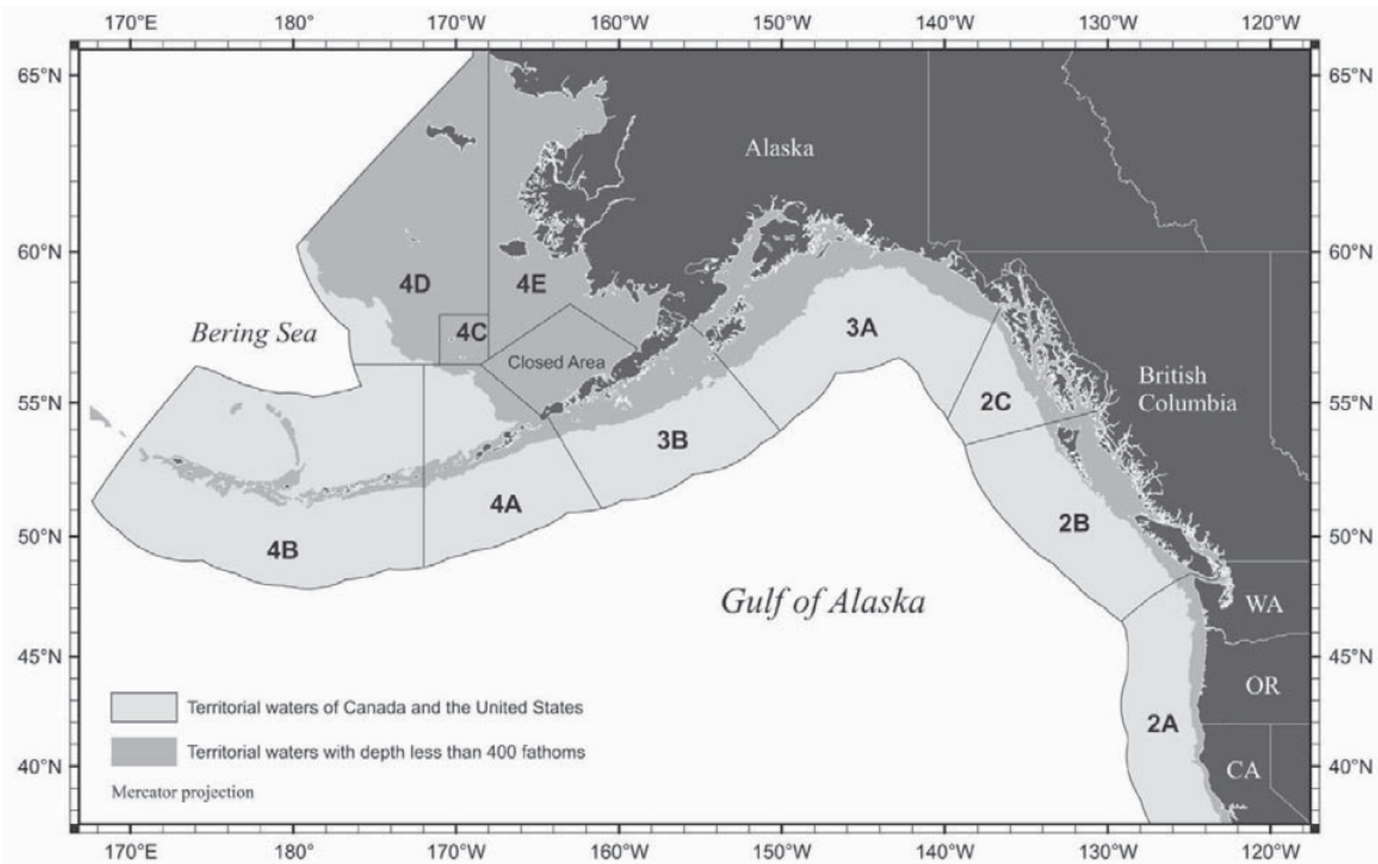
Economic Implications of a Strategy to Purchase Alaska Halibut Fishery Commercial Fishing Sector Quota Shares to Create a Recreational Guided Angler Sector Harvest Common Pool



CATCH Project

"The Catch Accountability through Compensated Halibut (CATCH) Project is a collaboration between the Alaska Charter Association and the South East Alaska Guides Organization whose purpose is to design a program that increases halibut resources available for harvest by Alaska's guided anglers in the International Pacific Halibut Commission's (IPHC) regulatory areas 2C and 3A."

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Economic Implications of a Strategy to Purchase Alaska Halibut Fishery Commercial Fishing Sector Quota Shares to Create a Recreational Guided Angler Sector Harvest Common Pool

Revision 2.2

prepared by

The Research Group, LLC
Corvallis, Oregon

prepared for

CATCH Project
Auke Bay, Alaska

August 2013

FOREWORD

This study's sponsor organization is called the Catch Accountability through Compensated Halibut (CATCH) Project. The CATCH Project received a grant from the National Fisheries and Wildlife Foundation to help reimburse costs for the CATCH Project staff and consultants. This study's results have been used at workshops and coordination meetings to assist in helping design the CATCH Project. The Project director was Richard Yamada and the project manager was Sherry Flumerfelt.

The Project retained The Research Group, LLC (TRG), Corvallis, Oregon for assisting in the design. Shannon Davis (President of The Research Group, LLC) and Gilbert Sylvia, Ph.D. (President of SylDon Inc.) were the lead authors of this study's report. Dr. Sylvia is also the Director of the Coastal Oregon Marine Experiment Station (COMES), Oregon State University. Chris Cusack, a Ph.D. student in the Department of Agricultural and Resource Economics at Oregon State University, is also an author. Kari Olsen (research assistant at TRG) assisted the authors. The authors appreciated the close working relationship with the Project director and manager, and extend additional thanks to CATCH Project board of directors for their encouragement and experience sharing.

This report was reviewed in draft form for the purpose of providing candid and critical comments that were to assist in making study results as sound as possible and to ensure that the report meets standards for objectivity, evidence, and responsiveness to the study charges. Although the reviewers have provided many useful comments and suggestions, they were not asked to endorse study findings and recommendations. The authors are solely responsible for making certain independent examination of this report was carried out in accordance with accustomed procedures and that review comments were carefully considered.

The authors' interpretations and conclusions should prove valuable for this project's purpose, but no absolute assurances can be given that the described results will be realized. Government legislation and policies, market circumstances, and other situations can affect the basis of assumptions in unpredictable ways and lead to unanticipated changes. The information should not be used for investment or operational decision making. The authors do not assume any liability for the information and shall not be responsible for any direct, indirect, special, incidental, or consequential damages in connection with the use of the information.

ABSTRACT

Alaska fishing charter service owners are seeking an increased share of halibut fish resources be reserved for the recreational guided angler sector. An organization representing the owners who fish in the International Pacific Halibut Commission Regulatory Area 2C (southeast Alaska) and Area 3A (southcentral Alaska) titled the Catch Accountability through Compensated Halibut (CATCH) Project are designing a plan whereby quota shares owned by commercial fishing sector are purchased and the quota pounds they represent are annually deposited in a guided angler harvest common pool. If necessary to assist in augmenting available harvestable fish from stock abundance to attain the same management regulations for both guided and unguided anglers in both regulatory areas, then the inter-sector transfers through purchases would be used. While this could be perceived as a fishery resource allocation dispute, the organization is not attempting to influence management bodies in reallocating the resource based on optimizing social welfare and economic development values. Instead the organization is looking for mechanisms that would allow it to purchase quota shares using voluntary market approaches consistent with privatized user rights and privileges.

The quota share inter-sector transfer procedures will necessarily be complex for several reasons. The amount to purchase needs to be estimated within the bounds of possible future resource abundances and what new effort might be attracted into the guided angler sector. Guided angler trip demand forecasts must be developed to account for less restrictive regulations, possibly higher angler costs, and other guided angler motivations for trip making such as nationwide general economic conditions. The possible cost increases are because one quota share purchase fund raising option is to use proceeds from imposing a guided angler fishing license endorsement fee. Diverting quota pounds from the seafood market for the quota share amounts to be purchased during years of lower exploitable stock abundance (range of 500 thousand to one million net weight pounds in Area 2C) will not in itself appreciably influence harvest price.

Another reason the plan is complex is that the existing program's quota share sales rules are highly regulated in order to satisfy an objective to retain the pre-privatized fishery structure. Quota share sales in recent years are very small and amounts needed for the inter-sector transfer would greatly exceed amounts annually coming to market. The inter-sector ask price would have to be high enough to incentivize new holders to the market. It is suggested that program rules on restraining certain transfers may need to be relaxed for sufficient purchases to occur. The acquisition is for an asset that is primarily needed by the guided angler sector during periods of relative low fish resource abundances. If stock recovery is sufficient, then the asset could be leased or even divested back to the commercial fishing sector.

A report was developed by economists to assist in the CATCH Project design. The report explains there will be significant challenges in conducting purchases for the benefit of a heterogeneous set of fishing charter service firms. There will be plan design problems associated with determining own industry needs; estimating angler response to fees and the changed quality of the angling experience; and, assessing commercial fishing industry quota share supply functions. There is probably sufficient flexibility for federal authorization of such a program, although establishing one is without precedent. The approval of a design is neither imminent nor assured given the required state legislative and administrative processes, the many federal and international treaty implementing unknowns, judicial review avenues, etc. However, the innovative process is deserving of consideration due to higher marginal economic benefits to local communities and the nation from reserving additional recreationally harvested fish, and concerns for a viable charter industry from customer demand response for the unequal fishery access.

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Overview

The Alaska Pacific halibut resource has many users (commercial and recreational sectors, non-halibut fisheries bycatch mortality, subsistence, and research) that historically have quite different resource impact levels. The International Pacific Halibut Commission (IPHC) Regulatory Areas 2C and 3A are where the largest Alaska commercial and recreational sectors catch occurs: 65 percent of both sectors catch and 99 percent of recreational sector catch were in these two areas in 2012.[1] There was growth in the recreational guided angler sector harvests in both Area 2C and 3A starting in the late 1990's and accelerating in the middle 2000's. Because the recreational sector was subtracted first from available harvests, commercial fishing organizations sought controls for protecting their allocations through the authority of the North Pacific Fishery Management Council (NPFMC or Council). Recreational guided angler sector Guideline Harvest Levels (GHL), which are a soft harvest cap, were adopted by the Council in 2003.[2] Ever more restrictive management specifications failed to reduce harvests to GHL's. The Council has abandoned the GHL approach in favor of a new Catch Sharing Plan (CSP) most recently adopted in 2012. The recreational guided angler sector percentage allocation under the new CSP is to be calculated in a parallel manner with the commercial fishing sector. Subsistence and recreational unguided angler sectors, whose harvests are estimated using un-varying

1. The International Pacific Halibut Commission (IPHC) determines annual resource availabilities for impacts in the Pacific Ocean for U.S. and Canadian Exclusive Economic Zones and internal waters (e.g. Puget Sound). In Alaska waters, the North Pacific Fishery Management Council (NPFMC or Council) in consultation with the Alaska Department of Fish and Game (ADFG) determines the allocations and user management measures for the resource impacts. The determinations are to be in addition-to and not-in-conflict with IPHC regulations. The IPHC considers the recommendations at its annual meeting in January of each year and then notifies the relevant authorities about the adopted regulations, which in the United States is the National Marine Fisheries Service (NMFS). The NMFS, in turn, publishes final regulations after review by the secretaries State and Commerce. The rulemaking tight timelines have worked well enough in the past, except when there are disagreements between the approving bodies. A case in point for a disagreement was the IPHC deciding on a surprise regulation for a one fish bag limit during part of the season in regulatory areas 2C and 3A for recreational guided anglers in 2007. The NMFS disagreed and instead promulgated different regulations for 2007, but kept the traditional two fish bag limit. Exploitable biomass declined again in 2008 and NMFS did decide to approve the one fish bag limit for Area 2C. Representatives of the charter fleet challenged the rule in court, but eventually lost the decision and a one fish bag limit was in effect for Area 2C in 2009 and has continued through each year as of the date of this publication.
2. GHL's were set at 125 percent of 1995 to 1999 average catch within each regulatory area with provisions for adjustment depending on IPHC determined halibut resources. Changes in halibut resources are accounted in GHL tiers and each tier has suggested management specifications associated with them. Angler effort continued to increase in the 2000's and GHL's were exceeded in Area 2C from 2004 forward to 2010 despite increasingly restrictive management specifications. The GHL's were exceeded in Area 3A from 2004 through 2007. Regulations for Area 2C in 2007 and 2008 were two fish of which one had a maximum size limit. Regulations for Area 2C in 2009 and 2010 were any size, one fish bag limit. An ill-advised size limit and one fish bag limit management specification in 2011 ratcheted down Area 2C recreational guided angler harvest to be about half of the GHL for that year. In 2012 and 2013 for Area 2C, there is a reverse slot limit size and one fish bag limit. The Area 3A management specification has been maintained any size, two fish bag limit. The recreational unguided angler sector continues with a management specification for any size, two fish bag limit in Area 2C and 3A.

management specifications, are still deducted first from IPHC determined exploitable halibut resources. The CSP is pending Commerce Secretary approval for implementation in 2014.

Decreasing exploitable stock abundances experienced in the last several years and forecasted to be stabilized at low levels into the near future will now be coupled via the CSP (if approved by the Commerce Secretary) to determine catch levels for the commercial and recreational guided angler sector. This means the Council will be annually considering a suite of recreational guided angler sector management measures to keep the season's catch within the allocated cap. The unknown management measures to be selected, and especially one set of measures being more restrictive than another for the same recreational market, are worrisome to charter fleet businesses whose demand for services has already been softened by the national economy downturn.

A special provision in the CSP will allow charter fleet operators to lease commercial fishing sector quota pounds (QP) (termed the Guided Angler Fish or GAF program) so that clients "temporarily" have the same management measures as the unguided angler. The Council during CSP deliberations admitted the GAF program may not be a "best" allocation solution and solicited for an industry developed improved plan. The charter fleet industry is seeking a "permanent solution" to increase predictability of management specifications and being able to satisfy customer fishing preferences. To this end, charter fleet businesses have formed an organization to design methods and procedures to address unequal angler access by allowing purchase of commercial fishing sector quota share (QS) for deposit in a guided angler sector harvest common pool. Area 3A charter fleet businesses are also interested in the concept as decreased exploitable stock abundances have placed their GHL tier assignment close to a catch level requiring more restrictive management specifications. The organization is called the Catch Accountability through Compensated Halibut (CATCH) Project.

The inter-sector transfer procedures to purchase commercial fishing sector QS will necessarily be complex for several reasons. The acquisition is for an asset that is primarily needed by the guided angler sector during periods of relatively low fish resource abundances. If there is stock recovery sufficient that the restrictive management measures are lifted and demand factors are resolved, then the asset could be leased or even divested back to the commercial fishing sector. How funds are raised for purchasing the QS and the arrangements for who holds and manages the asset do not have precedence in U.S. fisheries management. Given the complexity, the organization sought advice from consultants to assist in the design of appropriate methods and procedures.

The consultants provided a report offering suggestions for the CATCH Project design. A profile of the halibut fishery was provided that summarizes major dimensions of the fishery and management fundamentals relevant to design features. An economic sector model showing comparative economic effects from changes in resource use by the commercial and recreational sectors was explained. Economic methods were suggested that could provide at least some level of quantitative results to assist policy makers in their deliberations. Financing alternatives for acquiring commercial fishing sector QS for the purpose of adding it to a recreational guided angler sector harvest common pool were discussed. The discussions include effects a new large QS buyer (such as an entity established as a result of Council action on a CATCH Project design) will have on QS market price. Alternative QS financing and transfer mechanisms were offered and explained.

Background

The inter-sector transfer of QS through purchasing is not a new concept for Council policy making. The Council already considered plan alternatives for allowing commercial fishing sector QS purchases to be deposited into a common pool and/or for allowing commercial fishing sector QS purchases to be held by individuals. There were discussions about gains in economic efficiency because of a wider market for QS sales and discussions about loss in social objectives for diluting the commercial fishing sector economic structure. A preferred alternative for a charter fleet individual fishing quota (IFQ) plan was adopted, but then rescinded in December 2005. The Council has given encouragement to charter fleet interests to return with an industry developed plan for future consideration of the concept. Council review will require discussions about concerns in QS prices being driven up, differential impacts to participants, and distributive impacts on communities from changed sector allocations.

To assist in understanding the economic effects from CATCH Project objectives and design features, several Alaska fishery studies are reviewed in this report that attempt to predict recreational angler behavior and resulting economic effects towards changes in management measures. Criddle et al. (2003) relied on a University of Alaska, Fairbanks (UAF) survey of resident and non-resident anglers who made trips in 1997 to the Cook Inlet region. The study generated information about trip demand elasticity and marginal net benefits to the angler. Lew and Seung (2010) used an Alaska Fisheries Science Center (AFSC) survey results for non-resident anglers who made trips to Area 2C in 2006 to determine elasticities and regional economic impacts (REI). The two studies showed consequential, but relatively small effects on angler behavior to increases and decreases towards less or more restrictive management measures. For example, Criddle et al. (2003) found a \$10 (or \$12 in 2011 dollars) increase in trip costs would decrease angler participation by 3.6 percent. The elasticity was non-linear, with successively larger impacts at higher prices. In recent work, Lew and Larson (2012) using the UAF survey information found that an increase in bag limits generated significant per trip marginal values for recreational halibut recreational fishing in Alaska. An additional one fish limit ranged between an increased marginal value of \$132 for non-resident anglers and \$24 for southeast resident anglers.

While these and other studies examine the effects of alternative management measures on angler recreational experience valuation and participation, the true problem is how to translate CSP instruments and alternative CATCH Project design features into individual business decision financial templates.[1] The reviewed studies cannot be directly translated into estimates for Alaska

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1. For example, there is continued interest whether the Council decision to abandon the inter-sector QS transfer that was to be allowed in a charter fleet IFQ plan in favor of the GAF program in the CSP will accomplish the CATCH Project objective for any size, one fish bag limit. Halibut can weigh anywhere between 10 and 100 pounds, with 100 pounders common in recreational guided angler fishing. A five year average weight ending in 2010 for both 2C and 3A is about 20 pounds. Assuming lease prices are approximately 30 percent of 2012 ex-vessel prices (Sanchirico et al. 2011), a commercial harvested 100 pound halibut would cost about \$165 and a

halibut charter boat trips and prices unless more is known about the intentions of charter boat operators to pass-through any increased costs to clients, or instead absorb the costs as a liability in an overall business type financing. A focused, up to date, empirical study of both resident and non-resident angler preferences regarding halibut bag limits and charter operators' intentions may be the only way to reliably estimate utilization and potential economic effects for an inter-sector transfer through purchasing program.

Fishery Profile

The Alaska halibut fishery commercial sector harvest volume today has declined to about half of what it was in the early 2000's to 20.5 million pounds (net weight) in 2012 (preliminary). Ex-vessel prices rose to historic highs in 2011 at $6.29 statewide average and then fell back to $5.80 per pound in 2012. (All USD references are adjusted to be Year 2011.) Prices and harvests generated $15.8 million and $67.9 million harvest value in Areas 2C and 3A respectively in 2012. The statewide harvest value was $148.0 million in 2012 and $198.1 million in 2011. There were 1,051 vessels that had landings in the halibut fishery, of which 36 percent made landings in multiple IPHC regulatory areas. Many participants use their vessels in salmon and other fisheries.

There were 31 different processors that made purchases of halibut caught in Area 2C and 30 in Area 3A in 2010. For these processors, the Area 2C dependency on halibut was 21 percent and Area 3A dependency was 42 percent. In addition to the commercial deliveries processing, there are processors in communities where there is large charter fleet presence that provide filleting, packaging, freezing, and shipping services to anglers.

The first wholesale price of halibut processed product forms is subject to market demand factors (strength of economies, substitution fish, availability and price, etc.), product inventories, and other factors. The price will vary according to processor response to distributor demand for a different mix of product forms. The expected wholesale price and any changes in variable production costs will be passed on to harvesters in negotiations for harvest price. Using the 2010 first wholesale weighted average price and average yield across product forms results in another measure of direct value to be $234.2 million when statewide purchases of $196.2 million were made.

The commercial fishery has been managed under an IFQ program since 1995. QS holders can harvest their share or, and in restricted cases, arrangements can be made for others to harvest their share. Class A vessel permit holders can process harvests on board and the permit owners can lease their QS for harvesting by others. About 2.8 percent of QS volume in 2011 statewide is Class A and about the same minor percentage for Class A occurs in combined areas 2C and 3A. All of the rest of the QS holder classes must deliver harvests to registered floating or shoreside processors. Permit holders for the non-Class A vessels must be on-board during harvesting except for the original permit owners. The original permit owners may hire skippers, so as the original owners dispose of the permits, the percentage of on-board owner situations is

20 pound fish would cost $33. This cost range is within the estimates of angler net willingness-to-pay valuations for an additional halibut discussed in the mentioned studies.

increasing. Permits for Class B through D vessels are not permitted to lease QP except under very restricted circumstances. Most of the QS is held in Class C (catcher vessels 36 to 60 feet) statewide at 52.3 percent in 2011. The amount in this class is much higher in Area 2C at 78.4 percent. There has been a 48 percent consolidation in QS holders between 1995 and 2011. The reduction has left 1,408 QS holders in combined areas 2C and 3A at the end of 2011. Most of the exiting holders held Class D's QS. A typical pathway of new entrants into the halibut fishery is to gain sea-time experience and wealth working as crew and skippers on Class C vessels, then purchase a portion of the Class C owner's QS on that vessel. This allowed the vessel owner who was fishing under Class C block limits to use the crew and skipper QS to increase what the vessel can harvests. What little Class D QS that comes to market has had high prices in recent years, and when coupled with high vessel and gear costs and decreasing QP for a unit of QS, makes the investment goals for returns and capital value growth uncertain.

QS can be transferred to others for use in commercial fisheries, but several restrictions were put in place to avoid concentration. First, QS is blocked in large bracket amounts. The originally issued QS that represented less than 20 thousand pounds was issued as a block, and such blocks may not be subdivided upon transfer. Further, there is a limit on the number of blocks a person may hold for the same species in any regulatory area. The result is that there were many small blocks that can be acquired to make operations more efficient. However, holders of large blocks would have to be bought out in their entirety. Another program rule in-place to avoid concentration, is that annual landings are subject to QS holder caps (one percent of Area 2C of QP, 0.5 percent of combined areas 2C, 3A, and 3B QP, and 1.5 percent of Area 4 QP) and vessel use caps (one percent of Area 2C QP and 0.5 percent of all Alaska QP). QS holder amounts are very skewed and individual amounts are much greater in Area 3A than in Area 2C. The highest 10 percent of holders own about 38 percent of all QS in Area 2C and 46 percent in Area 3A.

Community quota entities (CQE) were made a feature of the IFQ Program in 2004 to protect against the displacement of commercial fisheries in small communities due to small block holders selling out to larger operations that are located elsewhere. CQE's have the authority to raise funds and purchase QS under certain annual caps and cumulative amounts. There are generous rules for CQE's to lease all of their owned QP to eligible residents. Very little QS has been purchased (31 of 42 eligible communities as of 2013 have formed CQE's and only two are halibut QS holders as of 2012) partly because the QS price is too high to generate net returns to the CQE from lease rates affordable to community harvesters.

The restrictive management measures applied to the recreational guided angler sector especially in Area 2C has resulted in the unguided angler sector share of total recreation sector catch in Area 2C rising to be more than 50 percent (average over the last four years). A high majority share of guided anglers fishing for halibut are non-resident in Areas 2C and 3A, but the share of resident anglers is higher in 3A. From an annual portrayal, charter fleet trip target species are balanced across salmon, halibut, and rockfish fisheries in Area 2C while trips in 3A mostly target halibut. Salmon fisheries have narrow seasons so there will be trips made for only bottomfishing during a typical halibut season.

A federal limited entry program for charter fleet operators in Areas 2C and 3A was first adopted by the Council in 2007, approved by the Secretary of Commerce in 2010, and implemented in

2011. The limited entry permits are termed Charter Halibut Permit or CHP. The control dates used to show participation in the fishery were whether there was documented bottomfishing effort in ADFG logbooks in 2004 or 2005, and 2008. All permits include limits on the number of anglers that can keep halibut, called angler endorsements. Only some CHP's are transferable depending on the extent (number of eligible trips made) of a registrant's fishing history. CHP holders are generally limited to five permits. CHP's are issued specific for the two regulatory areas. In Area 2C there are 578 CHP's and in Area 3A there are 508 CHP's in 2012. There is substantial latent capacity in both areas as only 287 and 419 made at least one landing in each area respectively. About 20 CHP holders also own halibut commercial QS. In some instances, the same vessel that is used to catch commercial QS is re-fitted to harvest recreational guided angler sector allocated fish. However, commercial and charter fishing may not occur the same day. A commercial QS holder can lease GAF fish to themselves as long as it is declared prior to the charter fishing trip. A limited number of CHP's can be requested by CQE's (123 were requested as of 2011) at no cost for leasing to eligible residents and non-residents as long as trips originate and end in the community.

The CSP's GAF program has many restrictions.[1] The CSP sets caps on how much a QS holder can annually lease (different by regulatory areas, but approximately 1,500 pounds) and caps on how much a single CHP holder may annually acquire (400 fish for a six angler vessel, etc.). There will be an adjustment period for this innovative program while both willing sellers and buyers build relationships and find ways to include the transactions in business plans. A similar experimental program in British Columbia started in 2011 had minimal utilization.

It is difficult to predict whether the GAF program will be exercised. There might be initial hesitancy as with the similar British Columbia program. As an example of factors to consider for trying to predict utilization, the GAF program would not be needed in 2013 for Area 3A because recreational guided angler management specifications are the same as for unguided anglers. Another factor is that current definitions for what constitutes guided angler services for applying catch regulations are being reviewed by the Alaska Department of Fish and Game (ADFG). A tightening of the definition could add to guided angler demand whose customers would appreciate having equal regulations as the unguided angler.

A charter fleet operator will have to pay at least the foregone net benefit of a fish to a commercial fishing sector operator. The charter fleet operator ostensibly would pass the cost on to angler trip fees. Anglers would have to decide if they are indifferent to the fee increase or decide displeasure about the increase. If the latter, then the charter operator would decline to utilize the GAF program. Such a decision would have to be made with knowledge about how overall demand for business type services is being affected by the management specification that is being attempted to overcome (size or bag limit limitation or both). It could be that the charter operation is one cost center in a business type that also offers lodge and other visitor services. Losing a customer because of one fishery's management specification might induce the operator to absorb the cost into overall business type financing. Another interpretation is that charter fleet businesses may find that the GAF program provides a service that allows for a differentiated product for a market segment with unmet demand. Upon approval by the Commerce Secretary,

1. The CSP has an interesting feature that does create a QS purchase inter-sector market. CQE's could purchase commercial sector QS for the purpose of leasing QP to existing CHP holders to be used as GAF program fish.

the CSP's GAF program will be an experiment about whether a firm level solution can be successful in solving a public trust resource allocation issue that leads to optimality improvements.

The complex dimensions of the halibut fishery should be viewed in consideration that the fishery for both commercial and recreational sectors is only one fishery in a portfolio of fisheries for participants. The economic effects discussed in the report largely are isolated for changes to the single halibut fishery, however a more robust discussion should include spillover effects to other fisheries (where substitute access exists) for impact from increased or decreased opportunities in the halibut fishery.

Economic Effects Methods

The history of the halibut fishery illustrates the conflict between conservation, cultural and food values, commercial fisheries, and recreational fisheries. Controlling the mortality from directed fishery harvest and harvest bycatch are the critical factors for conserving the halibut resource. Extensive federal and state fishery management processes exist to manage this mortality, and the continuing harvest opportunities depend on the degree to which this management is successful. Specifying how much each fishery is allowed to kill is a social policy issue for which knowing economic effects helps management bodies decide allocation schemes.

One purpose of this study is to model the marginal economic effects for tradeoffs from small changes in user allocation amounts. The model results will be valuable, because recent Council management decisions for this purpose have not been informed with quantitative economic descriptions despite requirements to have such information in federal Executive Order 12866, the Regulatory Flexibility Act, consistency with the National Standards in the Magnuson Stevens Act (MSA), and provisions of the Northern Pacific Halibut Act (NPHA). A short primer about economic effects measurements and a brief discourse regarding the adequacy of existing scientific data and models needed to develop the information is provided. There is no single metric that can reveal all dimensions of economic effects, and the Council needs to patiently absorb the meaning of descriptions when they are offered. It will ultimately be up to the decision makers to use the full array of conservation, social, and economic information in their decision making.

Available commercial and recreational sector user behavior data and models were pulled together to demonstrate how economic effects measurements can be generated.[1] The demonstration equilibrium model showed the difference in economic effects between harvests in the commercial and recreational guided angler sector within the envelope of needed QS purchase amounts being considered for the CATCH Project. The net economic value (NEV) to the nation and REI within Alaskan economies was greater if harvests occurred in the recreational guided angler sector. Both Criddle et al. (2003) and Lew and Larson (2012) research studies made

1. While there is detail and rigor in the demonstration models used in this report, a more thorough investigation of available economic analysis tools described in this study would be warranted for use in any future evaluation of Council policy and management issues.

similar findings. The higher marginal economic value in the recreational sector means that the current allocation is not optimally efficient.

Halibut fishery access rights are intractably privatized. Resolving allocation disputes means finding mechanisms and implementation details that preserves assigned rights. Economic analysis discussions need to look past any claims for maximizing the utility of halibut resources. Instead, the economic analysis should be used for comparing and contrasting future management alternatives given that the allocation creating the private assets has already occurred. Management measures to be analyzed are not always whether the alternative meets a most optimal utilization standard, but how one alternative's calculated economic effects compare to another's. A quite accurate result that can be illuminating to decision makers is which alternative's net economic effects rank more negative than the other.

The Council has grown accustomed to only getting direct value measurements (e.g. ex-vessel prices, recreational trip counts, etc.) as possible outcomes for policy actions. Often repeated and normative statements accompany the direct value measurements on possible indirect economic effects (e.g. REI including multiplier effects, nation level NEV, etc.). We suggest instead that the Council should be presented with modeled indirect economic effects, as well as illustrative economic effect measurement derivations for management alternatives (e.g., cost effectiveness analysis (CEA), cost-benefit analysis (CBA), multi-criteria analysis (MCA), etc.) for their decision making. Both value-based and impact analysis, if properly supported with relevant and timely data, can provide useful and necessary information for understanding economic implications of decisions. Although economists will sometimes argue that while such information will help inform decision makers, sufficient scientific data and modeling techniques do not exist to perfect estimates. This should not always be a fall back excuse for informing the Council about best available data and modeling results. It is hard work and takes competence to generate quantitative economic effects information knowing its presentation has to be accompanied with statements about uncertainty and risk that modeled outcomes may not be representative. The end result can be discouraging when decisions are made for other reasons than what is the most economically efficient. There has to be solace that one dimension of a policy change's impacts were revealed and considered despite other reasons being used to justify the decision.

Quota Share Transfer Financing

Commercial-to-commercial fishing sector QS transfer rates have been consistently decreasing since the halibut fishery catch-share program was implemented, and now hover around 2.5 percent QS in both Area 2C and 3A. This represents about 60 thousand QP in Area 2C and 360 thousand QP in Area 3A in 2011. It is unknown how much of this amount might have had a willing seller on an open market. Some is undoubtedly transfers within families and businesses for the purpose of making operations more efficient or passing assets to another fishing family generation. The amount needed for the CATCH Project to fulfill an "any size, one fish" and uninterrupted season objective (approximately 500 thousand pounds in Area 2C depending on stock abundance and allocation shares) would greatly exceed recent market trading amounts. A 500 thousand pound purchase would represent 21 percent of all QP for Area 2C in 2011. Even if the acquisition was spread over multiple years, the new market presence of a large volume buyer would result in significant increases in QS prices as existing holders would have to be incentivized to become willing sellers.

One alternative for financing the CATCH Project is to secure a purchase loan with debt service accomplished using revenues from new angler fees via guided angler fishing license endorsement. The endorsement could be similar to the king salmon stamp except it would only be required for anglers using guided services to fish for halibut. It was shown that a $20 stamp with a fee structure having similar discounts in time and residency status as the king salmon stamp would generate sufficient revenues to purchase 500 thousand QP in 2011 at existing reported QS market prices. A perspective for a program that would impose mandatory fees on an angler stratum for the purpose of purchasing sufficient QP to be deposited into a harvest common pool is that of risk spreading. The possible perils (unfavorable management measures) to be suffered by any angler are being insured against through payments from all anglers in the strata.

One concern is whether ex-vessel prices might be incrementally affected from a decrease in halibut supplies. A Herrmann and Criddle (2006) study found a traditional commercial fishery supply-demand relationship for halibut prices, but data for the econometric study was acquired before the downturn in world economic conditions coupled with increasing import demand from China. It would be difficult to justify using their econometric model given recent and dramatic changes in allowable harvests and increases in ex-vessel price. The Herrmann and Criddle (2006) study acknowledges that determining an ex-vessel price may be better predicted by simply using an annual lagged wholesale price markdown. In other words, the worldwide situation of inventories, substitutions (including aquaculture), currency exchange, and other global market variables determine price, rather than merely the fluctuations in Alaska supplies. While the project budget resources did not allow development of a new econometric market model, we suggest that the purchases within the envelope of envisioned QS needed, would not appreciably influence changes to ex-vessel prices due to the reduction of halibut market supplies.

Quota Share Transfer Mechanism

Complexities associated with developing the best financial instrument, optimizing its use over time, and managing the purchase and sale of quota assets were discussed. There will be significant challenges in conducting purchases for the benefit of a heterogeneous set of firms and the problems associated with determining own industry needs, angler response to fees and the quality of the angling experience, and commercial industry quota supply functions. Key findings included:

- "Asset thinking:" The recreational guided angler sector must understand they are purchasing a valuable private asset. If the purchases are well designed and the asset efficiently managed, the program may generate higher asset values (for both QS holders and CHP holders) and result in an increase in the overall social welfare of the halibut fishery. Unless properly addressed, however, the latent recreational CHP's especially in Area 2C may decrease potential sector benefits from a quota purchase program.

- QS purchase for common pool deposit: This is the next best solution relative to allowing purchases by individual charter fleet businesses. However, a harvest common pool approach may be one of the better solutions given political realities and addressing other social objectives besides maximizing rents and social welfare.
- Flexibility in trading, purchasing, and leasing quota: there is no long run solution for the optimal amount of quota to hold and manage. Changes to the biological resource and the recreation and seafood markets will require constant adjustment in quota amounts. Optimal asset management will require the option to sell, lease, or trade quota to meet guided angler demand over time.
- Pilot projects and experiential learning: given the novelty of the CATCH Project approach and the considerable risks, the guided angler sector should consider undertaking pilot projects in order to develop the best approach in designing fee structures, making purchases, and managing the program.

Predicting the market transactions price for QS purchases is difficult given that it hinges on a host of economic variables including the own-quantity price effect. It is a reasonable supposition that QS price will increase significantly from present levels depending on the quantity of purchases, the strategy for conducting the purchases, the efficiency in managing the purchased QS, and the ability to engage long term in the larger QS market. But there are scenarios where QS price could decrease —for example, as a result of eliminating (at least temporarily) constraining transfer rules, and/or significant decreases in stock abundance and/or harvest rates. The institutional challenge will be finding the QS trading management structure that brings greater overall value to the commercial, recreational, and bycatch fleets while meeting a diverse set of economic and social objectives.

The inter-sector QS transfer program structure that relies on a single purpose and mandatory angler fee collection program to raise funds for the purchase would undoubtedly require Alaska state legislation and an assigned state agency's administrative rules for setting up and managing a purchase fund. There would be constitutionality questions for whether it meets tests of exclusive use of a resource in the public trust or whether it simply means social costs are being recouped when an angler removes a fish. The State would be concerned with the administrative and enforcement costs. The MSA probably has sufficient flexibility for federal authorization of such a program, although establishing one is without precedent.[1] A NPFMC implementing procedure would be for an amendment to the yet to be approved CSP. Council staff would be advantaged for already having developed public hearing descriptions of the concept, but there would have to be many new consistency and impact issues addressed for the amendment, such as the program being a replacement or in-addition to the GAF program. The NOAA Fisheries (2010) catch-share policy statement delineates regional fishery management council responsibilities and the characterizations of inter-sector transfer programs. The policy statement notes pros of increasing net benefits and cons for impacting social objectives. The policy statement, however, is not a guidance manual and many program features would have to be interpreted for compatibility. There is also the question as to whether two-way transfers would have to accompany the design,

1. The Gulf of Mexico Fishery Management Council has taken steps to include a similar inter-sector transfer mechanism in their Reef Fish Management Plan (FMP) for red snapper, but the FMP amendment action is presently stalled due to intense commercial sector concerns.

i.e. for allowing the commercial fishing sector to purchase allocations from the recreational guided angler sector. The required legislative and administrative processes, the many federal and international treaty implementing unknowns, judicial review avenues, etc. will assure that even with NPFMC acceptance of a design that final approval is neither assured nor imminent. However, the innovative process is deserving of consideration due to higher marginal economic benefits to local communities and the nation from reserving additional recreationally harvested fish, and concerns for a viable charter industry from customer demand response for the unequal fishery access.

I. OVERVIEW

A. Study Purpose

Securing an appropriate Alaska Pacific halibut fishery recreational allocation has grown progressively more frustrating from the recreational guided angler sector perspective. This is partly because of:

- Decreases in stock abundance that are causing lower allocations for all users;[1]
- Conditions in the national economy that have weakened demand for recreational services and limited ways to make business adjustments;
- Compounding complexities in federal and state fishery management processes, and, perceptions that recreational interests are marginalized by fishery management bodies dominated by commercial fishing sector interests;
- Minor proportions of all fishery user removals that would be needed for re-allocation to cover recent increased charter fleet harvests;[2] and,
- Advice from researchers about the comparative economic values of the resource between the commercial and recreational fishing sectors.[3]

The Alaska halibut fishery has many users (commercial and recreational sector, non-halibut fisheries bycatch mortality, subsistence, and research) that historically have quite different catch levels.[4] Unlike other U.S. fisheries allocation battles where the recreational sector has played a prominent role in the development of initial fishery management plans (FMP), the relatively small recreational and subsistence harvest share in the overall halibut fishery only had acknowledgment that those harvests must have stock conservation accounting. The halibut commercial fishing sector individual transferable quota (ITQ) program was approved in 1993 (and implemented in 1995) without an allocation share being assigned to the recreational and subsistence sectors.

There was growth of the recreational guided angler sector harvests starting in the late 1990's and accelerating in the middle 2000's. Since the recreational sector harvests were subtracted from available commercial sector resources, commercial fishing organizations sought controls for protecting their allocations through the authority of the North Pacific Fishery Management Council (NPFMC or Council). Since that time frame, there has been an ever evolving and complex array of guided angler sector management measures proposed, dismissed, or modified prior to implementation. It is not necessary to recount the history of the control attempts for introducing the purpose of this study, but suffice it to say that policy discussions and elaborate management schemes have been pursued.

- Squabbling over whether the State or the NPFMC should manage the recreational guided angler sector.
- Restrictive annual management specifications developed to keep the recreational share within Guideline Harvest Levels (GHL). The GHL's were approved in 2003 and allow for a harvest to be 125 percent of the 1995 to 1999 average catch level. The GHL plan is

structured, however, to increase and decrease in tiers with changes in exploitable stock abundances. The step in tiers when exploitable stock abundance changes do not always favor higher GHL's for the recreational guided angler sector.

- Disaggregating International Pacific Halibut Commission (IPHC) Area 2C (southeast Gulf of Alaska area) and 3A (southcentral Gulf of Alaska area) quotas among smaller geographic sub-districts, including establishment of local area management plans (LAMP's) and super-exclusive charter fleet registrations.[5]
- On and off again regulations by the State and Council for charter fleet skippers and crew to retain catch and gift it to customers or retain it in lieu of wages.
- A charter fleet ITQ program failed to be implemented (retracted by the Council in December of 2005) after many years of review and public hearings.
- A surviving element of the proposed charter fleet ITQ program was a moratorium on charter vessels. The moratorium was adopted by the Council in 2007 and approved by the Secretary of Commerce in 2009. Limited entry Charter Halibut Permits (CHP) were issued in 2010 and required for participation in 2011.
- Allow community quota entities (CQE's) to purchase commercial quota shares (QS) and then lease the annual quota pounds (QP) to individual community residents starting in 2004.[6] In addition, a limited number of CHP's can be requested by CQE's to be leased for operations by community residents or by non-eligible residents for trips at the communities.
- After several attempts, there is now a Council adopted Catch Sharing Plan (CSP) with a recreational guided angler sector percentage allocation calculated in a parallel manner with the commercial fishing sector. This method is a disconnection from procedures used to calculate the subsistence and unguided angler sector which is to subtract first from exploitable biomass available to fisheries using un-varying management specifications. The CSP is pending Commerce Secretary approval for implementation in 2014.
- One element of the adopted CSP allows permitted charter vessels to lease QP from commercial vessel QS holders (referenced as a Guided Angler Fish or GAF program) for the purpose of aligning management specifications (principally daily bag limits) to be consistent with the unguided angler sector.
- Other less noteworthy schemes.[7]

Decreasing exploitable stock abundances experienced in the last several years and forecasted to be stabilized at low levels into the near future will now be coupled via the CSP (if approved by the Commerce Secretary) to determine certain catch levels for the commercial and recreational guided angler sectors.[8] This means the Council will be annually considering a suite of restrictive guided angler sector management measures to keep the catch within the allocated cap. Since the design objectives will be to allow for an uninterrupted charter fleet season, the measures will have to be necessarily conservative. Measures in past years have been different for areas and user groups which has fragmented what is usually a unified recreational organization response in other U.S. fisheries situations. For example, the Area 2C and 3A charter fleet regulations in 2013 will have different bag limits and fish size restrictions. In Area 2C, there is also a difference between daily bag limits and fish size for guided anglers (one fish and reverse slot limit size) and unguided anglers (two fish and any size).[9] The unknown management measures to be annually selected, and especially one set of measures being more restrictive than another for the same recreational market, are worrisome to charter fleet businesses whose demand for services has already been softened by the national economy downturn.

The Council recognizes that the CSP still needs work to address any economic inequities. The Council terminology for this issue is that the CSP still needs a "permanent solution." Charter fleet businesses located in Area 2C and Area 3A have formed an organization to design methods and procedures to further the permanent solution through a process allowing purchase of commercial fishing sector QS for deposit in a guided angler sector harvest common pool. (See Figure I.1 for a map of regulatory areas 2C and 3A.) Customer feedback in comments and booking counts reveal the negative effects from size and bag limit management restrictions to Area 2C's charter fleet businesses. Area 3A charter fleet businesses are also interested in the concept as decreased exploitable stock abundances have placed their GHL tier assignment close to a catch level requiring more restrictive management specifications. The organization is called the Catch Accountability through Compensated Halibut (CATCH) Project. The inter-sector transfer purpose is so that annual management measures can be sufficiently relaxed to alleviate reasons for further erosion of demand for guided services. The procedures will necessarily be complex for several reasons. The acquisition is for an asset that is only needed by the guided angler sector during periods of low fish resource abundances. If there is stock recovery sufficient that the restrictive management measures are lifted and demand factors are resolved, then the asset could be leased or even disposed back to the commercial fishing sector. There is no established precedent in U.S. fisheries management for how funds could be raised for purchasing the QS and the arrangements for who holds and manages the asset. Given the complexity, the CATCH Project sought advice from consultants to assist in the design of appropriate methods and procedures.

The assigned consultant workscope has the following tasks.

1. Provide commercial and recreational halibut fisheries background descriptions with emphasis on recent economic activity and trends, and changes to management. Issues to be discussed include the economic effects from commercial fishing sector-to-commercial fishing sector QS transfers; commercial fishing sector QP leasing; recreational management measure restrictions (size, bag, angler season limits, etc.); charter fleet limited entry permit program; and, charter fleet leasing of commercial fishing sector QP.

2. Outline alternative financing arrangements and implementation strategies for adding to the charter fleet "common pool resource." Discussion strategies for the financing may be guided angler sector self assessments, angler fees, mitigation compensation, and/or benefactor sources. Charter fleet industry QS acquisition cost absorption is also to be discussed.

3. Recalibrate an existing halibut fishery sector (recreational and commercial) economic model to be updated to reflect current year harvests and economic response coefficients. Use the economic sector model to compare and contrast sectors' marginal economic

effects. The purpose is to demonstrate the potential tradeoffs in the use of halibut resources.

4. Discuss QS transfer economic implications, such as impacts of QS prices due to market participation by the guided angler sector, ex-vessel price impacts from reduced incremental halibut supplies reaching markets, community level economic distributive effects, and changes in efficiency measurements.

The inter-sector transfer of QS through purchasing is not a new concept for Council policy making. The Council already considered plan alternatives for allowing commercial fishing sector QS purchases to be deposited into a common pool and/or for allowing commercial fishing sector QS purchases to be held by individuals (for example, see NMFS (2007)). The plan included details such as annual transfer caps, charter fleet QS holder maximums, disposing QS back to the commercial fishing sector, leasing after the transfers, etc. There were discussions about gains in economic efficiency because of a wider market for QS sales, and loss in social objectives for diluting the commercial fishing sector economic structure. While the plan was withdrawn from further action, the Council remains open for being requested to revive the concept.[10] There will have to be updated discussions about concerns in QS prices being driven up, differential impacts to participants, and distributive impacts on communities from changed sector allocations.

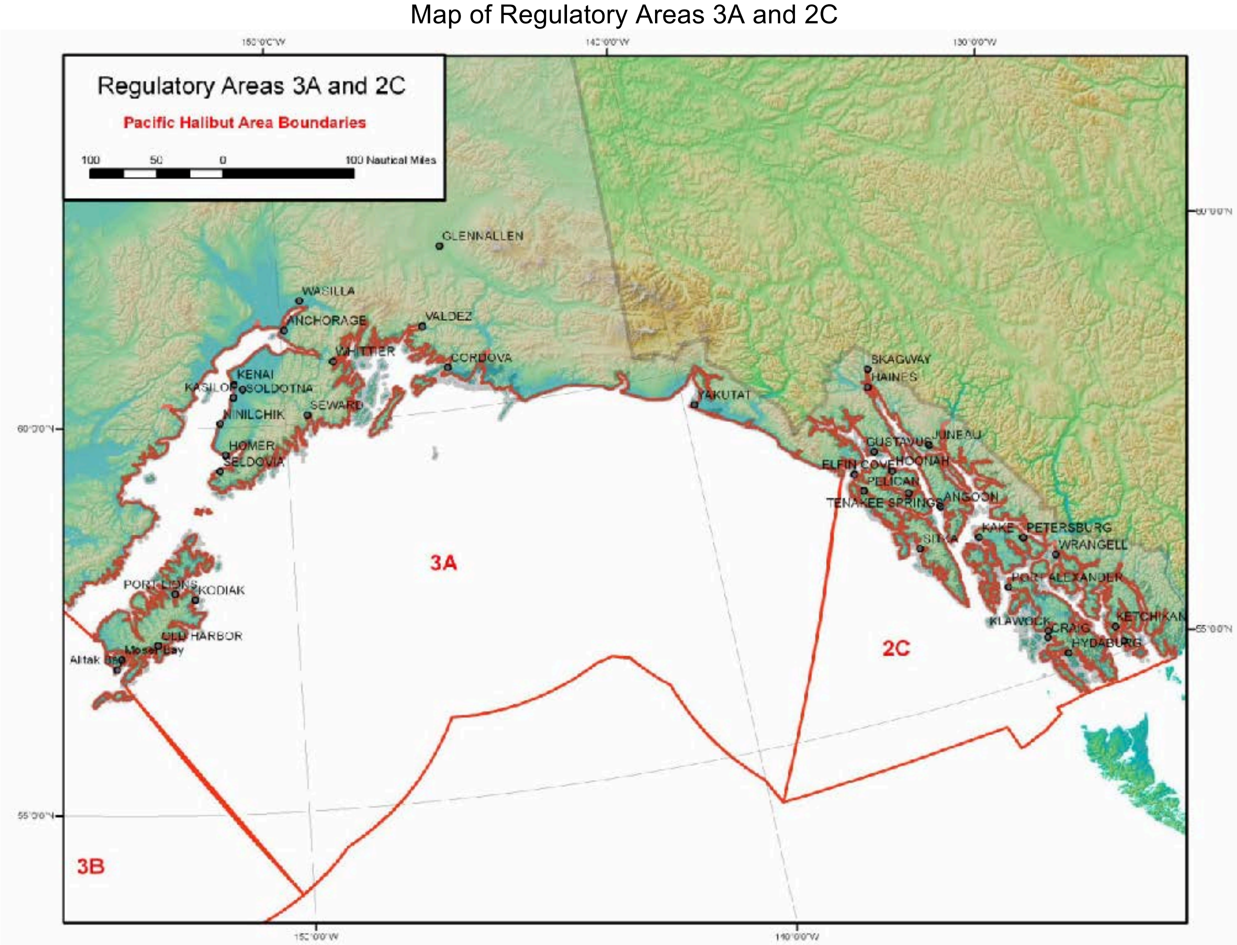
The increasing catch by the guided angler sector has raised one of the most contentious issues in fishery management to prominence. And that is harvest allocation decisions between recreational and commercial harvesters. Edwards (1990) and Easley (1992) provided often cited theoretical discussions of the issue whose frameworks are still being used - including in this report. There is a wide body of literature on the topic suggesting modeling procedures and how results can be used in decision making, for which we have referenced several in later chapters of this report. The application of the modeling procedures sometimes show commercial fisheries benefits exceed recreational fishing (central Pacific Ocean longline fishery as modeled by Sharma and Leung (2000)) and sometimes vice versa (red grouper in the Gulf of Mexico modeled by Carter et al. (2008)). More recent focus on the economics of allocations issues is the long term fish resource user benefits gained from conservation and stock recoveries (Pew Oceans Commission (2003) and CEA (2012)). NOAA Fisheries is becoming more active in the issue holding public meetings for input in the development of an "Engagement Initiative" (NOAA Fisheries April 2013). A report by George Lapointe Consulting LLC (2012) is being used for background information for the initiative's development.

This study draws upon the excellent *past* economic analysis provided by Council staff and consultants as described in NPFMC discussion papers and other decision documents that were prepared in support of public inquiries and Council actions to implement management policy (for example see economic impact discussions starting on page 98 at NPFMC (2001)). However, *more recent* economic implication discussion analysis provided to inform Council halibut fishery management actions has been less useful without quantitative based analysis. Reader attention is drawn to the CSP decision documents where purely qualitative descriptions of indirect economic effects were provided (for example see economic impact discussion starting on page xxix at NPFMC (September 2012)). This report suggests economic analysis methods with examples that could provide some level of quantitative results to assist policy makers in their future fishery management deliberations.

B. Report Contents

This report's contents present the above mentioned workscope task results in logically grouped chapters. First, a profile of the halibut fishery is provided that summarizes broad dimensions and major management features. Second, an economic sector model showing relative economic values of changes in resource by the commercial and recreational sectors is explained. The next chapter discusses financing alternatives for acquiring commercial fishing sector QS for the purpose of adding it to a guided angler sector harvest common pool. The discussions include effects from a new large QS buyer (such as an entity established as a result of Council action on a CATCH Project design) that will have QS market price impacts. Chapter V suggests alternative QS transfer mechanisms and also considers their QS price effects if implemented.

Figure I.1
Map of Regulatory Areas 3A and 2C



Source: NMFS RAM (October 29, 2012).

II. HALIBUT FISHERY PROFILE

A. Fishery Dimensions

This section provides a profile of the Alaska halibut fishery. Trends in harvester landings and processor activities are described. The number of harvester participants by individual transferable quota (ITQ) program permit type and the number of processor businesses by type that purchase commercial halibut are included. Permit counts for the new charter fleet limited entry permit program are described. Sufficient indicators and measures are supplied to appreciate the fishery's heterogeneity. There are other dimensional aspects of the fishery that are aptly covered in the source material for the tables and figures referenced in this report's section. The characteristics we describe are pertinent to study purpose and are often used to support other narrative explanations in this report.

1. Harvesters

A State and federal administered paper and electronic fish ticket system provides commercial fishing sector harvest information. A small portion of Alaska fishing grounds harvest is delivered to Washington ports. In this case, deliveries are tracked by the State of Washington's fish ticket system but harvest amounts are attributed to the International Pacific Halibut Commission (IPHC) regulatory areas. The Catch Sharing Plan (CSP) (if approved by the Commerce Secretary) stipulates that the charter fleet logbook system will be used to compile recreational guided angler sector catch and effort information. A statewide mail-out survey is currently relied on for the recreational sector. NOAA Fisheries (NMFS) issues a Subsistence Halibut Registration Certificate (SHARC) for personal use (term is used synonymously with the term subsistence) fishing. A voluntary survey of SHARC holders provides the basis for estimating total personal use harvests.

The largest Alaska commercial and recreational catch occurs in IPHC regulatory areas 2C and 3A. Table II.1 shows 65 percent of both users' catch and 99 percent of recreational users' catch are in these two areas in 2012. Table II.2 and Figure II.1 show recent trends by user group for all removals for these two areas. Table II.3 and Figure II.2 show commercial fishing sector harvest trends in the two areas. Table II.4 and Figure II.3 show recreational guided angler sector harvest trends for these two areas. The guided angler sector trends in participation and management specifications are shown on Table II.5 and Figure II.4. Alaska commercial fishing sector harvest volume has declined to about half today of what it was in the early 2000's to 20.5 million pounds (net weight) in 2012 (preliminary). Ex-vessel price rose to historic highs in 2011 at $6.29 statewide average and then fell back to $5.80 per pound in 2012. (All USD references are adjusted to be Year 2011.) Revenues totaled $15.8 million and $67.9 million in Areas 2C and 3A respectively. The statewide harvest value was $148.0 million in 2012 and $198.1 million in 2011.

The guided angler sector harvests have also decreased in the last 10 years especially in Area 2C where there has been increased scrutiny given rising harvests over historical levels. The restrictive management measures applied to this sector has meant that the unguided angler sector share of total recreation sector catch has risen to be more than 50 percent average over the last four years. A high majority share of guided anglers fishing for halibut are non-residents in Areas 2C and 3A, but the share of resident anglers is higher in 3A. From an annual portrayal, charter fleet trip target species are balanced across salmon, halibut, and rockfish fisheries in Area 2C while trips in 3A mostly target halibut. Salmon fisheries have narrow seasons so there will be trips made for only bottomfishing during a typical halibut season.

2. Processors

There were 31 different processors that made purchases of halibut caught in Area 2C and 30 in 3A 2010. For these processors, the Area 2C dependency on halibut was 21 percent and 42 percent in Area 3A. Charter fleet anglers successful in catching halibut and other species will sometimes utilize local processors for filleting, packaging, freezing, and shipping services. Charter fleet businesses will also provide these services. In both cases, there is no halibut fishery federal registration required. A State food service license is required, and depending on location, a local business license might be required. Business counts for providing services that include halibut catch are not available.

The first wholesale price received by buyers and processors of halibut for manufactured products is reported to the Alaska Department of Fish and Game (ADFG) in commercial operator annual report (COAR) submittals. The halibut processor types and purchase amounts in 2010 are shown in Table II.6. The product specific and overall weighted average first wholesale prices in 2010 reported for statewide purchases are shown in Table II.7. The first wholesale price is subject to market demand factors (strength of economies, availability and price of substitution fish, etc.), product inventories, and other factors. The price will vary according to the response of processors to produce a different mix of product forms and ultimately what they receive for the products. The expected wholesale price and any changes in variable production costs will be passed on partially or fully to harvesters in negotiations for harvest price. The 2010 first wholesale direct value is $234.2 million for purchases of $196.2 million ex-vessel value (Table II.7).

3. QS Holders

The commercial fishery has been managed under an individual fishing quota (IFQ) program since 1995. Quota share (QS) holders can harvest their share or, in restricted cases, arrangements can be made for others to harvest their share. Transfers and landings are tracked by NMFS's Restricted Access Management (RAM) so that QS and overall total allowable catch (TAC) are not exceeded. QS holder characteristics are shown in Table II.8 and Figures II.5 to II.7. Class A vessel permit holders can process harvests on board and the permit owners can lease their QS for harvesting by others. About 2.8 percent of QS volume in 2011 statewide is Class A and about the same minor percentage for Class A occurs in combined areas 2C and 3A. All of the rest of the QS holder classes must deliver harvests to registered floating or shoreside processors. Permit holders for the non-Class A vessels must be on-board during harvesting except for the original permit owners. The original permit owners may hire skippers, so as the original owners dispose of the permits, the percentage of on-board owner situations is increasing. Permits for Class B through D vessels are not permitted to lease quota pounds (QP) except under very restricted circumstances. Most of the QS is held in Class C (catcher vessels 36 to 60 feet) statewide at 52.3 percent in 2011. The amount in this class is much higher in Area 2C at 78.4 percent.

There has been a consolidation in QS holders between 1995 and 2011 (Table II.9). The decrease in holders across all vessel classes statewide is about 42 percent. The decrease is a little higher in areas 2C and 3A. There were 1,408 QS holders in combined areas 2C and 3A at the end of 2011.

QS can be transferred to others, but several restrictions were put in place to avoid concentration. First, QS is blocked in large bracket amounts. The originally issued QS that represented less than 20 thousand pounds was issued as a block, and such blocks may not be subdivided upon transfer. Further, there is a limit on the number of blocks a person may hold for the same species in any regulatory area. The result is that there were many small blocks that can be acquired to make operations more efficient. However, holders of large blocks would have to be bought out in their entirety. Another program rule in-place to avoid concentration, is that annual landings are subject to QS holder caps (one percent of Area 2C quota share pool (QSP), 0.5 percent of combined areas 2C, 3A, 3B QSP, and 1.5 percent Area 4 QSP) and vessel use caps (one percent of Area 2C QP and 0.5 percent of all Alaska QP). QS holder amounts are very skewed and much greater in Area 3A than in Area 2C. The highest 10 percent of holders own about 38 percent of all QS in Area 2C and 46 percent in Area 3A in 2011. This represented 0.9 million pounds in Area 2C and 6.7 million pounds in 3A in 2011.

4. CHP Holders

The North Pacific Fishery Management Council (NPFMC or Council) designed a Charter Halibut Limited Access Program (CHLAP) that establishes a federal Charter Halibut Permits (CHP) system for operators in the charter halibut fishery in Areas 2C and 3A. The CHLAP also provided a limited number of permits issuable on request to nonprofit corporations representing specified rural communities (CQE's) and for U.S. military service members (Morale, Welfare and Recreation Program (MWR's)). Only some CHP's are transferable depending on the extent (number of eligible trips) of a registrant's fishing history. CHP holders are generally limited to five permits. Vessel operators in Areas 2C and 3A with charter anglers onboard must have CHP's onboard during every trip on which Pacific halibut are caught and retained. CHP's are endorsed for the appropriate regulatory areas, and except for military CHP's, the number of anglers that may catch and retain charter halibut on a trip. Table II.10 shows the number of CHP's issued and the number of permit holders in 2012. In Area 2C there are 578 CHP's and in Area 3A there are 508 CHP's in 2012. There is substantial latent capacity in both areas as only 287 and 419 made at least one landing in each area respectively. About 20 CHP holders also own halibut commercial QS. Table II.11 shows current CHP and QS holder counts. In some instances, the same vessel that is used to catch commercial QS is re-fitted to harvest guided angler sector allocated fish. However, commercial and charter fishing may not occur the same day. A commercial QS holder can lease Guided Angler Fish (GAF) program fish to themselves as long as it is declared prior to the charter fishing trip.

5. GAF Program

The Council adopted CSP will allow CHP holders to lease commercial fishing sector QP so that clients have the same size bag limits and other management measures as the unguided angler sector. There is a similar program already underway in British Columbia halibut fishery management (see inset text box). There are caps on how much a QS holder can annually lease (different by regulatory areas, but approximately 1,500 pounds) and caps on how much a single CHP may annually acquire (400 fish for a six angler vessel, etc.). There are generous rules for CQE's to lease all of their owned QP to eligible residents, and lease up to the QS holder cap restrictions to non-eligible residents. These rules present the interesting pathway for CQE's to purchase QS for the purpose of leasing to individual CHP holders. A circumnavigated QS market is being created that has similarities to a charter fleet ITQ program whereby inter-sector QS transfers can occur. Any utilization of this pathway will provide additional revealing information as to the difference in marginal economic benefits between the sectors. If the marginal economic benefit of the guided angler sector is greater than the commercial fishing sector, then there will be an incentive for participants to exercise this pathway.

CELEBRATING THE RODGERS FAMILY'S 101ST YEAR SPORTFISHING LEGACY

Many of you have been asking about the new halibut regulations that were recently announced by the DFO. The 2013 regulations allow for the retention of 1 Halibut a day and 2 in possession which is the same as in 2012. The big change for 2013 is that they have now imposed a slot limit on the size of the halibut that you are allowed to retain. One halibut has to be under 83cm which is about a 15 pound fish and the other halibut has to be under 126 cm which is about a 60 pound fish. We feel that these new regulations will not only be confusing to our guests, but, will also be difficult for us to administer. As you can well imagine, this is a very controversial and unpopular decision on the part of the DFO.

On a more positive note, DFO has also established a new program, which is now available to the Sports Fishing Industry whereby Sports Fishing Lodges like ourselves, can purchase extra commercial halibut quota for this coming season. We have decided that it is in our best interest and the best interest of our many customers to take advantage of this opportunity. By buying commercial quota, we feel that this decision will greatly simplify this component of our fishery. For this reason, we have decided to purchase enough commercial halibut quota to satisfy our needs for this coming season. In short, what this will mean to our customers is that, although the possession limit will still be 2 halibut per angler, our customers will now have the option of either retaining or releasing any oversized halibut that they catch when fishing at Rodgers.

We have been looking at several different ways of trying to make this program work. After giving this issue a great deal of thought, we have decided that the best and fairest approach is to give our customers the option of keeping or releasing an oversized halibut on a pay as you go basis. In other words, if a customer chooses to retain any halibut over the legal allowable size, than the on the spot cost of the halibut will be based on the rate of $5.00 a pound. This is the price that we are going to be paying per pound to the commercial sector in order to purchase this extra quota. This extra cost of $5.00 a pound for an oversized halibut can be shared by one or more members of the party. The rate of $5.00 per pound will be based on the dressed weight, cleaned and head off of the halibut and not the round weight. The formula the DFO uses is that the dressed weight is 75% of the round weight. For example, an 80 pound halibut becomes a 60 pound halibut when cleaned and dressed. The cost of this halibut would be $5.00 X 60 pounds = $300.00

I doubt if many other fishing lodges in B.C. will be offering this program and I feel fortunate that we have been given this opportunity. Our 2013 season is scheduled to open May 1st and according to the DFO forecasts, we are anticipating having another excellent year. The DFO forecasts are calling for an abundance of Coho/Silvers and a high return of 4 and 5 year old Chinooks/Kings. If you would like more information or if you would like to make reservations...

Give us a call at 1-800-429-5288 or email us at rodgersfishinglodge@yahoo.com and check out our new home page at http://www.rodgersfishinglodge.com/

RODGERS FISHING FROLICS

B. Halibut Fishery Scope

The mentioned dimensions for the halibut fishery should be viewed in consideration that the fishery for both

 Macintosh HD:Users:websterj:Desktop:Alaska CATCH asset value Rev 2.2 S.docx commercial and recreational sectors is often one fishery in a portfolio of fisheries for the participants. About 31 percent of the 1,080 vessels that had landings in either the halibut or sablefish fisheries in 2011 participated in both fisheries (NMFS RAM April 2012). Further, of the 1,051 vessels that had landings in the halibut fishery, 36 percent made landings in multiple Alaska regulatory areas. Many participants use their vessels in salmon and other fisheries. A few use their vessels for tendering. Appendix C, Table C.1 shows the mix of fisheries and other revenue sources for an average southeast Alaska halibut fishery participant. Similarly for the guided angler sector, anglers will participate in Chinook and coho salmon and rockfish species fisheries during the same trip when seasons overlap. Approximately three out of every five saltwater trips in Area 2C were for combined fisheries in 2011 (Sigurdsson and Powers 2012). The southeast region trips were more targeted for bottomfishing and only 30 percent in 2011 were combined with salmon fishing. The economic effects discussions in this report are largely focused on the halibut fishery, however a more robust discussion should include spillover effects to other substitute or complementary fisheries when they are impacted from increased or decreased opportunities in the halibut fishery.

Table II.1
Estimates of Pacific Halibut Removals by Sector and IPHC Regulatory Area in 2012

	IPHC Regulatory Area						
Sector	2A	2B	2C	3A	3B	4	Total
Commercial	574	5,811	2,568	11,649	4,954	5,511	31,067
Sport	415	1,144	1,405	3,938	13	16	6,931
Bycatch Mortality:							
O26	103	175	6	1,259	1,109	3,685	6,337
U26 fish	2	14	1	681	470	2,362	3,530
Personal Use	25	405	387	266	22	43	1,148
Wastage Mortality:							
O26	11	165	78	561	467	196	1,478
U26 fish	0	6	5	30	57	28	126
IPHC Research	18	109	119	297	112	76	731
Total Removals	1,148	7,829	4,569	18,681	7,204	11,917	51,348

Notes: 1. Preliminary, November 7, 2012.
2. Removals are in thousands of pounds (net weight).
3. Area 2A bycatch is the 2011 estimate as the 2012 estimate will not be available until 2013.
4. Personal use includes 2011 Alaskan subsistence harvest estimates. Area 2A treaty Indian ceremonial and subsistence fish authorized in the 2012 catch sharing plan. Area 4 includes 20,000 pounds of sublegal halibut retained in the 2012 Area 4DE Community Development Quota.

Source: IPHC (2013).

Table II.2
Halibut Removals by Sector for IPHC Areas 2C, 3A, and Combined in 1992 to Preliminary 2012

		User Group											
			Recreation			Bycatch			Wastage				
Area	Year	Commercial	Charter	Non-guided	Subsistence	Legal	Sublegal	Total	Legal	Sublegal	Total	Research	Total
Area 2C	1992	9.82		1.67	0.37	0.57		0.57	0.39		0.39		12.82
	1993	11.29		1.81	0.11	0.33		0.33	0.36		0.36		13.90
	1994	10.38	0.99	1.00	0.11	0.40		0.40	0.38		0.38	1.99	15.24
	1995	7.76	0.99	0.77	n/a	0.22		0.22	0.05		0.05		9.79
	1996	8.74	1.19	0.94	n/a	0.23		0.23	0.04		0.04		11.14
	1997	9.75	1.03	1.14	n/a	0.24		0.24	0.04		0.04		12.21
	1998	9.67	1.58	0.92	0.17	0.24		0.24	0.04		0.04		12.62
	1999	9.90	0.94	0.90	0.17	0.23		0.23	0.07		0.07		12.21
	2000	8.27	1.13	1.13	0.17	0.25		0.25	0.04		0.04		10.98
	2001	8.27	1.20	0.72	0.17	0.18		0.18	0.04		0.04		10.59
	2002	8.46	1.28	0.81	0.17	0.17	0.16	0.33	0.03	0.11	0.14	0.15	11.33
	2003	8.29	1.41	0.85	0.62	0.14	0.17	0.31	0.03	0.10	0.13	0.12	11.72
	2004	10.12	1.75	1.19	0.68	0.15	0.21	0.36	0.03	0.28	0.31	0.12	14.52
	2005	10.49	1.95	0.85	0.60	0.14	0.20	0.34	0.03	0.23	0.26	0.14	14.63
	2006	10.40	1.80	0.72	0.58	0.21	0.20	0.41	0.02	0.28	0.30	0.10	14.32
	2007	8.35	1.92	1.13	0.53	0.22	0.13	0.35	0.03	0.27	0.30	0.15	12.72
	2008	6.15	2.00	1.27	0.46	0.22	0.13	0.35	0.01	0.21	0.22	0.06	10.50
	2009	4.87	1.25	1.12	0.46	0.22	0.13	0.35	0.01	0.26	0.27	0.09	8.40
	2010	4.35	1.28	1.27	0.46	0.21	0.13	0.34	0.01	0.24	0.25	0.10	8.04
	2011	2.29	0.39	0.93	0.43	0.21	0.13	0.34	0.01	0.07	0.07	0.09	4.53
	2012p	2.57	0.65	0.76	0.39	0.01	0.00	0.01	0.08	0.01	0.08	0.12	4.57
Area 3A	1992	26.78		3.90	0.33	2.64		2.64	1.51		1.51		35.16
	1993	22.74		5.27	0.33	1.92		1.92	1.08		1.08		31.33
	1994	24.84	2.55	1.96	0.33	2.35		2.35	1.65		1.65		33.68
	1995	18.14	2.85	1.67	0.01	1.46		1.46	0.13		0.13		24.25
	1996	19.32	2.82	1.92	0.01	1.40		1.40	0.18		0.18		25.65
	1997	24.24	3.41	2.10	0.10	1.55		1.55	0.07		0.07		31.47
	1998	24.54	2.99	1.72	0.07	1.47		1.47	0.15		0.15		30.94
	1999	24.31	2.53	1.70	0.07	1.28		1.28	0.12		0.12		30.01
	2000	18.17	3.14	2.17	0.07	1.29		1.29	0.06		0.06		24.89
	2001	21.10	3.13	1.54	0.07	1.62		1.62	0.07		0.07		27.53
	2002	22.61	2.72	1.48	0.07	1.07		1.07	0.14		0.14		28.10
	2003	22.32	3.38	2.05	0.07	1.18	1.43	2.61	0.07	0.61	0.68	0.42	31.53
	2004	24.72	3.67	1.94	0.28	1.52	2.08	3.60	0.08	0.67	0.75	0.45	35.40
	2005	25.23	3.69	1.98	0.43	1.32	1.81	3.13	0.16	0.57	0.73	0.81	36.00
	2006	25.24	3.66	1.67	0.38	1.06	1.62	2.68	0.05	0.70	0.75	0.47	34.86
	2007	26.13	4.00	2.28	0.37	0.99	1.78	2.77	0.05	0.92	0.97	0.35	36.88
	2008	24.17	3.38	1.94	0.34	1.06	1.91	2.96	0.06	0.92	0.99	0.36	34.13
	2009	21.40	2.73	2.02	0.33	0.97	1.92	2.89	0.04	1.12	1.16	0.36	30.89
	2010	20.09	2.99	2.08	0.33	0.95	1.71	2.66	0.02	1.42	1.44	0.32	29.91
	2011	14.27	2.84	1.70	0.31	1.04	1.86	2.90	0.03	0.88	0.91	0.29	23.22
	2012p	11.65	2.38	1.56	0.27	1.26	0.68	1.94	0.56	0.03	0.59	0.30	18.68

Table II.2 (cont.)

		User Group											
			Recreation			Bycatch			Wastage				
Area	Year	Commercial	Charter	Non-guided	Subsistence	Legal	Sublegal	Total	Legal	Sublegal	Total	Research	Total
Combined	1992	36.60	0.00	5.57	0.70	3.21	0.00	3.21	1.91	0.00	1.91	0.00	47.98
	1993	34.03	0.00	7.08	0.44	2.25	0.00	2.25	1.44	0.00	1.44	0.00	45.23
	1994	35.22	3.54	2.96	0.44	2.75	0.00	2.75	2.04	0.00	2.04	1.99	48.93
	1995	25.90	3.83	2.43	0.01	1.68	0.00	1.68	0.18	0.00	0.18	0.00	34.04
	1996	28.06	4.01	2.86	0.01	1.63	0.00	1.63	0.22	0.00	0.22	0.00	36.79
	1997	33.99	4.45	3.24	0.10	1.79	0.00	1.79	0.11	0.00	0.11	0.00	43.68
	1998	34.20	4.57	2.63	0.24	1.71	0.00	1.71	0.20	0.00	0.20	0.00	43.56
	1999	34.21	3.47	2.60	0.24	1.51	0.00	1.51	0.18	0.00	0.18	0.00	42.22
	2000	26.43	4.27	3.29	0.24	1.54	0.00	1.54	0.10	0.00	0.10	0.00	35.88
	2001	29.37	4.33	2.27	0.24	1.80	0.00	1.80	0.10	0.00	0.10	0.00	38.12
	2002	31.07	4.00	2.29	0.24	1.24	0.16	1.40	0.17	0.11	0.28	0.15	39.42
	2003	30.61	4.79	2.89	0.70	1.32	1.60	2.92	0.09	0.71	0.80	0.54	43.26
	2004	34.83	5.42	3.12	0.96	1.67	2.29	3.96	0.11	0.95	1.06	0.57	49.92
	2005	35.72	5.64	2.83	1.03	1.46	2.01	3.47	0.19	0.80	0.99	0.95	50.62
	2006	35.64	5.47	2.40	0.96	1.27	1.82	3.09	0.07	0.98	1.05	0.57	49.17
	2007	34.48	5.92	3.41	0.90	1.21	1.91	3.12	0.08	1.19	1.27	0.50	49.60
	2008	30.31	5.38	3.21	0.80	1.28	2.03	3.31	0.07	1.14	1.21	0.42	44.63
	2009	26.27	3.98	3.15	0.79	1.19	2.05	3.24	0.05	1.38	1.43	0.45	39.30
	2010	24.44	4.27	3.35	0.79	1.16	1.84	3.00	0.03	1.66	1.69	0.41	37.94
	2011	16.56	3.23	2.63	0.74	1.25	1.99	3.24	0.03	0.95	0.98	0.38	27.75
	2012p	14.22	3.02	2.32	0.65	1.27	0.68	1.95	0.64	0.04	0.67	0.42	23.25

Notes:
1. Removals are in millions of pounds (net weight).
2. For years 1992-1993, sport was not broken down by charter/non-guided detail and is shown as non-guided.
3. For years prior to 2002 for Area 2C and 2003 for Area 3A, no data is available for sublegal or research removals, except 1994 Area 2C research assumed to be residual of total.
4. Bycatch is estimated mortality in non-halibut fisheries and wastage is mortality in the commercial sector fishery.
5. The removals for 2011 and 2012 are preliminary estimates subject to final ADFG review and publication.

Sources: NPFMC (2001, 2008a, January 2012, and September 2012), NMFS (Sept. 2007), IPHC (2012); preliminary 2012 IPHC (2013).

Table II.3
Alaska Commercial Fisheries Halibut Volume, Value, and Price for
IPHC Areas 2C and 3A and Statewide in 1995 to Preliminary 2012

	Area 2C			Area 3A			Combined 2C and 3A			Statewide	
Year	Volume (millions)	Adjusted Value (millions)	Adjusted Price	Volume (millions)	Adjusted Value (millions)	Adjusted Price	Volume (millions)	Adjusted Value (millions)	Adjusted Price	Adjusted Value (millions)	Adjusted Price
1995	7.8	$ 22.0	$ 2.83	18.1	$ 50.2	$ 2.76	25.9	$ 72.1	$ 2.78	$ 88.2	$ 2.74
1996	8.7	$ 26.9	$ 3.08	19.3	$ 58.9	$ 3.05	28.1	$ 85.9	$ 3.06	$ 105.8	$ 2.99
1997	9.8	$ 29.3	$ 3.00	24.2	$ 70.2	$ 2.90	34.0	$ 99.5	$ 2.93	$ 139.9	$ 2.85
1998	9.7	$ 17.7	$ 1.83	24.5	$ 44.3	$ 1.80	34.2	$ 62.0	$ 1.81	$ 90.7	$ 1.70
1999	9.9	$ 25.7	$ 2.60	24.3	$ 66.2	$ 2.72	34.2	$ 91.9	$ 2.69	$ 153.1	$ 2.60
2000	8.3	$ 27.7	$ 3.35	18.2	$ 60.3	$ 3.32	26.4	$ 88.0	$ 3.33	$ 175.6	$ 3.22
2001	8.3	$ 21.8	$ 2.64	21.1	$ 53.4	$ 2.53	29.4	$ 75.3	$ 2.56	$ 145.0	$ 2.48
2002	8.5	$ 23.0	$ 2.73	22.6	$ 61.9	$ 2.74	31.1	$ 84.9	$ 2.73	$ 162.7	$ 2.69
2003	8.3	$ 29.5	$ 3.56	22.3	$ 77.8	$ 3.49	30.6	$ 107.3	$ 3.50	$ 203.3	$ 3.42
2004	10.1	$ 36.0	$ 3.56	24.7	$ 87.9	$ 3.56	34.8	$ 123.8	$ 3.56	$ 204.9	$ 3.48
2005	10.5	$ 36.6	$ 3.49	25.2	$ 87.9	$ 3.48	35.7	$ 124.5	$ 3.48	$ 194.7	$ 3.41
2006	10.4	$ 42.8	$ 4.12	25.2	$ 104.8	$ 4.15	35.6	$ 147.7	$ 4.14	$ 222.6	$ 4.12
2007	8.3	$ 39.2	$ 4.70	26.1	$ 122.8	$ 4.70	34.5	$ 162.0	$ 4.70	$ 237.1	$ 4.62
2008	6.1	$ 27.8	$ 4.52	24.2	$ 111.0	$ 4.59	30.3	$ 138.8	$ 4.58	$ 220.2	$ 4.46
2009	4.9	$ 15.5	$ 3.19	21.4	$ 69.0	$ 3.23	26.3	$ 84.5	$ 3.22	$ 141.0	$ 3.12
2010	4.4	$ 20.9	$ 4.81	20.1	$ 96.2	$ 4.79	24.4	$ 117.1	$ 4.79	$ 202.6	$ 4.71
2011	2.3	$ 14.7	$ 6.41	14.3	$ 90.3	$ 6.33	16.6	$ 105.0	$ 6.34	$ 198.1	$ 6.29
2012p	2.6	$ 15.8	$ 6.14	11.6	$ 67.9	$ 5.83	14.2	$ 83.7	$ 5.89	$ 148.0	$ 5.80

Notes: 1. Value and price adjusted to 2011 dollars using the GDP implicit price deflator developed by the U.S. Bureau of Economic Analysis. Year 2012 is preliminary.
2. Harvest volume is commercial catch in millions of pounds. Year 2012 is preliminary.
3. Ex-vessel prices are based on net pounds (headed and gutted).

Sources: NPFMC (2001, 2008a, January 2012, and September 2012), NMFS (September 2007), and IPHC (2012). Preliminary 2012 prices from Federal Register (2012). Preliminary 2012 volume from Gilroy and Williams (2012).

Table II.4
Estimated Harvest by the Recreational Unguided and Guided
Angler Sectors in Areas 2C and 3A in 2000 to Preliminary 2012

	Area 2C						Area 3A					
	Unguided		Guided				Unguided		Guided			
Year	Amount	Percent	Amount	Percent	Total	GHL	Amount	Percent	Amount	Percent	Total	GHL
2000	1.121	50%	1.130	50%	2.251	-	2.165	41%	3.140	59%	5.305	-
2001	0.721	37%	1.202	63%	1.923	-	1.543	33%	3.132	67%	4.675	-
2002	0.814	39%	1.275	61%	2.090	-	1.478	35%	2.724	65%	4.202	-
2003	0.846	37%	1.412	63%	2.258	1.432	2.046	38%	3.382	62%	5.427	3.650
2004	1.187	40%	1.750	60%	2.937	1.432	1.937	35%	3.668	65%	5.606	3.650
2005	0.845	30%	1.952	70%	2.798	1.432	1.984	35%	3.689	65%	5.672	3.650
2006	0.723	29%	1.804	71%	2.526	1.432	1.674	31%	3.664	69%	5.337	3.650
2007	1.131	37%	1.918	63%	3.049	1.432	2.281	36%	4.002	64%	6.283	3.650
2008	1.265	39%	1.999	61%	3.264	0.931	1.942	37%	3.378	63%	5.320	3.650
2009	1.133	48%	1.249	52%	2.383	0.788	2.023	43%	2.734	57%	4.758	3.650
2010	0.885	45%	1.086	55%	1.971	0.788	1.587	37%	2.698	63%	4.285	3.650
2011	0.685	67%	0.344	33%	1.029	0.788	1.615	37%	2.793	63%	4.408	3.650
2012p	0.761	54%	0.645	46%	1.405	0.931	1.563	40%	2.375	60%	3.938	3.103

Notes: 1. Harvest is in millions of pounds (net weight).
2. Also shown is the Guideline Harvest Level (GHL) applicable to the recreational guided angler sector.

Source: IPHC (2013).

Table II.5
Charter Fleet Participation and Management Specifications in Areas 2C and 3A in 2007 to 2012

Charter Fleet Participation in Bottomfish Fishing

	Southeast (2C)								Southcentral (3A)							
	Active Vessels				Target Fishery Vessel Trips				Active Vessels				Target Fishery Vessel Trips			
Year	Salmon	Bottomfish	Both	Total	Salmon	Bottomfish	Both	Total	Salmon	Bottomfish	Both	Total	Salmon	Bottomfish	Both	Total
2007	637	494	676	768	12,759	6,144	20,633	39,599	377	576	495	641	2,876	16,489	8,145	27,553
2008	622	534	648	757	11,338	7,368	18,634	37,448	325	546	441	596	2,135	15,733	6,617	24,557
2009	538	417	586	670	8,789	4,842	14,498	28,174	269	497	402	547	2,008	12,604	5,699	20,332
2010	514	401	567	644	7,613	5,369	14,740	27,821	245	476	385	528	2,026	13,225	5,593	20,932
2011	522	287	505	610	8,687	3,465	16,056	28,287	257	419	358	469	2,057	12,093	5,987	20,204

Notes: 1. Total vessel participation includes trips when the target species was either salmon, bottomfish, both salmon and bottomfish, or unknown.
2. Active vessel counts are for vessels that made at least one saltwater trip in each target category.

Source: Sigurdsson and Powers (2012).

Charter Fleet Mean Harvest Weight

Year	Area 2C	Area 3A
2007	17.5	16.9
2008	19.4	17.0
2009	23.3	16.3
2010	26.4	15.2
2011	9.4	15.1
2012p	14.6	13.3

Source: NPFMC (January 2012 and September 2012), and preliminary 2012 from Gilroy and Williams (2012).

Recreational Sector Management Bag Limit Specification

	Guided Sector		Unguided Sector	
Year	Area 2C	Area 3A	Area 2C	Area 3A
2006	2-f	2-f	2-f	2-f
2007	1O32,1U32	2-f	2-f	2-f
2008	1O32,1U32	2-f	2-f	2-f
2009	1-f	2-f	2-f	2-f
2010	1-f	2-f	2-f	2-f
2011	1U37	2-f	2-f	2-f
2012	1 r/45-68	2-f	2-f	2-f

Notes: 1. The notation "2-f" means two fish bag limit, any size. The notation "1 r/45-68" means one fish bag limit, but only if under 45 inches or over 68 inches. "O32" means over 32 inches, and "U37" means under 37 inches.

Table II.6
Halibut Purchases by Processor Type at Central and Southeast Alaska Ports in 2010

Port Group	Processor Type	Processors	Halibut Purchases	Total Purchases
Central Alaska	CASO	5	23,127	65,246
	DMCP or FLPR	3	64,523	92,017
	SBPR	22	86,267,821	205,631,765
	Shorebased processors by purchase volume:			
	Less than $1 million	7	1,351,384	2,110,839
	$1 million to $10 million	8	24,585,713	47,356,850
	Over $10 million	7	60,330,724	156,164,076
	Total	30	86,355,471	205,789,028
SE Alaska	CASO	5	44,267	90,771
	DMCP	4	35,551	127,712
	SBPR	22	38,228,602	185,950,390
	Shorebased processors by purchase volume:			
	Less than $1 million	5	186,383	1,154,592
	$1 million to $10 million	9	14,641,156	52,291,042
	Over $10 million	8	23,401,063	132,504,756
	Total	31	38,308,420	186,168,873

Notes: 1. Halibut purchases include only those delivered to the indicated port group.
Total purchases include all species and all ports for those processors.
2. CASO = Catcher/Seller
DMCP = Direct Marketer Vessel
FLPR = Floating Processor
SBPR = Shorebased Processor

Table II.7
Halibut Purchase Price and First Wholesale Finish Volume and Price by Product Form in 2010

Product Form	Reporting Count	Processed: Finish Pounds	Wholesale Value	Average Price
Fresh				
Cheeks or chins	14	34,636	273,268	7.89
Fillets with skin-no ribs	7	583,866	6,824,769	11.69
Fillets-no skin or ribs	11	394,526	4,714,663	11.95
Gutted only	7	3,177,806	18,323,049	5.77
Headed & gutted	43	15,259,214	87,953,964	5.76
Frozen				
Cheeks or chins	12	61,977	383,094	6.18
Fillets with skin-no ribs	9	52,206	492,696	9.44
Fillets-no skin or ribs	22	4,632,161	49,741,248	10.74
Headed & gutted	30	7,066,674	43,419,369	6.14
Heads	6	130,552	59,924	0.46
Pectoral girdle only	5	102,802	73,012	0.71
Frozen/IQF				
Cheeks or chins	7	15,059	71,336	4.74
Fillets-no skin or ribs	5	507,144	5,438,647	10.72
Headed & gutted	6	1,224,368	7,477,480	6.11
Heads	3	342,331	76,413	0.22
Vacuum Packed/Frozen				
Fillets with skin-no ribs	4	4,660	47,334	10.16
Fillets-no skin or ribs	16	351,632	3,831,951	10.90
Total for shown products		33,941,614	229,202,218	6.75
Total including products not shown		35,217,446	234,168,547	6.65

	Purchased: Pounds	Value	Average Price
Total purchased for shown and not shown products	40,493,209	196,201,143	4.85

Note: 1. Confidential data (less than three processors reporting) has been removed from this table to protect confidentiality.
2. Average price per finish pound is wholesale value divided by finish pounds. The total average price is calculated by dividing the sum of wholesale value by the sum of finish pounds.
3. Purchased pounds are in net weight.
4. Headed & gutted is IFQ halibut only from 2003 forward.

Source: Commercial Operators Annual Report, Halibut Wholesale Values Statewide.

Table II.8
Halibut Quota Share Vessel Category Distribution by IPHC Area in 1995 and 2011

IPHC Area	Vessel Category	QS Units in 1995	1995 Percentage of QS	QS Units in 2011	2011 Percentage of QS	1995 to 2011 Change	1995 to 2011 % Change
2C	A-Freezer Vessel (any length)	1,233,704	2.1%	1,249,141	2.1%	15,437	1%
	B-Catcher Vessel > 60 ft	2,900,705	4.9%	2,655,243	4.5%	-245,462	-8%
	C-Catcher Vessel 36-60 ft	45,347,899	76.9%	46,677,536	78.4%	1,329,637	3%
	D-Catcher Vessel < or = 35 ft	9,497,773	16.1%	8,970,119	15.1%	-527,654	-6%
	Total	58,980,081	100.0%	59,552,039	100.0%	571,958	1%
3A	A-Freezer Vessel (any length)	4,160,515	2.3%	4,773,918	2.6%	613,403	15%
	B-Catcher Vessel > 60 ft	67,514,777	36.9%	68,568,976	37.1%	1,054,199	2%
	C-Catcher Vessel 36-60 ft	97,784,444	53.5%	98,878,681	53.5%	1,094,237	1%
	D-Catcher Vessel < or = 35 ft	13,343,921	7.3%	12,689,740	6.9%	-654,181	-5%
	Total	182,803,657	100.0%	184,911,315	100.0%	2,107,658	1%
All areas	A-Freezer Vessel (any length)	8,205,312	2.5%	9,221,518	2.8%	1,016,206	12%
	B-Catcher Vessel > 60 ft	121,296,960	37.1%	122,609,592	37.0%	1,312,632	1%
	C-Catcher Vessel 36-60 ft	170,425,214	52.1%	173,589,745	52.3%	3,164,531	2%
	D-Catcher Vessel < or = 35 ft	27,349,712	8.4%	26,232,149	7.9%	-1,117,563	-4%
	Total	327,277,198	100.0%	331,653,004	100.0%	4,375,806	1%

Source: NMFS RAM (April 2012).

Table II.9
Halibut Permit Holding Size Distribution by IPHC Area for Quota Pounds Initially and 2011

IPHC Area	Holding Size	Initial Issuees	Initial Percentage of Issuees	Holders at End of 1995	1995 Percentage of Holders	Holders at End of 2011	2011 Percentage of Holders	1995 to 2011 Change	1995 to 2011 % Change
2C	3,000 or less	2,196	92%	1,909	90%	867	77%	-1,042	-55%
	3,001-10,000	188	8%	208	10%	241	21%	33	16%
	10,001-25,000	4	0%	8	0%	22	2%	14	175%
	over 25,000		0%		0%	0	0%	0	
	Total	2,388	100%	2,125	100%	1,130	100%	-995	-47%
3A	3,000 or less	2,069	67%	1,804	66%	541	38%	-1,263	-70%
	3,001-10,000	606	20%	538	20%	471	33%	-67	-12%
	10,001-25,000	264	9%	277	10%	269	19%	-8	-3%
	over 25,000	132	4%	133	5%	150	10%	17	13%
	Total	3,071	100%	2,752	100%	1,431	100%	-1,321	-48%
All areas	3,000 or less	3,406	71%	3,136	70%	1,265	48%	-1,871	-60%
	3,001-10,000	844	17%	789	17%	679	26%	-110	-14%
	10,001-25,000	315	7%	324	7%	399	15%	75	23%
	over 25,000	264	5%	260	6%	294	11%	34	13%
	Total	4,829	100%	4,509	100%	2,637	100%	-1,872	-42%

Notes: 1. Holding size in 2011 QP equivalents. Pounds are in net weight.
2. Holders unique to the shown IPHC areas are not unique to all areas, for example there are 2,322 holders that own QS in either Area 2C or 3A in 2011.

Source: NMFS RAM (April 2012).

Table II.10
Charter Halibut Permits, Businesses, and Anglers in Areas 2C and 3A in 2012

Area	Permit Type	Permits	Transferable Permits	Businesses	Endorsed Anglers
2C	CHP	533	372	356	2,734
	CQE	44	0	11	264
	MWR	1	0	1	unlimited
3A	CHP	439	339	439	3,227
	CQE	63	0	9	378
	MWR	6	0	3	unlimited
Both	CHP	972	711	795	5,961
	CQE	107	0	20	642
	MWR	7	0	3	unlimited

Notes: 1. Permit types Include active Charter Halibut Permits (CHP) and CHP holders regular permits with angler endorsements, community permits (CQE), and U.S. Military Morale, Welfare and Recreation Program permits (MWR).
2. Businesses are within each permit type and area. CHP holders reflect all holders of all permits, but each holder is counted once, regardless of the number of CHP's held.
3. Active permits are current and nonrevocable.
4. Counts are current as of October 16, 2012.

Source: NMFS RAM (October 29, 2012).

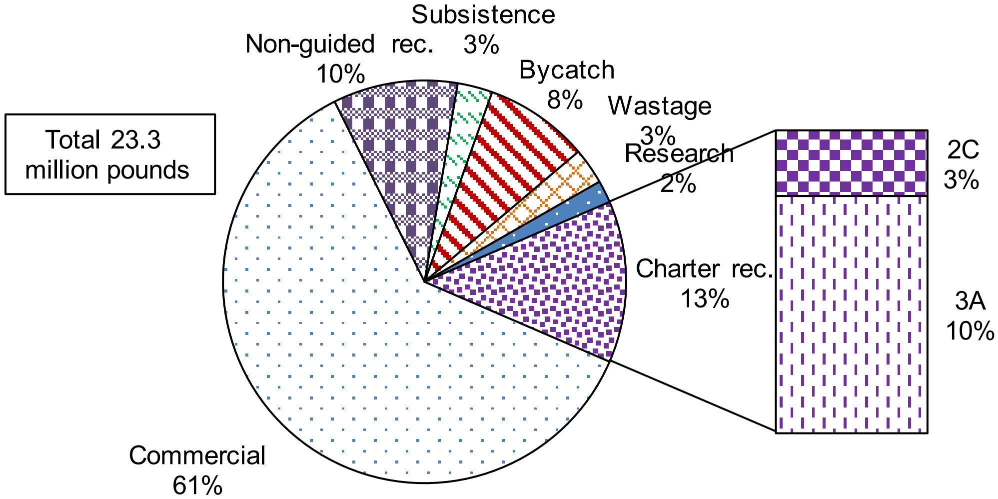
Table II.11
CHP Holders That Also Hold Halibut Quota Share in 2012

Area	QS in Same Area	QS in Either 2C or 3A
2C	20	23
3A	21	22

Notes: 1. Counts are current as of October 16, 2012.

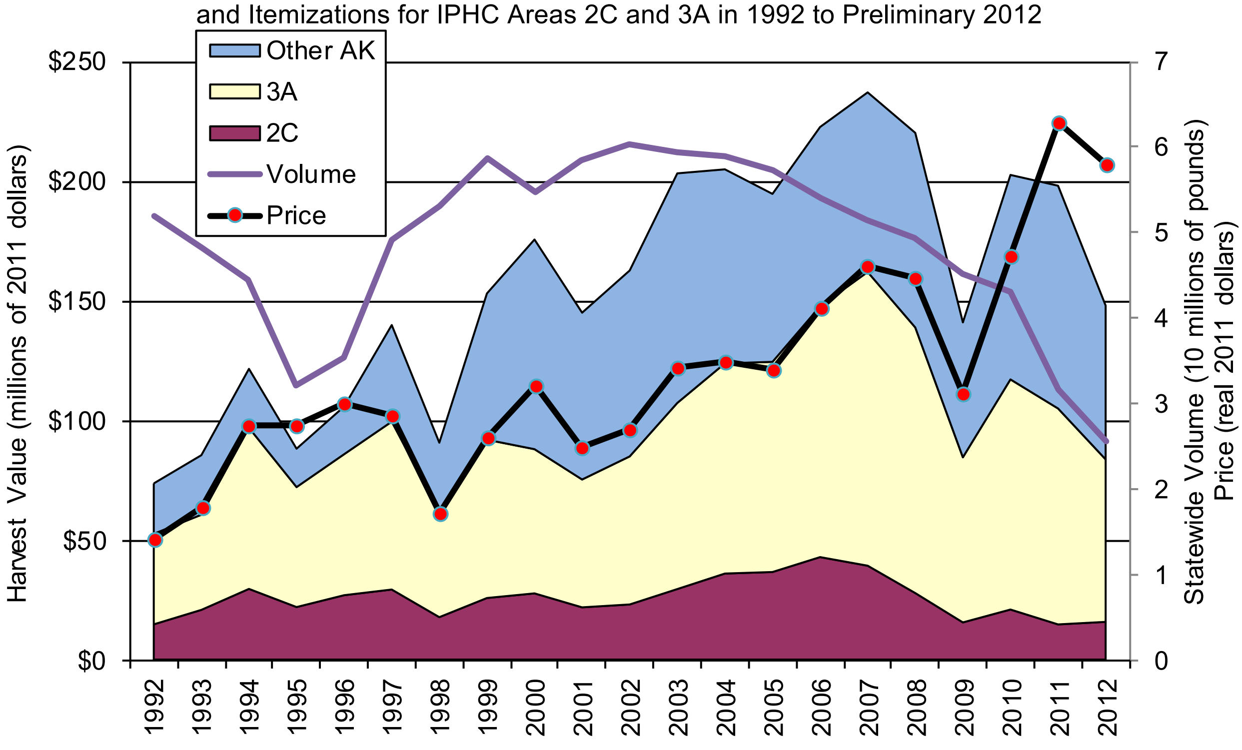
Source: NMFS RAM (October 29, 2012).

Figure II.1
Halibut Removals by Sector for Combined IPHC Areas 2C and 3A in 2012



Source: Preliminary 2012 from IPHC (2013).

Figure II.2
Halibut Commercial Fishery Harvest Volume, Value, and Price for All Alaska and Itemizations for IPHC Areas 2C and 3A in 1992 to Preliminary 2012

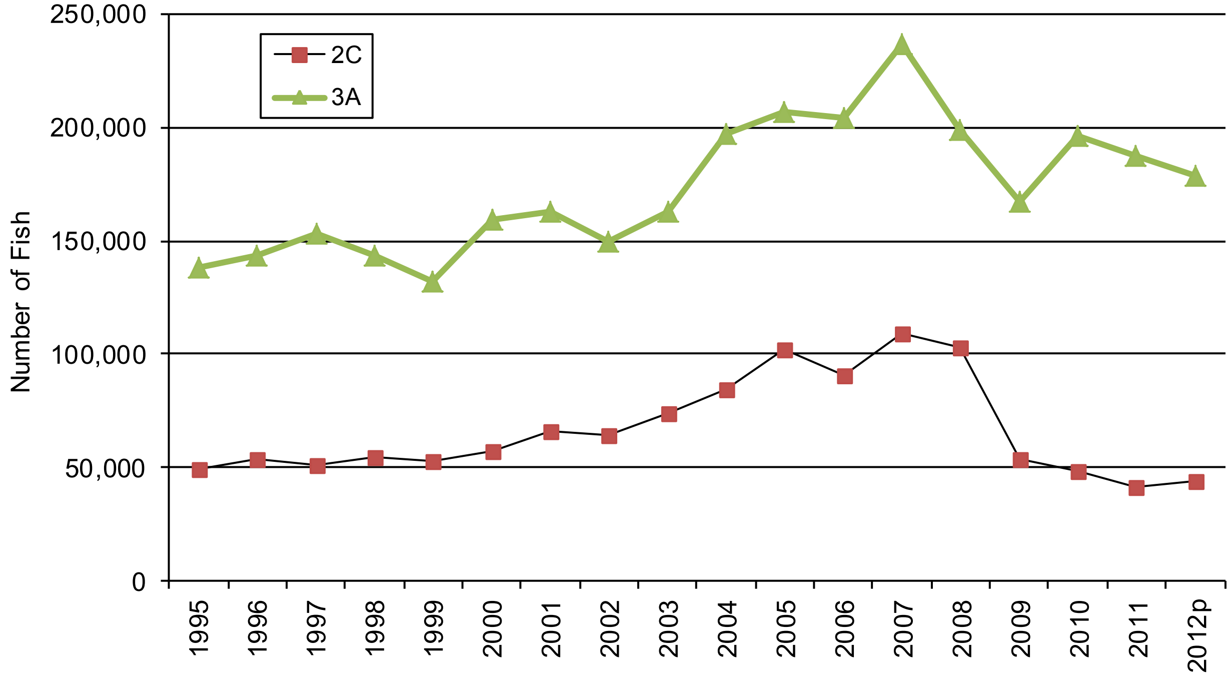


Notes: 1. Value and price adjusted to 2011 dollars using the GDP implicit price deflator developed by the U.S. Bureau of Economic Analysis. Year 2012 is preliminary.

2. Year 2012 volume is shown as statewide total allowable catch (TAC). Harvest value for 2012 assumes a $5.80 per pound season price statewide, $6.14 for Area 2C, $5.83 for Area 3A, and preliminary volume for each area.

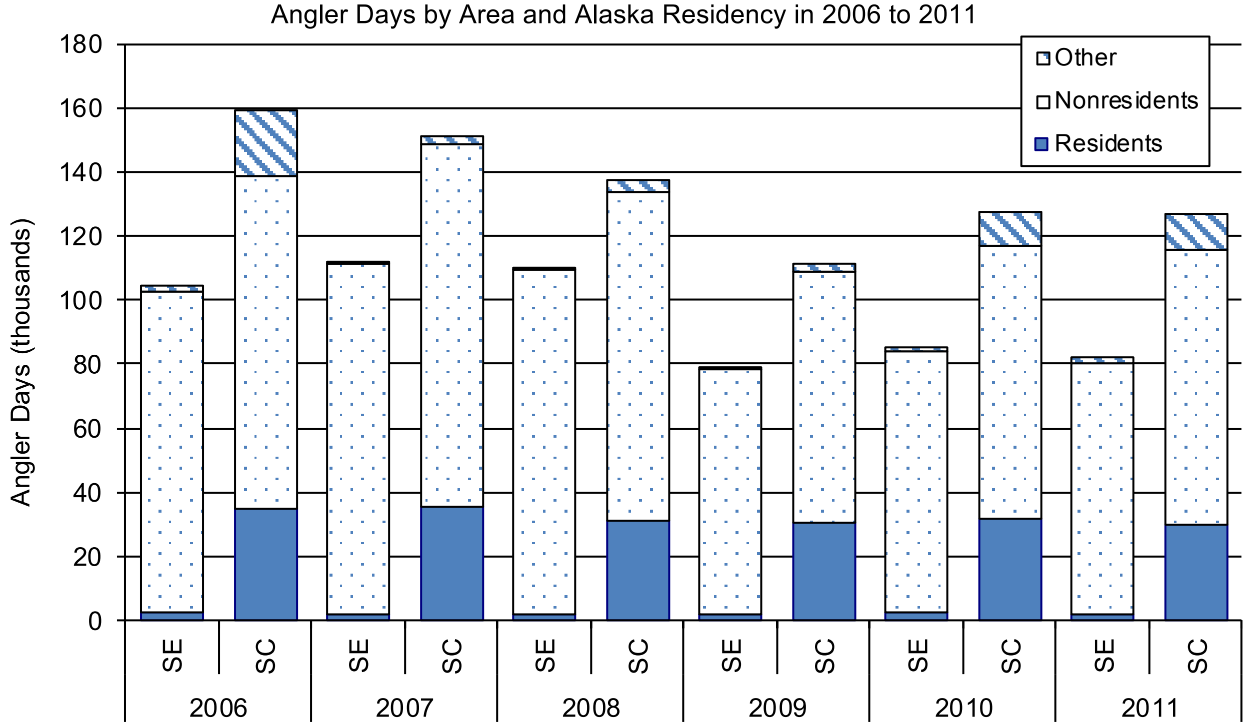
Sources: NPFMC (2001, 2008a, January 2012, and September 2012), NMFS (September 2007), NMFS RAM (April 2012), and IPHC (2012). Preliminary 2012 prices from Federal Register (2012). Preliminary 2012 volume from Gilroy and Williams (2012).

Figure II.3
Alaska Halibut Charter Fleet Harvest Trends in Area 2C and 3A in 1995 to Preliminary 2012



Sources: NPFMC (2001, 2008a, January 2012, and September 2012), NMFS (September 2007), and IPHC (2012). Preliminary 2012 from Gilroy and Williams (Dec. 6, 2012).

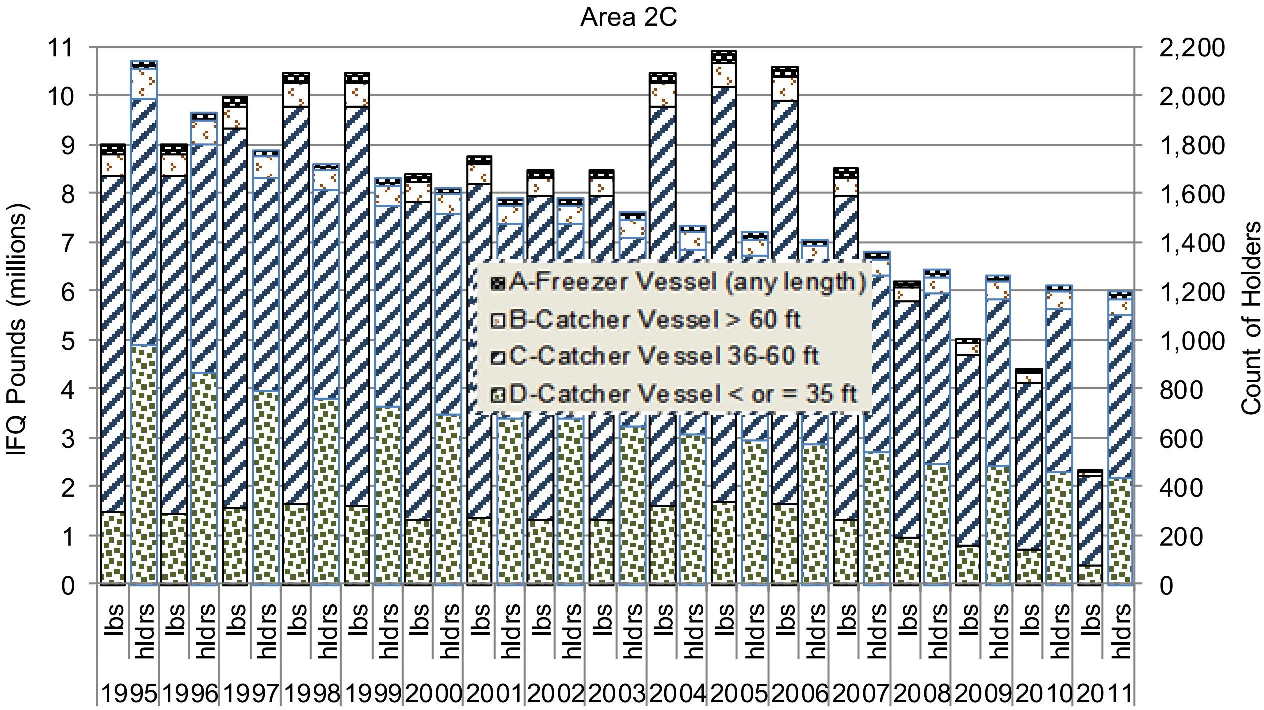
Figure II.4
Alaska Saltwater Recreational Guided Angler Sector Bottomfish Angler Days by Area and Alaska Residency in 2006 to 2011

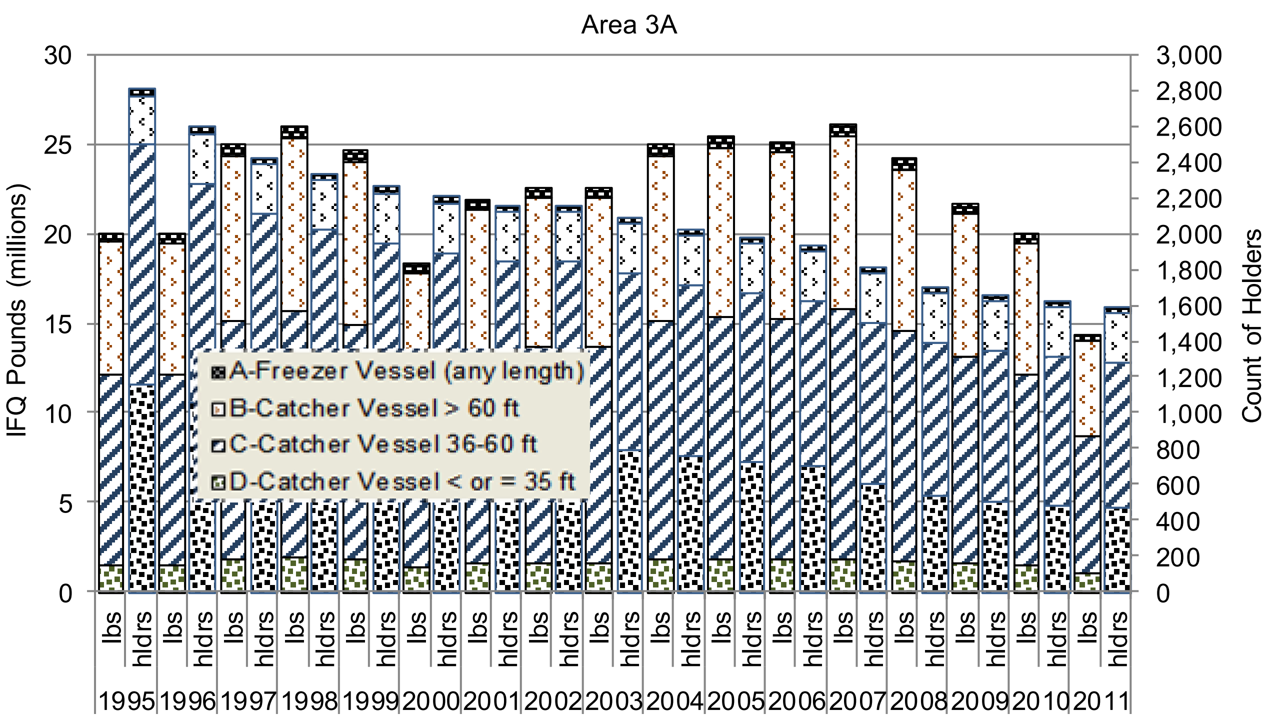


Notes: 1. SE=Southeast, SC=Southcentral.
2. "Other" includes comped, crew, and unknown angler days.
3. Angler days when halibut is retained is not distinguished from days when other bottomfish is being fished.

Source: Sigurdsson and Powers (2009, 2010, 2011, and 2012), using charter logbook data.

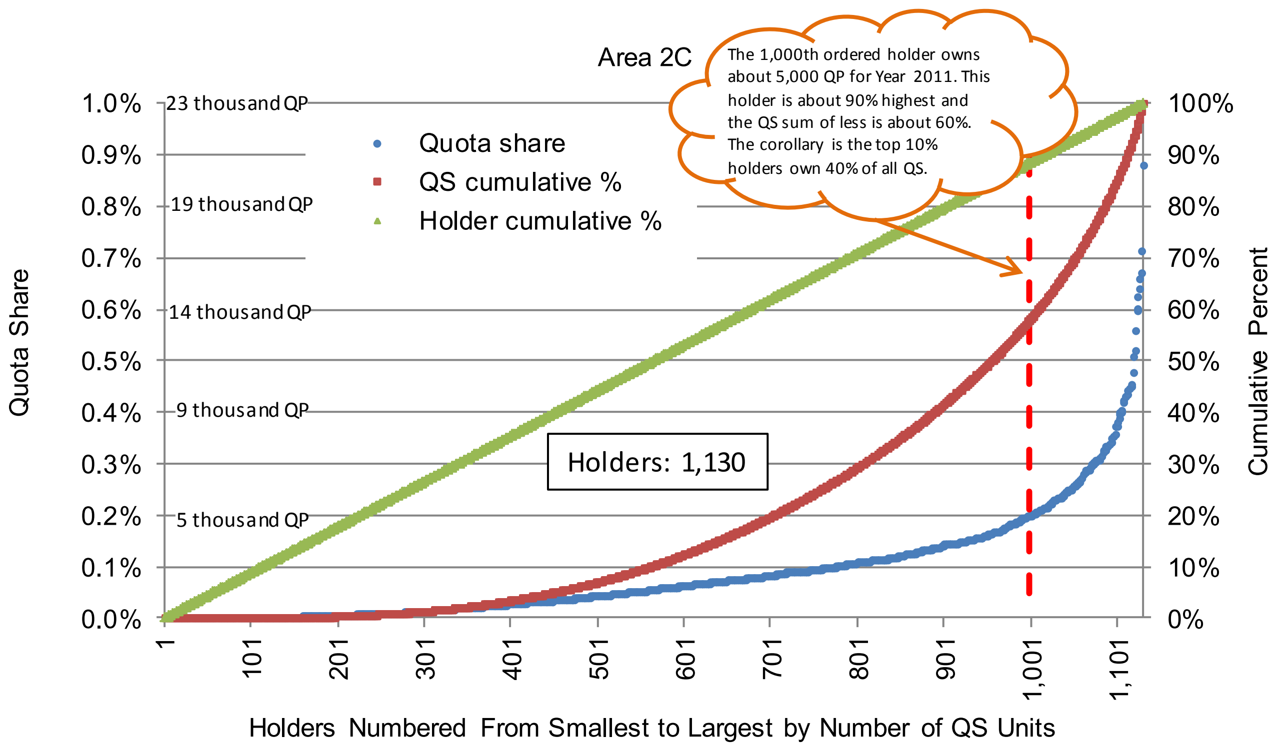
Figure II.5
Halibut Quota Pounds and Count of Holders by Vessel Category in 1995 to 2011

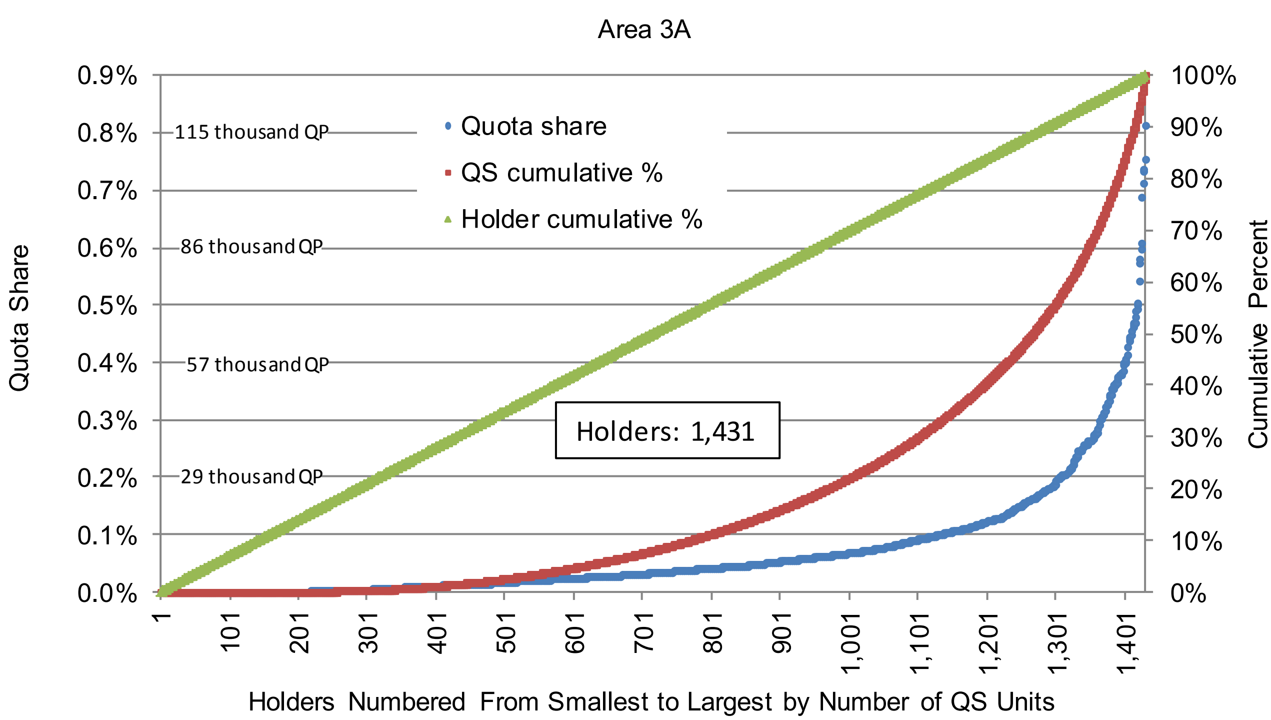




Notes: 1. Holders may be counted in more than one vessel category.
2. QP are calculated using the TAC for each shown year.
Source: NMFS RAM (November 13-14, 2012).

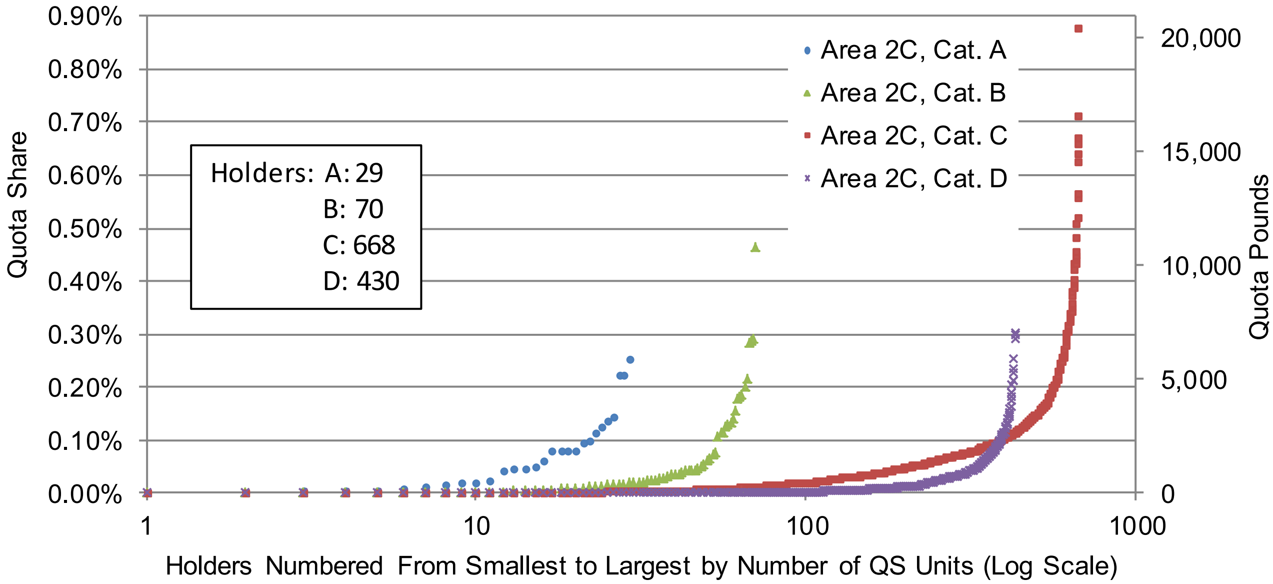
Figure II.6
Quota Share by Order of Holders for Area 2C and 3A in 2011

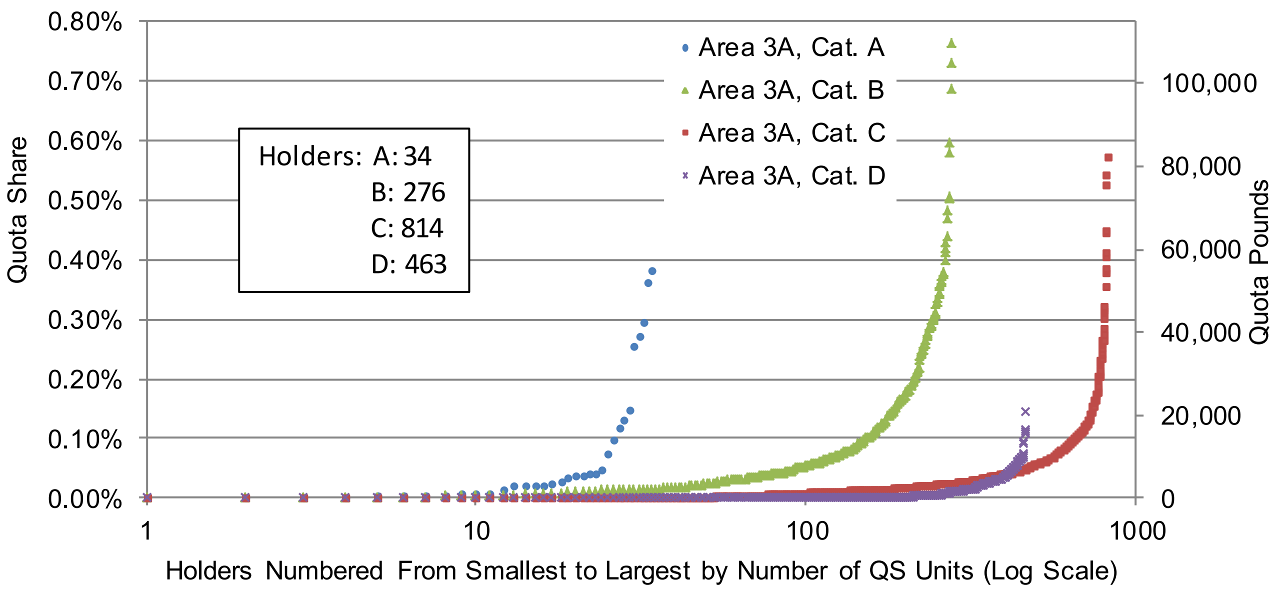




Source: NMFS RAM (November 13-14, 2012).

Figure II.7
Quota Share and Quota Pounds in 2011 by Order of Holders and by Vessel Category for Area 2C and 3A





Source: NMFS RAM (November 13-14, 2012).

III. INTER-SECTOR QUOTA SHARE TRANSFER ECONOMIC ANALYSIS METHODS

A. Problem Statement

The Alaska halibut fishery provides substantial contributions to regional, state, and national economies. These contributions include $113.3 million personal income in Alaska from Area 2C and 3A from commercial harvesting and processing in 2005 according to McDowell Group (2007). The recreational sector generated $182.4 million personal income for individual and package trip expenditures by resident and nonresident angler when saltwater fishing in 2007 according to Southwick Associates Inc. et al. (2008) and $152 million personal income in 2011 according to Southwick Associates (2013). From a broader perspective, the Pacific halibut fish resource contributes to the ecosystem and has cultural and other intrinsic values. There are techniques in the discipline of economics to account for all of these values when considering the tradeoffs for one fish resource use or another. The purpose of this study is not to dwell on all of the absolute economic measurements for the fishery, but to discuss the marginal economic effects for tradeoffs from small changes in user allocation amounts. The discussion is necessary because recent North Pacific Fishery Management Council (Council) halibut fishery management decisions have not benefited from quantitative-based economic descriptions. As such, there is not the usual suite of reliable economic factors developed by others that can be referenced to show the economic consequences for moving allocations from one sector to another.

The Council has worked diligently on their responsibilities to promote conservation of this economically important species. The history and progress for developing sharing arrangements between user groups up to the Council February 2001 meeting is aptly described in NPFMC (2001). That document was significant because it offered economic analysis decision making information as required by the Northern Pacific Halibut Act (NPHA) and Magnuson Stevens Act (MSA). The economic analysis was able to utilize what were then recent studies (Lee et al. (1999a and 1999b), Herrmann et al. (2001), Wilen and Brown (2000), and others) for decisions related to commercial and charter fleet sector allocations. While some of the recreational economic studies were for angler participation in the Kenai area, explanations were provided with respect to applying the information for determining statewide effects on the Alaskan economy.

Through court decisions and rejections of management approaches by the Commerce Secretary, the Council has had to face and revisit many decisions about conservation and use of the halibut resource. The decision making about controlling the fishery and making allocations since the publication of the NPFMC (2001) document has not had the advantages for being informed with a similar level and extent of quantitative economic information. Subsequent National Environmental Policy Act (NEPA) and other Council documents do discuss and provide some numbers for the direct value effects to the user groups and even offer partial calculations of indirect economic effects, but stop short of carrying through to model how those effects play out in the national and Alaska economies. This is a critical and needed analysis because of high trade leakage in the commercial fishing industry to the Puget Sound and other non-Alaskan economies. This section demonstrates how results from economic studies that are now available can provide the tools to determine economic effects for this fishery's management.

There are many past halibut fishery planning issues that deserve descriptions of quantitative economic effects.[11] This section does not provide specific results for any one past issue, but does make findings that insufficient scientific data and economic analysis has been brought to the Council's attention for making those recent management and allocation decisions.[12] We use the example of quota share (QS) inter-sector transfer between the commercial and recreational guided angler sector to demonstrate how economic analysis can be accomplished and how the information can contribute to policy decision making.

B. Applicable Economic Modeling Studies

The description we provide for economic analysis tools relies both on studies reviewed by Seung and Waters (2007) for the halibut fishery, and more recent data acquisition programs and applicable analysis content literature. The studies' results are summarized in Table III.1. Two relevant 1990's surveys were reported by ISER (1999) and Lee et al. (1998). The ISER study used survey data from 1993 and 1994 to estimate net economic value (NEV) and regional economic impact (REI) in regions and statewide. However, the results had to be summarized over target species and modes (guided and non-guided, bank and boat, etc.) to preserve representativeness. The Lee et al. (1998) study was about marine recreational fishing activity originating from the Kenai Peninsula in 1997. The survey results have stated accuracy levels for halibut as a target species. Hamel et al. (2002) and Criddle et al. (2003) utilized the data for the economic modeling. The Seung and Waters (2007) nine studies were limited to certain areas or differed in methods so extrapolations would be required for their applicability to the current decision making. The more recent data being made available through recreational and commercial surveys especially in Area 2C does not have those limitations.

The Alaska Department of Fish and Game (ADFG) sponsored a recreational fishing study in 2008 that included a survey and REI modeling (Southwick Associates Inc. et al. 2008). The study was partially prompted by concerns for completeness of the U.S. Fish and Wildlife Service (USFWS) National Survey for 2006 participant activities. Southwick Associates Inc. et al. (2008) designed their angler expenditure survey for a sufficient sample size to allow recreational saltwater fishing economic information to be reasonably unbiased for Area 2C and 3A tabulations. The sampling was also designed for accuracy at non-residents/residents of southeast Alaska, and all other Alaska residents. The Alaska Fisheries Science Center (AFSC) undertook a survey in 2007 to collect information on saltwater fishing participation, effort, and preferences of resident and nonresident anglers for their 2006 activity. Lew and Seung (2010) analyzed the stated preference choice experiment (SPCE) questions for the saltwater non-resident category. Lew et al. (2010) describe all survey results and Lew and Larson (2012) use the stated preference survey questions to estimate how recreational saltwater anglers value their catches, and the regulations governing them, for Pacific halibut, Chinook salmon, and coho salmon. Southwick Associates (2013) used the USFWS 2011 National Survey results to again estimate recreational angler REI in Alaska. However, results from that study are only applicable at the statewide level. The AFSC has begun a charter fleet voluntary economic survey. The initial year response rate was very low, making results unrepresentative. Researchers have increased outreach efforts in the hope that a second phase will generate satisfactory return rates.

Waters and TRG (2012) surveyed commercial fisherman who deliver harvests and processors who purchase landings in southeast Alaska. The commercial longliner vessel type cost and earnings profile from that study is used in this study for economic modeling. The Waters and TRG (2012) study builds on an earlier TRG (2007) study for statewide commercial fisheries.

It would be convenient to have a regularly updated measure of the relative economic effects from a unit of halibut catch taken in the commercial and recreational sectors, and then simply compare those two values. Work by Criddle (2004) may come closest to this by attempting to estimate the benefits-maximizing allocation of halibut between commercial and recreational fisheries for a single point in time. (Benefit maximization says an efficient allocation occurs when the combination of net benefits to consumers and producers in each sector is greatest.) It is rare that an economic benefit-maximizing study exists for a fishery. The catch share generating the highest economic benefits for the fishery described in the Criddle (2004) study is probably still applicable, since management techniques have attempted to keep the user group share the same in recent years. The study found that benefit maximization occurs when the commercial fishing sector has 71 percent and the recreational sector has 29 percent of the harvest pounds. This is compared to actual 77 percent and 23 percent respectively for Area 3A in 2012 (Table II.1). We have chosen Area 3A for the comparison since it encompasses the region where the Criddle (2004) information was collected.

C. Economic Modeling Metrics

It is not generally appropriate to use a given quota or amount of fish based on volume or weight measure available in one fishery versus an equivalent amount accessible in another fishery to show economic effects. Harvesting the fish amounts drive the economy in different ways. Commercial fisheries economic effects are driven by the ex-vessel value and processing margin per unit of fish landed. Recreational fisheries economic effects are driven by the amount and distribution of expenditures made by recreational anglers fishing in different modes (bank, private boat, charter vessels) and in different water (freshwater, estuaries, ocean) per trip taken. These drivers are termed direct value measurements, and also are inappropriate comparison measures for equating economic effects.

Commercial fisheries direct values include dollar amounts received for harvests plus first wholesale value received by processors. Indirect economic effects include spending by suppliers of fuel, gear, ice, bait, food, electricity, water, equipment, etc. who sell directly to vessels and processors. Induced effects include the economic activity driven by the spending of income by fishing and processing crews, owners of the vessels and plants, and employees of the suppliers. Adding up all the rounds of re-spending in the economy produces the estimate of total economic impact. The amount of the total output paid out for labor determines total income impact and can be translated to the number of jobs generated.

In the case of recreational fisheries, the direct value effects are the payments made by anglers for the goods and services directly related to their fishing experience. However it is sometimes difficult to determine whether expenditures are incurred for the act of fishing or are related to another non-fishing activity. Researchers usually apportion expenditures among the different activities, and also make assumptions regarding which expenditures were made locally versus at home or en route. For this reason, total impacts, the sum of all direct, indirect and induced spending in the economy, can vary considerably depending on the share of total angler expenditures assumed to be both local and fishing-related.

The calculation of indirect economic effects does generate appropriate comparison measures. However, an issue when showing indirect economic effects is confusion between concepts of "economic impact" versus "net benefit." Economic impacts are a measure of the amount of money changing hands in a regional economy (i.e., the dollar value of transactions), while net benefits are a measure of the value received in excess of the costs incurred by a defined user group. For industry producers such as harvesters and charter fleet operators, net benefit roughly equates to economic profit. For seafood consumers and recreational users, net benefits are more difficult to measure and usually depend on interpreting behavior and comparison responses for a carefully designed survey.

Economic impacts are typically measured using input-output (IO) models. In an IO model, industries produce "output" by combining goods and services purchased from other industries and households. The total amount paid by industry for all inputs used in production, including goods, services, imports, taxes and depreciation is called total expenditure. Total expenditure is the broadest measure of economic activity and is equal to total output or total sales by industry. However total output can bear little resemblance to the amount of value generated in the economy. For example, suppose a luxury car dealer sells an imported car for $100 thousand. Total sales in the economy are $100 thousand but most of that amount goes overseas to pay for the factory where the car was made, shipping across the ocean, and delivery to the local dealership. Of the remainder, the dealer pays costs, including utilities, insurance, interest, advertising, and employee commissions or salaries. Only this latter item, and perhaps and a small profit for the dealership owner are counted as "income" accruing to the local economy. The portion of total output paid by industry as wages, salaries, proprietors' incomes, dividends, interest and rent represent compensation for the use of labor and capital services. These industry production costs become income paid directly to the recipients. In total these payments are the components of personal income.

However, even personal income is not a net benefit because (1) some of the costs of resources used and opportunity costs are not counted, and (2) changes in personal income may not necessarily accrue to the persons who resided in the region before the change occurred. While personal income is a closer measure of regional benefits than is total output, total sales, or total expenditures, they are still not the same things. From a national perspective, the highest-value use of public resources is achieved by maximizing net benefits, where all values and opportunity costs are accounted for. From the standpoint of a local economy, economic impacts are more important than net benefits, as impacts represent an actual flow of funds in the economy. A policy that generates positive income impacts on local communities may not increase net national benefits, while one that maximizes net benefits may leave out local communities.

Several key assumptions greatly affect estimated economic impact results, especially in an economy as unique as Alaska's. The treatment of halibut quota pounds (QP) lease payments and use of hired skippers are examples. Lease payments and proprietorship income should be treated as a stream of income to the QS holder. Then the place of residence of the QS holder needs to be considered to estimate revenues being exported from Alaska economies. The NMFS RAM (April 2012) report shows in 2011 that 28 percent of Pacific halibut quota in Alaska is owned by non-Alaska residents.[13] Minimizing the outflow to non-Alaska residents was a design objective for the halibut fishery individual fishing quota (IFQ) program.

Another important and related assumption in economic impact modeling is the amount of trade "leakage" in the economy, i.e., expenditures for imported goods and services, including labor. Economic impact models normally track incomes paid by businesses in a region but not necessarily to a specific group of recipients. Some income is paid to resident households, and some is paid to non-residents. Income paid to non-residents and purchases of goods and services produced non-locally represent imports into the region. Payments for imports do not count as income from the perspective of regional residents, and so do not figure in the calculation of benefits for residents.

Commercial fishing economic impact estimates do not generally address effects on recreational anglers or consumers of processed seafood. Likewise, recreational sector economic impact estimates do not generally address effects on commercial fishers or consumers of processed seafood. Nor do they address any net economic benefits enjoyed by the recreational anglers themselves. However by simultaneously running the changes in apportionment of Pacific halibut quota and catch levels on both commercial and recreational fisheries, a resulting "net" effect of income change in the overall economy can be estimated.

There are a number of economic concepts that require special consideration when modeling economic effects:

- Substitution effects: Assumptions about the possibility of substitutes are critical to the analysis of changes in net benefits or impacts from a given change in regulation.

- Application of multipliers: They should not be used to estimate economic values. Output multipliers larger than 2.5 should be carefully scrutinized.

- Gross versus net benefits: Assigning value on the basis of benefits or revenues alone (without costs) leads to exaggerated results.

- Lump-sum tradeoffs: "All or nothing" thinking ignores the importance of marginal changes in value. Efficient allocations are determined on the basis of incremental tradeoffs in NEV's.

- Benefits transfer: Applying or "transferring" measures of economic benefits or value from one fishery to another is of limited usefulness unless there is a high degree of similarity among fisheries.

- Stated and revealed preference surveys: These survey approaches to valuing recreational fisheries, such as contingent valuation, are potentially prone to bias. Because valuation is only "contingent," and not observed through market transactions, people have an incentive to shape their responses to influence the results. Research methods require careful structure and testing to ensure unbiased results. A revealed preference survey approach can be more useful to valuing recreational fisheries, such as the travel cost method, but is highly sensitive to the way the models are constructed.

- Validation using hindcasting: There should be evidence that the models were validated using hindcasting and other ways of revealing predicted/actual results, review of sensitivities with respect to limiting factors, discussion of error multiplying, and other characterizations to show their applicability and usefulness. These characterizations would apply to both empirical and theoretical models regardless of whether they have static or dynamic features.

D. Economic Modeling Application

This section explains in more detail direct value and indirect economic effects measures. Derivations measurements, such as cost effectiveness analysis (CEA) and cost-benefit analysis (CBA) are also explained. Data sources, research studies, modeling methods, and intermediary tables used to derive the economic measurements are referenced.

1. Direct Value Effects

Direct value measurements for the Pacific halibut fish resource are readily available or, in the case of the recreational sector, can be estimated using participation counts and economic survey results. The often quoted direct value measurements for the commercial fishing sector are harvest revenue and first wholesale value. The harvest and processing volume and value trends were reported in Chapter II. The direct value for the recreational sector is expenditures made on fishing trips. While useful, especially for showing trends, direct value statistics can be misleading.[14] Both commercial harvesting and processing and marine recreational fishing have heavy labor, materials and services, and capital requirements. The amount of return to the user group business owners (charter fleet operators, destination resorts, commercial vessel owners, processors, etc.) is a small fraction of the money received from receipt of angler spending or harvest and processing revenues.

Recreational fishing direct value measurements require additional interpretation. Recreational fishing expenditures may have been spent anyway in other discretional spending, even if the fishing opportunity was not there. This is especially applicable to resident anglers who might make other local purchases if not on fishing. Also, fishing trip expenditures do not represent all angler spending. There is also capital spending for fishing equipment, boats, etc. This type of spending is generally not associated with a direct value measurement for a fish resource for several reasons: 1) it could be spent in an economy elsewhere from the fishing location -- such would be the case of non-residents; 2) it is usually for a capital item that could be used to pursue other fish resources; and 3) the purchase may be unrelated to the decision to take a fishing trip for the fish resource being studied.

When analyzing commercial fisheries there exists a relatively large amount of data on price, effort, costs, and other economic variables with which to evaluate potential impacts of management actions. Commercial fisheries management in most cases mandates a data collection process as a condition of participation in these fisheries. In recreational fisheries, the converse is true for most cases. While basic data are collected, such as how many fishing licenses are sold, there is a lack of market-based (directly observed) data available with which to conduct analyses. As a consequence of this data deficiency, most economic studies of recreational fishing rely on non-market values, estimated using revealed and stated preference methods to estimate benefits of recreational fishing. These models relate an angler's decision of fishing activity choice to characteristics of the activity chosen, characteristics of activities not chosen, individual angler characteristics, and possibly other influences such as weather. They also provide the basis for calculating the utility of the attributes of a fishing activity, such as expected catch or the number of fish able to be retained (Raguragavan et al. 2010).

The characteristics of a charter fleet trip in Alaska are significantly different to those examined in the majority of existing literature. The main target species are Pacific halibut, Chinook and coho salmon, and rockfish species. These species are subject to various bag and size limits depending on the geographical area in which they are targeted. Pacific halibut are both prized for their meat and seen as a 'big game' fish, and are likely to have a large impact on demand for charter fleet trips in Alaska. Salmon species are often caught as a side-board to halibut although salmon-specific charters are common. Using estimates of demand for charter fleet trips from other fisheries in the U.S. to infer potential impacts in Alaska is problematic. The population of potential charter fleet clients and characteristics of the trip on offer differs significantly between fisheries. For example, comparing Stoll and Ditton (2006) estimate of consumer surplus in the bluefin tuna fishery, which is largely catch and release due to conservation concerns, to Alaska's halibut fishery with a large emphasis on meat, less conservation concerns, and a more tourist-oriented clientele may not be realistic. Estimates from other fisheries must therefore be used as a guideline for comparison purposes.

Recreational fishing trip expenditures are not a serially reported data set. The data must be acquired in special surveys. There are sufficiently credible studies that are directly relevant to the Alaska halibut charter fleet industry for which direct values and more in-depth economic effects values can be drawn.[15] This report's Section III.B provided descriptions of applicable economic data and interpretation studies.

2. Indirect Economic Effects

Although it is usual to think of commercial and recreational fisheries as producing different types of values, these values are not entirely exclusive.[16] Commercial fisheries emphasize market values - revenues to the fishery, incomes of fishers, and the impacts of their expenditures - but they also entail non-market values associated with job satisfaction, cultural heritage, stability, operating flexibility, food provision, community health and minimal conflicts. Recreational fisheries emphasize non-market values - enjoyment of the recreational experience, subsistence and gourmet food, stability, and flexibility - but they also generate economic effects through angler expenditures and the impacts of these expenditures.

Allocation is the essence of economics: the sharing of scarce resources among competing uses. The key economic concepts that arise from economics include: valuation, impacts, and distribution, all under variable conditions. Information on the value of commercial and recreational fisheries, on the economic impacts generated by these fisheries, and the distribution of those impacts can all help inform the management decision about allocation.

Economic value can be represented at different levels and for different attributes. Economic value can be produced at the individual, business, or social level. Fishery management is generally concerned with economic and social value produced by a publicly owned resource - net social benefits. The determination of which fishery or combination of fisheries produces greater overall value to society is an empirical one that varies across fisheries and changes over time. There is no general answer. The weighting of societal values ultimately is a political determination to be made in policy bodies within their broader management mandates.

This section has offered a brief description about methods and measurements that are available to reveal economic effects of management alternatives. Central to quantifying the effects is the calculation of NEV. An efficient allocation of the halibut fish resource would occur when NEV is maximized, i.e. when the allocation maximizes economic efficiency. The MSA through National Standard 5 mandates that efficiency be considered in management decisions. There may be other distributional effects measured by direct value to user groups or REI to the economy that produce winners and losers in the decisions.

The recreational sector fishing NEV calculations rely on the results from Criddle et al. (2003). Applying the research results to the entire Area 3A and statewide to include Area 2C would require an assumption halibut fishing trip characteristics all of 2C and 3A are the same as those that characterize the Kenai Peninsula locations. The NPFMC (2001) document concludes that statewide extrapolations are inappropriate for applying Criddle et al. (2003) results. However, as a first approximation for estimating direction and magnitude, using best available information is warranted. As long as the reader is aware of the applicability assumption, then further interpretation can be made for any comparative calculations that use the survey results. Rather than concluding that insufficient data and research exists and only qualitative descriptions can be used, it is suffice to accompany analysis with statements about possible bias and uncertainty due to a different client mix and trip characteristics for areas outside of the Kenai Peninsula.

3. Other Economic Metrics

The above discussion on economic effects dwells on the need and usefulness to offer quantitative measurements for efficiency and distributional effects at the state and community economic level. These measurements are statutorily required and are usually of genuine interest to decision makers. Below we mention other economic measurements such as CEA and NEV used in a CBA framework. A CEA methodology description is provided, but does not have an application example. A CBA is provided in Chapter IV to show economic efficiency changes from moving halibut resources from the commercial to the recreational sector. A third analysis method termed multi-criteria analysis (MCA) described below references CBA results and other economic effects measurements. It is a procedural and presentation technique that undoubtedly has familiarity with experienced decision makers which makes an example superfluous.

a. Cost Effectiveness Analysis

CEA is a way to assess how to get the biggest "bang for the buck." CEA is appropriate for alternative actions that 1) produce the same or similar type of output, 2) have costs and output that can be measured or reasonably estimated, and 3) have costs large enough to justify the additional analysis. CEA can be used to compare two or more alternatives when the projects have the same type of output. For example, what alternative management technique (gear, area-time, other restrictions) might achieve the lease cost for reduced halibut bycatch. The measurement unit in this case would be harvesting cost per saved fish.

There are two general types of CEA. Type 1 addresses the selection of a set of actions from among several alternatives. Actions that achieve the objective for the least cost are the most cost-effective. Type 2 addresses the selection of a single cost-effective action from among several alternatives.

As might be surmised, CEA has limited application but is certainly not precluded from providing information to fish resource allocation actions. The problem is assessing the user group and administrative costs that might be incurred from imposing the action and then tying them to a common objective such as an equity measurement. Because there is disparity to what costs mean to user groups, there will be different interpretation even if common objective can be found. CEA is more informative when applied in the Type 1 situation for a single user group's policy question. The advantage of CEA is that only costs and objectives need to be quantified rather than economic effects measurements for benefits.

b. Cost-Benefit Analysis

CBA is a method to compare gross benefits of the project or policy (e.g., gains) with the actual and opportunity costs (e.g., losses). It can give insights into the economic efficiency of management and regulatory actions. It is a surrogate measure of the public's willingness to pay for a gain or to avoid a loss, or as the willingness to accept compensation to tolerate a loss or to go without a benefit. Opportunity costs may be such items as wages forgone by skippers and crew members who elect to work in the fishing industry rather than other industries. Opportunity costs for a recreational angler might be foregone wages if an employed person was fishing rather than being compensated for working. Opportunity costs may also include the loss of benefits associated with growth and reproduction if the fish were allowed to escape rather than be harvested. An important feature of CBA is that incorporates changes over time to the extent that varying benefits and costs are known to change over time. Future differences in the stream of net benefits are reduced to present value via application of expected discount rates on the net benefits.

The accounting stance for a CBA is important to declare when providing results. A CBA at a most basic level can simply be a financial analysis when, for example, a business wants to know whether profits can be made on a new venture. The traditional financial CBA deals with actual financial transactions and makes orthodox commercial analysis on the basis of market prices of products and all factors of production. It does not deal with the questions of distributional equity and does not make an analysis of the impact of externalities. When the perspective is changes in net benefits to the nation, then additional considerations need to be made whether one activity is just replaced with another or true added value is resulting from an action. For example, a government subsidy that is needed to maintain or inaugurate a project is not a benefit since it simply moves derived taxation from one use to another. To the degree of interest by decision makers or depending on the regulatory requirements for decisions, additional variables for social and environmental impacts can be introduced. The introduction adds abstraction to results as social and environmental variables are not always a marketed resource and shadow prices or comparative prices must be used. Any lessor inclusion of every possible impact measurement means the CBA becomes a limited CBA. However, a limited CBA is not an invalid CBA. The decision maker using results simply needs to be aware of the accounting stance and included variables.

Aldrich et al. (2001) counsels that decision makers are faced with the awkward problem of evaluating potential outcomes and choosing policies to achieve these outcomes in the presence of intense complexity. If it is at all possible to specify what an alternative outcome might become using ordinal or cardinal measurements, then it is the decision maker's interest to decide which alternative might be best. CBA is an analytical tool, which has the potential to significantly promote this process. It provides a means for systematically comparing the economic value of outcomes with the costs for achieving the outcomes. When all else is equal, the more economic efficient scenario should be chosen over the less efficient one.

CBA is capable of providing a calculation of equity, but CBA cannot measure the multi-dimensional aspects of overall policy desirability that may include such factors as sustainability, altruism, ethics, public participation in the decision process, and other existence and social values. The intent rather, is to provide the magnitude of the differences between gains and losses. The most economically efficient choice may not be optimal without weighing efficiency against other important criteria that would affect overall social desirability. Therefore the CBA may inform the decision process, but it cannot by itself determine policy. Techniques such as MCA may be more applicable when multi-dimensional inputs are important.

The calculation of NEV from commercial fishing includes what changes occur in consumer and producer surplus. Surplus in this sense is the difference between the benefits and costs arising from the consumer and the harvester/processor sectors. Any valuation of the halibut fishery involves a seafood market where there are substitutes. In these cases, the demand curve is relatively flat. That is, if consumers are faced with a rise in the price of halibut, consumers will shift their consumption to an alternative protein product. There are no extra benefits (or consumer surpluses) that could be counted resulting from consumers' willingness to pay different prices for a specific halibut fishery product. Therefore, most economic valuations involving seafood will center on the benefits that a producer receives (or producer surpluses) from the harvesting and processing of halibut.

The calculation of producer surplus for harvesting means the costs of harvest (fuel, repairs, labor, etc.) should be subtracted from the gross revenues. Because fishing seasons are of short duration, most fishing boats are not limited to halibut fishery participation. The investment in boat and gear is also used for other fisheries. Also at low stock abundances, it is often argued that any increased harvest could be taken with almost the same amount of labor, fuel, gear, etc. as before. This assumption implies that almost no additional costs are involved and gross harvest revenue is close to net benefits. Without detailed investigation of participant business portfolio, the application of CBA needs to have a stated assumption about whether there are substitute fisheries for replacement of lost harvest revenue due to a policy action. Generally for showing a maximum likelihood, the assumption is made that replacement is non-existent.

The assumption of full employment is implicit in most benefit and cost analysis. But unemployment and excess fishing capacity, both transitory and chronic, seem to prevail in many coastal communities dependent on commercial fishing. Changes in markets or fishing opportunities may make it necessary for people and capital to change occupations and/or locations. Various factors make it difficult for this to happen quickly enough to prevent a period of unemployment and idle capacity. The Water Resources Council (1979) suggests that when "idle boats" are available, the only NEV will be the operating costs.

Because it is difficult to collect data on the commercial halibut fishing industry for specific areas, a general guidance may be to present information for harvesters and first level primary processing basis on a regional basis. Because primary processing is an integral part of producing halibut products, a portion of the primary processor margins should also be used to calculate the NEV of commercial fishing. It is argued that the only processing benefit that should be included is the minimal amount of processing required to move the fish out of the region - dressing, icing, packing, etc. The first level processor basis should be used because in many areas tendering and other costs and incentives (such as year-end bonuses) may not reflect the actual ex-vessel prices. It may also be argued that the first level processing in any area is inseparable from the harvesting sector contributions.

Using NEV commercial and recreational measurements in a cost and benefit framework over time can provide illuminating information for policy makers. It is an analysis generally applied to show overall social welfare changes, and therefore includes factors for social benefits and costs. For example, labor benefits would be credited back to NEV in the equation showing in the financial only NEV developed in Appendix A, Section A.1. The applications of this modeling approach in other Alaska must also address an emerging financial consideration in the prosecution of Alaska fisheries which is permit lease payments being made for prosecuting limited entry fisheries where individual transferable quotas (ITQ's) are privately held. Similarly, any lost social benefits representing future expectations on a decreasing halibut stock would be a subtraction in a CBA equation. Any omission of benefit and cost factors contributes to the analysis being of a limited nature. When all social factors are eliminated, the analysis simply becomes a direct financial analysis.

A CBA can be performed at any point in the policy review process. When a CBA is done *ex ante,* there is cognitive reasoning for choosing variables to be included in the analysis. This type of analysis is useful in considering whether a prospective program should be undertaken or determining the most efficient design among alternatives. A CBA done for a pilot project or when implementation is underway is called *medias res* analysis and provides information about whether a program should continue. An *ex post* or retrospective analysis provides feedback on program design. A CBA at each juncture has its usefulness. The *ex ante* is most prone to error because many assumptions are made. On the other hand, *ex post* has variables' data but costs and benefits might be attributed to factors not included in the analysis.

The CBA estimates utilized in this report should be viewed as general indicators. Specific application of the models for certain program effects or in selective geographic areas may not be appropriate. Because of these assumptions, the CBA is referred to as a "limited" model. Results are an indicator of changes in social welfare rather than a complete estimate of social welfare.

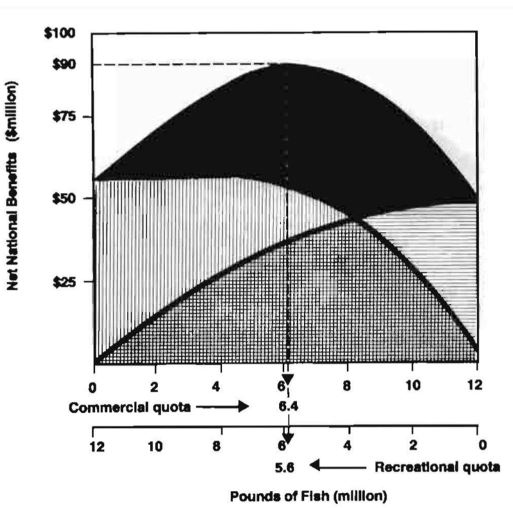
c. Multi-Criteria Analysis

MCA enables the evaluation of the attractiveness of different alternatives by comparing them according to the selected criteria (European Commission 2008). These criteria may have a different level of importance in which case relative weights are attached to them. The MCA is based on the expert opinion of specialists carrying out an assessment (when establishing criteria, attaching weights to them, assessing alternatives according to each criterion, presenting their general evaluation) and it is, therefore, more subjective than other mentioned techniques of alternatives analysis. Nevertheless, where the possibilities of evaluating the key costs and/or benefit in terms of money are missing, the technique of MCA provides enhanced structural detail and transparency to decision assessment. It also allows participants in the policy making process the opportunity to explore tradeoffs and search for compromise solutions through a series of iterative discussions and analysis. The MCA, like other analysis techniques, does not rely on a single objective such as whether economic efficiency is optimized. In other words, the possibility exists that the best alternative is a status quo alternative. The advantage is that MCA provides structural detail and transparency to decision assessment in terms of different objectives and tradeoffs. The disadvantage is that it is often based on the assessment of policy participants in a single moment in time based on criteria that are often not measured using the same "currency," criteria, or standards (e.g., NEV).

E. Demonstration Model Discussion of Economic Effects

The history of the halibut fishery is illustrative of the conflict between conservation, cultural and food values, commercial fisheries, and recreational fisheries. The challenge of conserving halibut stocks is certainly not unique in fisheries management. Mortality from directed fishery harvest and harvest bycatch is a control variable in conserving this fish resource. Extensive federal and state fishery management approaches exist to manage this mortality, and the continuing harvest opportunities depend on the degree to which this management is successful.

Economic data collection and analysis for the fishery has been sporadic and spurred by available research funding and/or policy making emergencies. The conduct of studies and the use of non-standardized and non-specific data can result in "speculative" extensions which are unsupportable by accepted scientific approaches. The AFSC ongoing project to improve on economic modeling for the purpose of providing quantitative analysis of fishery management and allocation issues is not significantly advanced for timely application to Council decisions. The delivery is eventual, but that does not mean quantitative analysis has to wait. No research economist will be satisfied with the representativeness and uncertainty that accompanies



The "hill" in the example figure traces total net economic value in the combined sectors for each possible share. Graphically, this hill is the vertical summation of net economic value in each sector. It is clear from this top curve that total net economic value is maximized at the apex, or at about $90 million where, the anglers' share is about 5.6 million pounds and the commercial fishermen's share is 6.4 million pounds. Any deviation from these shares would reduce total net economic value, including "fair" allocations such as an equal apportionment or a system that is proportional to historical use.

Although not obvious from the figure, the net economic value of the 5.6 millionth fish in the sport fishery and the 6.4 millionth fish in the seafood sector are equal at nearly $3.75. This latter property of the maximally efficient allocation illustrates the economic principle that in order to maximize the total net economic value from using fish commercially or for recreation, an allocation must equate marginal net economic values from each conflicting use of the fish stock.

Source: Edwards (1990)

calculations; and, will be hesitant to support that the calculations characterize the outcome of a management policy change. But the application of the methods in itself can lead thought process on likely outcomes, and when combined with expert interpretations, can assist decision makers who usually are far less skilled in judging direction and magnitudes of economic effects.

Available data, models, and interpretive studies are used to pull together a demonstration model whose results show that quantitative analysis of management policy alternatives can be accomplished in a meaningful way (see Appendix A). Table III.2 shows examples of the indirect economic effects of the difference between whether halibut pounds are harvested by commercial or recreational guided angler sectors. For both REI at the Alaska statewide economy level and NEV, the difference is positive when it is caught in the guided angler sector.

The results are calculated from average per unit values. This means all else being equal, the difference is positive. In reality, all else is not equal. In order to change the harvesting sector, there are going to be costs incurred and benefits effected that will affect participant behavior in both sectors. The Criddle (2006) study aptly describes scenarios and economic responses for changed harvest opportunity in the sectors. Following sections in this report recount those scenarios and describe another model type that can calculate economic effects when changes in behavior occur.

Economic analysis helps decision makers decide how fish resources can best be used by providing a way to assess: (1) the creation of benefits under various management actions; as well as (2) the impact of those actions on local, regional and national economies. Studies can be designed for theoretically comparing reallocations in the commercial and recreational fisheries (Edwards 1990 and 1991, Holland 2002, Blamey 2002, Hundloe 2002, and more recently Plummer et al. 2012). However, in applied analysis, this is far more difficult given the inherent weaknesses and biases that can plague the design, particularly where there are few if any market signals to ground truth or tune the studies. In addition, public resource allocation decisions are rarely made for a single objective such as economic efficiency or economic impacts, so it is difficult to raise the resources (time and budget) to conduct the analysis.

Conducting high quality and comprehensive economic studies will require far better data than is presently being collected. The timing and frequency of economic data collection must be carefully integrated into the timing of management and allocation decisions. Economic decisions, however, may not be on the same schedule as biological decisions. Harvest decisions require "real time" annual updates of both biological and market data. There has been a charter mandatory logbook program since 1998, however official catch estimates use a sample survey of licensed anglers. If the new Catch Sharing Plan (CSP) is approved by the Commerce Secretary, then official estimates will rely on estimates using logbook program submittals. To make economic measurements timely and accurate, there could be a requirement that both the commercial and charter fleet sectors submit economic reports similar to those required under the crab rationalization program. This would not include all necessary data collection needed for the studies, such as what can only be garnered through revealed and stated preference surveys from anglers (Duffield et al. 2002). But it would go a long way to providing modeling research inputs. Of course, any such data collection procedures should be preceded with a heavily collaborative and peer reviewed research plan. The plan would outline the core set of routine data collection and analyses that will assist in economic model development.

Our discussions have brought together existing completed research to demonstrate that NEV and REI measurements could be calculated. One of the insights gained from these demonstration calculations is that there are significant economic consequences for allocation decisions. The demonstration measurements were characterized in the discussion for only having ordinal level accuracy and at most showed the direction (positive or negative) and relative magnitude of the economic effects. The discussion concluded that a more thorough application of available tools would be warranted. However, paucity in existing data and lack of comprehensive research results should not be an excuse for not carrying through on using best available data and modeling practices.

The lack of analysis for showing quantitative economic effects should be an important public concern. The inability to understand the economic implications of alternatives limits the ability of the managers and policy makers to effectively address the allocation problem. Without an adequate understanding of the economic consequences of alternative policies, decisions may be made that are unnecessarily adverse to industry and/or economies.

Table III.1
Halibut Fishery Economic Data Survey and Modeling Selected Studies

Data Description Publications	User	Survey Type	User Activity Year	Survey Design for Results Accuracy: Species	Mode	Region	Origin	Water	Other Interpretation and Extension Studies	Economic Effects: REI	NEV
ISER (1999)	Rec	M, T	1993/1994	N	A	S	R, NR	S,F		Y	Y
Lee et al. (1998); Herrmann et al. (2001)	Rec	M	1997	Y	G	Kenai	R, NR	S		N	N
									Hamel et al. (2002)	Y	N
									Criddle et al. (2003)	Y	Y
TRG (2007)	Comm	F	2004	-	-	S	-	S	Waters and Seung (2010)	Y	N
Southwick Associates et al. (2008)	Rec	M	2007	N	A	S, SE, I	R, NR	S,F		Y	N
Lew et al. (2010)	Rec	M	2006	Y	G	S, SE	R, NR	S,F		N	N
									Lew and Seung (2010)	Y	N
									Lew and Larson (2012)	N	Y
Waters and TRG (2012)	Comm	M, PI	2010	-	-	S	-	S		Y	N
USFWS (2012)	Rec	T	2011	N	A	S	R, NR	S,F	Southwick Associates (2013)	Y	N

Where: User is Comm - commercial vessel and processor businesses, Rec - recreational guided and unguided angler
Survey type is F - fish ticket and COAR data, M - mailout, T - telephone interviews, P - telephone or in-person interviews, I - angler intercept
Species is accuracy at the King, coho, and other bottomfish level: N - no, Y - yes
Mode is accuracy for G - guided and unguided, A - not designed for guided and unguided
Region is accuracy for: SE - southeast, SC - southcentral, I - interior, S - statewide
Origin is accuracy for R - residents, NR - non-resident
Water is accuracy for: S - saltwater, F - freshwater
REI is regional economic impacts measured in personal income
NEV is net economic value

Notes:
1. The table shows that NEV is a statistic provided in the Lew and Larson (2012) article. However, it is an absolute willingness-to-pay (WTP) measure without angler trip expenditures subtracted. The study does offer results for changed WTP due to changed fishing experience. The results are not distinguished by guided or unguided participation, but are itemized for angler residency.
2. A study not showing in the table is Herrmann et al. (2000), prepared for the Minerals Management Service. The data used in this study was the same summary of Kenai Peninsula anglers for activity year 1997 and contained the same economic effects measurements as the other interpreting studies shown in the table.

Table III.2
Economic Analysis for Halibut Fishery Catch Changed From Commercial Sector to Recreational Sector in 2011 Using Average Per Unit Parameters

Transferred Pounds	Annual Commercial Harvest Value Change (millions)	Change in Alaska REI (millions) Commercial	Change in Alaska REI (millions) Guided Recreational	Change in Alaska REI (millions) Net	Change in U.S. NEV (millions) Commercial	Change in U.S. NEV (millions) Guided Recreational	Change in U.S. NEV (millions) Net
	Area 2C						
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300,000	(1.9)	(0.8)	5.3	4.5	(0.4)	3.0	2.6
500,000	(3.2)	(1.4)	8.9	7.5	(0.6)	5.0	4.3
600,000	(3.8)	(1.7)	10.7	9.0	(0.8)	6.0	5.2
700,000	(4.5)	(1.9)	12.5	10.5	(0.9)	7.0	6.1
800,000	(5.1)	(2.2)	14.2	12.0	(1.0)	8.0	7.0
900,000	(5.8)	(2.5)	16.0	13.5	(1.1)	9.0	7.8
1,000,000	(6.4)	(2.8)	17.8	15.0	(1.3)	10.0	8.7
	Area 3A						
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300,000	(1.9)	(0.8)	4.9	4.1	(0.4)	1.4	1.0
500,000	(3.2)	(1.4)	8.2	6.8	(0.6)	2.3	1.7
600,000	(3.8)	(1.7)	9.8	8.2	(0.8)	2.8	2.0
700,000	(4.4)	(1.9)	11.5	9.6	(0.9)	3.2	2.4
800,000	(5.1)	(2.2)	13.1	10.9	(1.0)	3.7	2.7
900,000	(5.7)	(2.5)	14.8	12.3	(1.1)	4.2	3.0
1,000,000	(6.3)	(2.8)	16.4	13.6	(1.3)	4.6	3.4

Notes:
1. REI is regional economic impact measured in personal income at the Alaska economic level, and NEV is net economic value at the national level. Per unit economic effects are from Appendix A, Table A.1.
2. Recreational unguided angler success rates are assumed to not change as a result of transferring commercial to recreational allocation, so economic change for this sector would be zero and is not shown.
3. Management specifications are assumed to change for both regulatory areas to allow for all of the changed harvest to be caught by the charter fleet.

Source: Study.

IV. QUOTA SHARE TRANSFER FINANCING

A. Problem Statement

The Catch Accountability through Compensated Halibut (CATCH) Project goal is to develop a charter fleet industry acceptable plan for creating a financial holding entity that raises funds to purchase commercial fishing sector quota share (QS). The QS is to be used to increase halibut total allowable catch (TAC) available to the recreational guided angler sector through deposits into a common pool resource. This de facto change in allocation is to maintain traditional guided angler management specifications for any size, two fish daily bag limit in International Pacific Halibut Commission (IPHC) regulatory Area 3A, and specifications for any size, one fish daily bag limit in times of low stock abundance and an any size, two fish daily bag limit in times of high stock abundance in Area 2C. It is expected that the purchasing would use an open market mechanism (i.e. rely on willing sellers) to compensate QS holders; and, the QS purchasing would be conducted in a manner that would not undermine the individual fishing quota (IFQ) program design. This would secure conditions for viable business opportunities that satisfy a tourism service market while achieving conservation goals, preserving public access, and lessening the stress between harvesting sectors. Other positive outcomes would be from reducing the need of managers and policymakers to continually revisit this issue.

Achieving these outcomes requires the CATCH Project to address major questions associated with the source of funds for financing the pooled purchase, managing the funds, and administering the purchases, sale, or leasing of quota using the funds. The CATCH Project must develop a mechanism that will generate finances adequate to purchase and manage halibut quota in order to meet their program goals. This challenge should not be underestimated given complexities of the recreational guided angler and commercial halibut IFQ fishery and the unprecedented nature of this approach given there are few examples or models in the U.S. or the world.

In considering the financing design, a core issue is whether the CATCH Project approach will be based on "asset thinking" (see definition in inset text box). The CATCH Project planned holding entity, as a rational and new market player, will initially increase QS asset value (as reflected in the purchase price) if the purchase of those assets brings greater benefits to the guided angler sector relative to the use of those assets in the commercial fishing sector. The CATCH Project approach will also increase long run asset value by recognizing that if the underlying institutional mechanisms are properly structured, the market asset value will reflect a design that minimizes costs, reduces risks, and maximizes opportunities to achieve program objectives. If the CATCH Project holding entity is the primary market participant representing

> "Asset thinking" or "optimal asset management" requires that those responsible for designing the asset institutions and then purchasing and managing the individual fishing quota (IFQ) halibut "asset" (quota) recognize they own a valuable market asset whose value (direct and indirect) will reflect the quality of these decisions. Thoughtful design and management decisions can optimize benefits to the guided angler sector—these benefits will manifest themselves as higher asset values (e.g., for quota, permits, other linked assets), increased profits, lower risks, and achievement of other goals important to the guided angler sector. In contrast to pure economic/financial markets where making decisions to maximize net present value (summation of discounted profits across time) will "optimize" asset values, "asset thinking" within the fisheries political regulatory environment requires that asset managers take into consideration a broader set of issues, constraints, and objectives. "Asset thinking" must be conducted within the larger risk context that considers the probability of policy acceptance as well as other regulatory and market issues. Of course the converse is also true—poor asset management decisions will result in lower asset values and achievement of few economic or organization goals.

the guided angler sector, then efficient mechanisms to finance, buy, sell QS and/or lease quota pounds (QP) will increase the value of the asset for both the commercial and recreational sectors, relative to inefficient mechanisms that result in fewer benefits. By strengthening asset values, it will help underwrite financing or loan schemes since QS is recognized by financial institutions as a relatively secure form of property that can be collateralized. By designing the financing mechanisms and management programs to improve asset values, overall benefits will increase for both the commercial and recreational sectors. These higher asset values will allow each sector to improve their business operations and underwrite capital investments.

A related issue is determining the amount of QS to be purchased as well as the expected price. This directly answers the question of financial amounts needed as well as whether financing strategies are affordable to charter fleet businesses and their customers. Designing a rational financing plan that will meet CATCH Project plan objectives, bring net value to guided angler sector participants, and increase asset values is critical in determining whether this novel approach can succeed.

The following sections consider the economic issues surrounding the financing and management of QS to be purchased for a CATCH Project design. Some of these discussions are similar to what has already been included in public hearing documents developed by the North Pacific Fishery Management Council (NPFMC or Council). The documents were for the charter fleet individual transferable quota (ITQ) program that the Council retracted in December 2005. Figure IV.1 is a graphic from the documents that shows the regulatory and legislative requirements for a common pool design's different financing and management options.

B. Fund Sources

There are a variety of possible funds sources to finance the purchase of QS. These include public funds, private funds, and user fees. Private funds could be voluntarily self-generated or via various fees or tax mechanisms. The source of the fund is critical to the potential success of the program since it will determine: 1) who may have access to the quota; 2) special legal and regulatory requirements; 3) administrative costs; and, 4) efficiency in aligning the economic and financial costs of the purchases with the economic and financial benefits from their use. These issues are discussed below for the three classes of funds:

1) Public funds: These may include direct grants from the government (federal, state, local) or private sources (e.g., non-governmental organizations including foundations). Grants may be associated with special taxes or funds (e.g., oil revenue taxes, lottery funds, etc.). If the purchases are paid by public funds the public would retain "ownership" of these quota harvest rights and use the purchases to support a variety of groups and needs including the guided angler sector, unguided angler sector, subsistence, and conservation. In addition, because these grants are subsidies, they could potentially distort market prices and demand for IFQ halibut since they are not being paid directly by the users. The subsidy would be potentially "capitalized" into the purchasing and selling behavior of IFQ market players and possibly inflate IFQ prices above normal market levels.

2) Voluntary private or government assessments:

   a. IFQ without a common pool: If the guided angler sector supported an IFQ program, then each charter owner could purchase the amount of QS (up to some cap) that maximized the net benefits to their respective individual business and pass some portion of these costs including price premiums onto their customers (who would ostensibly pay the costs and price premiums due to their higher level of recreational satisfaction). The interaction of thousands of market players would support a price discovery process and encourage market discipline to ensure that market prices reflected the underlying economic conditions (output prices, costs, technology, regulations, etc.) impacting the commercial and recreational sectors.
   b. IFQ self-assessed with common pool: If the CATCH Project plan is to support a common pool approach with equal sharing among participants, then using this approach industry could voluntarily assess a fee or a tax. For example, a fixed fee (per permit or angler endorsements) or variable fee (some proportion of charter revenues) would be mandated. The fees collected would be kept separate from general operating funds and forwarded to the holding entity. This concept is sometimes referred to as a holding entity stamp program to differentiate the mechanism from an angler stamp program.
   c. IFQ government assessed with common pool: Revenue could also be raised via a government fee or tax using the same type of mechanisms as self-assessment except that government would collect the fees/taxes and transfer it back to the industry for their use. This mechanism is usually referenced as an angler halibut stamp program. Whether self-assessed or government assessed, industry would attempt to pass some portion of this cost back to customers (who ostensibly would pay the increased costs due to their higher level of angling "utility" associated with larger or more abundant fish). However, because the purchase utilizes a common pool deposit, there is a single buyer representing the heterogeneous guided angler sector (700 firms with widely varying business types). As noted in Chapter V, this makes discovery of optimal prices and QS purchase levels more difficult and less efficient than approaches at the firm level (e.g., individual IFQ purchases).

3) User Fees: Levies are placed on the individual angler in the form of license fees or stamps. This is used typically by natural resource management agencies to generate budget revenue by granting privileges for specific hunting and fishing experiences. For the case of the CATCH Project, a halibut stamp would be a possible revenue option for guided angling trips. Fees would be collected by the management agencies (e.g., Alaska Department of Fish and Game) and returned to the CATCH Project plan's holding entity for use in purchasing QS. When state management agencies use targeted fees and stamps, their goal is to increase or maximize hunting and fishing revenues (especially in the case for trophy fish or game). However, this comes at a cost of participation since the higher the fee the lower the participation rate. This creates a set of "backward bending revenue supply curves *(Fee Revenues = Fee * Participation Rates)* where *Participation Rates* are a positive function of the angler/hunter experience and a negative function of *Fee* rates. Understanding the demand for hunting and fishing experiences as a function of fee rates is critical to determining the participation rate and total revenues. If the rates are too low and participation high there may not be enough revenues for management to support the required hunting/fishing experience;

conversely if fees are too high the amount of participants will be too low to generate adequate revenue to support the experience. The challenge for the CATCH Project plan is determining the "optimal" rate. This is even more complicated since the "optimal" rate must also consider the costs to purchase QS (see following section discussion). Since the stamp must be endorsed by government and co-managed with a government agency there will be government administrative costs besides internal administrative costs. In addition, it remains possible that the National Marine Fisheries Service (NMFS) may charge administrative fees to pay for costs of tracking purchases/sales/leases of QP. The CATCH Project plan will need to account for these administration costs in developing any fee program.

C. Funds and Quota Shares Management

There are a range of alternative structures or "holding companies" that could secure, hold, manage, and sell QS/lease QP for the saltwater recreational guided angler charter boat industry. In its simplest form the company could strictly conduct a one-time purchase of QS using a source of public or private financing and deposit the annually realized QP into a common pool so that all users could access the fish under similar rules consistent with the level of purchased QP plus allocated pounds. Their other responsibility, if the funds were derived from self- assessments, would be to collect payments from members of the holding company to pay for the QS. This might be a large one-time assessment (or annual or quarterly payments to finance a loan). Assuming a simple static world where charter fleet industry benefits, recreational demand, and QS costs were perfectly calculated, the purchase and payments would balance to optimize benefits for all three groups. However given the real world is uncertain and dynamic, it may be difficult to achieve the "optimal" quota purchase in a short period of time or a specially designed auction using features such as described in Curtis and Squires (2008).

1) Holding Entity as Efficient Asset Manager: The world of the charter and commercial industries, however, are extremely complex, dynamic, and uncertain. There is no single optimal level of purchase that will work across time. Even if an immediate term optimal QS purchase level could be determined, QS prices, financing requirements, and changes in recreational demand, that decision would be non-optimal in the longer term in response to changes in a) recreational demand (e.g., a shift in demand due to changes in the national income), b) halibut populations (increases or decreases due to changes in environmental conditions), or c) charter industry costs (e.g., new taxes or higher fuel costs). A well run "holding entity" would need to adjust their decision-making each year in the face of these changes in order to maximize benefits to the charter industry (and/or associated communities). For example, if halibut stocks were to grow dramatically, the QS purchased from the commercial industry as a relative percentage of total available harvest may be far greater than their harvest needs to optimize charter fleet benefits. The ability to sell QS or lease QP assets back to the commercial industry at market rates (or possibly below market rates in order to achieve other objectives including garnering political support or addressing other social objectives) would allow the charter industry to adjust their decisions to increase benefits while also increasing the asset value of their investment.

Although allowing individual charter fleet firms to buy and sell QS would maximize efficiency, industry benefits, and asset value, a well-managed "holding entity" that was able to adjust to changing market conditions and buy and sell QS, lease QP, and finance assets to meet the "average" needs of their members would generate far greater benefits than a holding company constrained by rules limiting their behavior. Similarly to the way that the rules on the commercial fleet limits their options in buying, selling, and leasing QP (which reduces the efficiency and value of the fleet in order to achieve other social objectives), limits on the behavior of the holding entity would reduce their ability to adjust to changes in the market and the environment. Two industry sectors – recreational guided angler and commercial – attempting to buy and sell QS and lease QP, but whose purchasing and selling behavior is highly regulated and constrained, would significantly limit the QS market's ability to discover and achieve "best" solutions, thereby reducing benefits to each sector as well as benefits to the general welfare.

2) Optimal Financing: As emphasized in this report, matching necessary financing with QS purchase needs is complicated by the uncertainties in the constrained market as well as uncertainties with respect to changes in behavior of recreational anglers facing higher costs or facing changes in available halibut quality or quantity. In addition, the flow rate and stock of finances may be inadequate to meet the needs to purchase QS; or conversely the flow and stock of available QS at "acceptable" prices may be inadequate to meet charter fleet industry needs even with adequate finances. This suggests that managing and building finances across time as well as selecting the optimal strategy for purchasing QS over time must be aligned. A large initial purchase of QS at "optimal prices and quantities" may require a well-financed purchase costing tens of millions of dollars and involving major industry risk. Conversely a go slow approach across many years may better align financial resources but may cost industry benefits if the lost opportunities in QS purchases reduce angler participation.

3) A Third Approach: Given the complexities in determining an optimal financing or QS purchasing strategy, the charter fleet industry could take a more cautious and adaptive approach by conducting a pilot CATCH Project program in limited geographic areas with a limited number of charter fleet vessels. The pilot would allow industry to test how the QS market works, evaluate alternative financing schemes, and evaluate angler response. Evaluation of the pilot program would then form the foundation for a larger effort with a tested set of financial and management instruments.[17]

D. Matching Financing Need With Recreational Demand and Quota Share Costs

A major challenge confronting CATCH Project is co-designing the finance strategy with the QS purchase. As discussed in this report this is a particularly difficult given: 1) the management and biological complexities of the commercial and recreational halibut fisheries; 2) the challenges inherent in purchasing QS given the constraints on sales; and, 3) the difficulty of determining the optimal QS purchase quantities and costs (prices) when there is a single buyer representing many heterogeneous firms (and/or other private or public organizations). Making the decision especially complex is the fact that the choice of financing levels (which is equal to the costs to purchase QS) influences many of the core "endogenous" choices (see Appendix B for the derivation of a mathematical model for maximizing benefits).

Establishing the optimal user fee is more complex than traditional fees associated with other fish and wildlife licenses and stamps given the need to understand own-industry needs, recreational user behavior, and the constrained supply functions of a commercial fishing sector that owns QS. These first two issues are discussed below (the third issue is discussed in Chapter V).

1) Own Industry Needs: As discussed previously, the guided angler sector is a complex industry composed of more than 700 heterogeneous firms with different business types, geographical locations, fisheries portfolios, and client groups. Attempting to maximize benefits for all firms through a common pool sharing arrangement is impossible, given this heterogeneity. If user fees (e.g., halibut fishing stamps) are used to generate revenue, firms may be differentially impacted via their different business types and client groups—for example charter fleet businesses with lower income clients may suffer a higher client loss than businesses with richer customers; conversely businesses located in areas favorably impacted by less restrictions due to the higher available QP may increase clients relative to businesses located in regions where harvest restrictions remain unchanged. QS purchases, however, may be a "second best solution" if politics or regulation prevents a more efficient approach. Under some circumstances, QS purchase may also achieve higher levels of social or community benefits or meet some consideration for equity or fairness. Given these considerations, it is critical that the CATCH Project make every effort to understand the heterogeneity of business models (profit and utility functions) in order to make the best decision for a collective group of diverse businesses.

2) Recreational Demand: The charter fleet industry in Alaska operates in what approximates a competitive market- there are many clients (recreational fishermen), and many suppliers (charter fleet companies). Trip client prices therefore reflect the market forces of supply and demand (Abbott and Wilen 2009). On the demand side clients choose between several different recreational choices, with charter fleet fishing just one of these choices. Estimating the demand for charter fleet trips in a partial equilibrium context, therefore, may be problematic as effects other than price and quality of the fishing experience are likely to affect demand.

   The total size of the population of potential Alaska charter fleet customers depends on various factors. As the U.S. population ages, more people have leisure time with which to enter the market for charter fleet trips. On the other hand, there has been a decreasing trend in the number of anglers in most regions of the U.S. (USFWS 2012). Given a total number of potential anglers in the U.S., however, what factors determine the demand for charter fleet trips in Alaska? In a broad sense, charter fleet companies in Alaska compete for clients with firms in other regions of the country that offer recreation opportunities. For instance, a guided river trip through the Grand Canyon may be a direct substitute for a week-long charter fleet trip in Alaska. It is important to remember, therefore, that the market for Alaska charter fleet trips is governed not only by local substitutes in recreation opportunities, but by a larger worldwide market that competes for people's time and money. In addition to this, macroeconomic factors such as the health of the economy affect the total demand for leisure opportunities in this world market.

While economic forces in this larger market determine the size of the potential customer base in Alaska, the characteristics of the charter fleet trip (price, species targeted, length of trip, expected catch, number of fish kept per person etc.), prices of substitutes (guided river fishing trip, kayaking, wildlife watching etc.), and prices of complements (fishing licenses, fishing gear, hotel stays in port, catch processing and shipping fees etc.) all affect the local market for charter fleet trips.

While resident and non-resident anglers are both subject to the forces of the same world market for leisure opportunities, there are some important differences between these segments of the population (Abbott and Wilen 2009). Resident anglers may see a charter fleet trip as an opportunity to fill subsistence needs (such as filling their freezer with high-quality fish), so demand from resident anglers may therefore be more sensitive to expected catch and bag limits and more price elastic due to the possibility of filling these needs in other ways (such as clam digging, crabbing, and river fishing). Non-resident anglers may exhibit a lower elasticity of demand (due to the fact that a slight increase in the price of a charter fleet trip is relatively insignificant compared to the total price of their trip to Alaska), and may be less sensitive to changes in the size of the bag limit for charter fleet trips. This may be because the cost of processing and storing catch, and transporting it (either by mail or as checked baggage) to home is significantly higher than for resident anglers, and their reasons for undertaking a charter trip may be more experience based than subsistence based. So, changes in the characteristics of charter fleet trips, such as bag limits or price, are likely to affect residents and non-residents in different ways.

A large and diverse set of economic literature has investigated the demand and willingness-to-pay (WTP) for recreational sector. A number of these studies have been conducted in Alaska. Although these studies use a variety of non-market and revealed preference techniques (e.g., travel costs, contingent valuation), they have generally arrived at consistent findings similar to other recreational fishery research. This work demonstrates that demand for recreational fishing is responsive to many variables including household income (the higher the income the higher the demand or WTP), size or number of fish (a higher WTP), or costs including license fees (a lower willingness to pay or participate). A stated preference research study by Lew and Seung (2010) on non-resident saltwater recreational fishermen in Alaska found similar results. In particular they found that trip costs significantly decreased demand and that availability of larger and more numerous halibut increased demand. They estimated that a bag limit of one additional and two additional halibut would increase participation by 1.25 percent and 2.29 percent respectively, resulting in an additional 3,319 and 6,043 annual participants in Area 2C. They further calculated that this would generate $11.4 million and $20.8 million in additional angler expenditures. Criddle et al. (2003) found that an increase in salt water per angler trip costs of $5, $10, $15, $25, or $50 would decrease angler days by 1.8, 3.6, 5.6, 9.7 and 21.3 percent, respectively. Non-residents were less sensitive to price increases than resident anglers. In recent work, Lew and Larson (2012) found that an increase in halibut size and numbers generated significant marginal values for recreational halibut recreational fishing in Alaska by non-resident anglers. An additional one fish limit increased marginal WTP for a charter trip by $132 and an increase in one pound of halibut increased marginal WTP by $13. The major question is whether an increase in demand for more halibut and/or larger halibut would more than offset any decrease in angler trips due to a moderate increase in a new halibut user license fee above existing levels (e.g., an increase of $10 to $50 per non-resident angler per day relative to existing daily license fees and stamps that may range from $20 to $40 per day). This is one of the core challenges that the CATCH Project must address.

E. A Financing Analysis

The new Catch Sharing Plan (CSP) (if approved by the Commerce Secretary) provides for a predetermined guided angler sector allocation percentage depending on tiers of combined sector available harvest. The CATCH Project design has an objective to augment the guided angler sector allocation sufficiently so that management measures at a minimum allow an any size, one fish daily bag limit in Area 2C and an any size, two fish daily bag limit in Area 3A. When halibut abundances are at higher levels, the CATCH Project objectives are to increase the Area 2C management to be any size, two fish daily bag limit. The combined sector available harvest tiers and percentages showed augmentation would only be necessary when the combined available harvests in Area 2C were less than 5.8 million pounds in which case the tier assigned allocation is about 18 percent. When over that combined available harvest allocation, the percentage drops to approximately 16 percent. Area 3A has about a 19 percent share when the combined available harvest is less than 10.8 million pounds. The percent lessons to 17.5 percent when the target harvests are between 10.8 million pounds and 20 million pounds, and about 14 percent when over 20 million pounds. As a comparison to 2013 conditions, the combined harvest in Area 2C is about five million pounds and Area 3A is about 13 million pounds. The management measures the Council decided to apply in 2013 to hold the guided angler sector within the allocations used a one fish bag limit, reverse slot size limit in Area 2C and a two fish, any size bag limit in Area 3A. The Area 2C charter fleet catch in 2009 and 2010 averaged about 1.2 million pounds for a daily bag limit of one fish, any size. So for the 2013 situation that has a Guideline Harvest Level (GHL) of 0.788, this means an additional -500 thousand QP would have to be secured from the commercial fishing sector's allocation. Under the new CSP for 2014, uncertainty plays a greater role in determining management measures. Even with the same combined sector available catch as in 2013, and, depending on stock abundance, as much as 500 thousand pounds total to be secured from the commercial fishing sector to achieve an any size, one fish daily bag limit.

If the CATCH Project plan rules were like community quota entity (CQE) purchase rules in Area 2C, they can only buy from B and C QS holders. If, for example in 2011, the CATCH Project needed 500 thousand QP in Area 2C, then that represents buyouts of the top 49 holders or the bottom 447 holders of their B, C QS units. This represents seven percent and 62 percent of holders respectively. The 500 thousand QP represents 21 percent of total QP in 2011. CQE rules are designed to cap each entity at one percent of QS units and ultimately 21 percent for entities added together in Area 2C. Although not exactly a synonymous issue, the CATCH Project would approximately fit under a same CQE cumulative cap using Year 2011 TAC as an illustration.

A complex set of factors influence the availability of QS and the price which quota would sell for. Tables IV.1 and IV.2 show a simple financial analysis conducted to help explore issues in aligning fees from a halibut stamp instrument to finance quota purchases for Area 2C. Because of the lack of robust econometric models for the Alaskan recreational charter fleet industry and commercial fishing sector, this analysis is designed to simply explore possibilities rather than represent a rigorous analysis. However, even this simple analysis can reveal important patterns.

The top of Table IV.1 shows four QS transfer options for different selling prices ($35 and $50) and different purchase volumes (300 thousand pounds and 700 thousand pounds). A brokerage fee and loan origination cost (5.0 percent) and administrative cost (3.0 percent) are also calculated to determine annual financing costs for the four options. The lower segment of Table IV.2 shows different levels of revenue generated under three different halibut stamp fee rates ($10, $20, and $30 per angler per day) for three different assumptions with respect to impact on angler participation rates due to the fee and associated changes in the fishing experience due to larger or more plentiful halibut (angler participation growth of zero percent over 10 years, -10 percent, and +10 percent).

The results show that the total annual financing costs for securing halibut could range from $1.2 to $3.9 million under the alternative assumptions. In contrast the annual fees that could be raised from the stamps would range from $0.7 to $2.7 million per year. The analysis shows that for the "optimistic" alternative (low price and halibut quantity to generate positive angler response even with a high stamp fee -- bottom Option 6 versus top Option 1), a $30 stamp would generate more than twice the dollars needed to support the required purchase of halibut quota ($2.7 million total fees versus $1.2 million in quota costs). Conversely, the "pessimistic" alternative (high quota costs and volume and negative angler response rate even to a low fee -- bottom Option 7 versus top Option 4) shows that total fees would be less than 25 percent of the revenues required to match total quota costs ($0.8 million total fees versus $3.9 million in quota costs).

While some of these options may be considered unrealistic, they are useful in revealing the range of possibilities. The results suggest that if adequate QS could be secured at $35 per pound and angler participation increased significantly at a stamp fee of $20 day, that revenues would be adequate to finance the necessary purchase. However, the reverse is also true; if QS costs were to approach $50 per pound or more, then even a stamp fee of $30 per angler day (assuming a positive increase in angler participation) would be inadequate to finance the required purchase (unless angler participation rates increased 30 percent or more). With a revenue stream established, besides availability of QS, time is the only issue facing reaching objectives. Much of the success will depend on the financial purchasing ability of the QS manager, provided he/she is not too constrained. It may not be possible to purchase all the quota needed at first to get back to one fish bag limit of any size in 2C, depending on availability and prices. However, any purchased QS will add to either keeping harvest within allocation or help loosen harvest restrictions.

Table IV.2 functions as a "reality check" for the fee estimation method by showing the actual revenue raised by the $10 per day Chinook stamp in 2011 in Area 2C. The total stamp sales by businesses located in southeast Alaska was $846,100. This is associated with a total of 97,895 salmon fishing angler days which is ($8.64 per angler day). Statewide stamp sales by local businesses represent 79 percent of all sales. The balance are sold via internet or mail-in purchases. The Chinook stamp fee has a discount residency and period structure. Table IV.2 suggests that using angler days times the daily fee generates a reasonable estimate of realized revenue.

Previously mentioned studies suggest that a $10 stamp may decrease angler participation by a small percentage (e.g., one percent to five percent) with all other conditions held constant. However, stamp revenues were invested to increase per angler success rate (e.g., increasing habitat quality or hatchery production) and increase participation. Similarly, a guided angler sector halibut stamp could increase participation due to regulations allowing retention of larger fish and more fish, as well as promote conservation by preventing over-harvest of allocation due to pre-season estimate uncertainty for what regulations will accomplish. The overall results suggest that the CATCH Project would need a stamp priced at at least $20 (daily fee with a similar Chinook stamp discount schedule) to adequately finance QS purchase assuming a net positive increase of 10 percent or higher angler participation. If the analysis of Lew and Larson (2012) reasonably represents anglers' willingness to pay for larger and additional halibut, then such a stamp fee would be tolerable to anglers.

A cost benefit analysis (CBA) was developed to demonstrate how an economic effect's calculation can be used in quantitative economic analysis descriptions (Table IV.3). The CBA results for conservative and optimistic financing options are shown. As explained in Chapter III, there are many assumptions to be made in developing a CBA, that when used to support policy decision discussions, need to revealed to decision makers. When assumptions are controversial or suspect for accuracy, their sensitivity for affecting results can be explored. For this CBA, the two shown options can be considered a sensitivity test on a package of assumptions. We also show how net present value (NPV) results are affected by a single assumption (Figure IV.2). The sensitivity to the assumption for marginal net economic value (NEV) change due to the bag limit increase shows that NPV is negative when the WTP change is decreased by about 10 percent for the conservative option and 50 percent for the optimistic option.

The CBA is developed for conditions in 2011 for required QP, ex-vessel price, participation, and measures of commercial and guided angler sector NEV.[18] The CBA assumptions include how these factors play out over time and implicitly acknowledge the concept that a unit of cost that initially produces a unit of benefit is diminished over time. There are influences included for angler days being decreased because of the additional cost for the stamp and increased because of the availability of more fish. In addition to these effects, it is assumed participation will increase in general due to national economy recovery and population increases. In the absence of employing a bioeconomic model that would show effects to future stock abundances from harvest mortalities switched from the commercial fishing sector to the recreational sector or using existing IPHC stock assessments projections, a stepped trajectory assumption is used for whether the purchased QS is needed to attain desired management specifications. It is assumed that halibut stocks will have recovered sufficiently by Year 2020 (shown as "CEY threshold attained") and QP are not needed to achieve a two fish daily bag limit. For Years 2020 through 2041, 90 percent of the QP (frictional amount is assumed for not being able to find a willing lessee) are leased backed to the commercial fishing sector for 30 percent ex-vessel price. The effect is that recreational consumer surplus ("NEV change for bag limit") goes to zero, but producer surplus (revenues to the CATCH Project and NEV for the commercial fishing sector) begins.

The CBA results show that the optimistic option has a positive benefit-to-cost ratio and the conservative option does not. The internal rate of return passes the acceptance test for being greater than the discount rate for the optimistic option, but not for the conservative option. A sensitivity test on QS price shows that the price for the conservative option using a $20 stamp fee cannot exceed $30 per pound (based on 2011 conditions) for the benefit-cost ratio to be greater than unity. This limitation not only supports the obvious observation that the viability of the CATCH Project design would be highly dependent on the QS price, but provides grounds for developing purchase rules. For example, a broker could be assigned the responsibility for making a blanket offer as long as a negotiated purchase price did not exceed a certain price that meets a CBA social welfare test.

As emphasized in this report, *ex ante* CBA is highly speculative. There is considerable uncertainty in relying on its outcome to predict the calculations and there will be risk in success given the novelty of the CATCH Project proposal. As previously suggested, a well designed pilot project that incorporates a properly designed charter fleet client and business survey may be useful in developing the knowledge and experience for designing and implementing a successful comprehensive program. A CBA would be valuable assessment information when repeated *medias res* using the experimental collected information from the pilot project rather than using prospective assumptions.

Table IV.1
Example Financing Requirements for Area 2C Alaska Recreational
Guided Angler Sector Quota Share Acquisition Options

	Guided Angler Sector Common Pool Resource Options			
Financing costs	Option 1	Option 2	Option 3	Option 4
Transfer (net pounds):	300,000	700,000	300,000	700,000
QS acquisition cost in 2012 QP equivalents (per net pound)	$ 35	$ 35	$ 50	$ 50
Purchase ($ millions):	$ 10.50	$ 24.50	$ 15.00	$ 35.00
Brokerage fee 3% (thousands)	$ 315	$ 735	$ 450	$ 1,050
Total financed (millions)	$ 10.82	$ 25.24	$ 15.45	$ 36.05
Loan origination				
Rate:	2.0%	2.0%	2.0%	2.0%
Amount (thousands):	$ 210	$ 490	$ 300	$ 700
Loan principal (millions):	$ 11.03	$ 25.73	$ 15.75	$ 36.75
Annual loan payments:				
Term (years):	20	20	20	20
Interest rate:	5.25%	5.25%	5.25%	5.25%
Annual payments (thousands):	$904	$2,108	$1,291	$3,012
Annual admin. fee:				
Base is total acquisition cost				
Rate:	2.5%	2.5%	2.5%	2.5%
Amount (thousands):	$ 263	$ 613	$ 375	$ 875
Total annual requirements (thousands):	$ 1,166	$ 2,721	$ 1,666	$ 3,887

	Annual Revenue from Imposing Halibut Fishery Guided Angler Sector Stamp								
Financing revenue	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Base bottomfish days 2011	81,698	81,698	81,698	81,698	81,698	81,698	81,698	81,698	81,698
Period growth rate	0%	0%	0%	10%	10%	10%	-10%	-10%	-10%
Period end-point days	81,698	81,698	81,698	89,868	89,868	89,868	73,528	73,528	73,528
Stamp fee	$ 10	$ 20	$ 30	$ 10	$ 20	$ 30	$ 10	$ 20	$ 30
Annual revenue (thousands)	$ 817	$ 1,634	$ 2,451	$ 899	$ 1,797	$ 2,696	$ 735	$ 1,471	$ 2,206

Notes: 1. Stamp fee adjustment factor for multi-day and annual stamp discounts based on King stamp sales and angler days when trip was for targeting salmon in 2011. It is reasonable that stamp sales annual revenue can be estimated using total effort (angler days) times a daily fee amount, as long as the overall fee structure and regulatory application is similar to the King salmon stamp system.

Source: Study.

Table IV.2
King Salmon Stamp Revenues and Angler Participation for Area 2C Alaska in 2011

King Salmon Stamp and Angling License Sales in 2011

	Fee Prices		Area 2C Sales	
Nonresident	KS	License	KS Count	KS Revenue
1 Day	$10.00	$20.00	14,778	$147,780
3 Day	$20.00	$35.00	10,278	$205,560
7 Day	$30.00	$55.00	8,136	$244,080
14 Day	$50.00	$80.00	679	$33,950
Annual	$100.00	$145.00	816	$81,600
Total			36,155	$718,780
Resident	$10.00	$24.00	12,732	$127,320
Total			48,887	$846,100

Fisheries Participation in 2011	Salmon Fishery Angler Days	Bottomfish Fishery Angler Days	Total Angler Days
Saltwater	97,895	81,698	158,551
Non-resident	94,188	78,678	
Resident	1,821	1,449	
Freshwater	8,885		11,610
Non-resident	8,292		
Resident	350		
Total			170,161

Notes: 1. Arrow and circle annotations are to indicate that even with a complicated resident/non-resident and annual/period KS fee structure, that a reasonable approximation for resulting revenue in Area 2C is salmon fishing angler days times $10. There would be other influences on amounts for resulting revenue if a similar fee structure was only for charter fleet anglers fishing for halibut.
2. License sales do not include combination hunting and fishing licenses.
3. License and King salmon stamps do not include Internet and mail-in purchases; only counts of agent sales when agents are located in Region I are included. Statewide agent sales are about 79 percent of all sales.
4. License and stamp total is not a sum of daily and annual. The total includes other sales including military and duplicates.
5. Guided fishery participation total is not a sum because it includes other participation types including comped, crew, etc.
6. Guided bottomfish fishery includes halibut targeting as well as trips when rockfish and other non-salmon species are targeted

Sources: License and KS stamp sales: http://www.adfg.alaska.gov/index.cfm?adfg=sportlicense.prices; angler participation: Sigurdsson and Powers (2012).

Table IV.3

Cost-Benefit Analysis for Inter-Sector Transfer Using Halibut Stamp Revenue for Area 2C

	Conservative	Optimistic	Source
Discount rate:	7%	3%	
Expectation period (years):	30	30	
Investment (millions):	$ 26.3	$ 18.4	Table IV.1
Recreational NEV per angler day:	$ 134.56	$ 134.56	Criddle et al. (2003)
Commercial NEV per pound:	$ 1.27	$ 1.27	Table III.2
Harvesters	$ 1.08	$ 1.08	
Processors	$ 0.19	$ 0.19	
Base participation (angler days):	81,698	81,698	Sigurdsson and Powers (2012)
NEV change for bag limit:	$ 142.12	$ 142.12	Lew and Larson (2012)
Base participation change:			
Bag limit increase	1.26%	1.26%	Lew and Seung (2010)
Additional cost	-7.65%	-3.60%	Criddle et al. (2003)
Base participation growth (expectation period):	0%	10%	
Transfer amount (pounds):	500,000	500,000	
CEY threshold attained:	Year 2020	Year 2020	
Lease back:			
Amount in Year 2020	90%	90%	
Lease rate	30%	30%	
Ex-vessel price	$ 6.41	$ 6.41	Table II.3
Stamp fee:	$ 20.00	$ 10.00	
Annual acquisition costs:	$ 625,000	$ 437,500	Table IV.2

	Year 1		Year 2020	
Economic Activity	Conservative	Optimistic	Conservative	Optimistic
Benefits	(thousands)			
Marginal NEV bag limit increase	10,869	11,339	-	-
Angler payments for stamps	(1,634)	(899)	(1,634)	(899)
NEV base participation change	(702)	(257)	(702)	(257)
NEV growth participation change	-	-	-	303
Lease back			865	865
Lease returns to organization	-	-		
Commercial NEV	-	-		
Total benefits	8,533	10,183	(1,471)	13
Costs				
Commercial NEV	635	635	(63)	(63)
Harvesters	539	539		
Processors	96	96		
Annual acquisition costs	625	438	(625)	(438)
Total costs	1,260	1,072	(688)	(501)
Net present value	3,062	43,470		
Benefit to cost ratio	0.1	2.4		
Internal rate of return	4%	48%		

Notes:
1. Initial investment assumes $50 per pound for conservative estimate, and $35 per pound for optimistic estimate. Also included are brokerage fee of 3%, and loan origination rate of 2%.
2. Annual acquisition costs assume 2.5% annual admin. fee.
3. Initial year for participation is Year 2011.

Source: Study.

Figure IV.1
Noted Challenges in Operating a Common Pool

Element	Option	Common Pool Options			Individual Management Option
		Federal Common Pool	State Common Pool	Regional Non-Profit Association Common Pool	
Element 1.1	Holding QS	?	🟡	🟡 🔴	🟡
	Loan Programs	🟥	🟥 🔴	🟥 🔴 (Public)	🟢 (Private)
	Buyout Program	🟥	N/A	N/A	N/A
	Bonding	N/A	🔴	N/A	N/A
Element 1.2	Charter Stamp	🟥	🔴	N/A	🟢 (Individual Business Revenue Stream)
	Sportfishing License Surcharge	N/A	🔴	N/A	
	Moratorium Permit Fee	🟥	N/A	N/A	
	Self-Assessment Fee	🟥	N/A	🔴	
	Business License Fee	N/A	🔴	N/A	

🟢=No regulatory or legislative change required
🟡=NPFMC regulatory change required
🔴=State legislative change required
🟥=Federal legislative change required

Source: NEI (2011).

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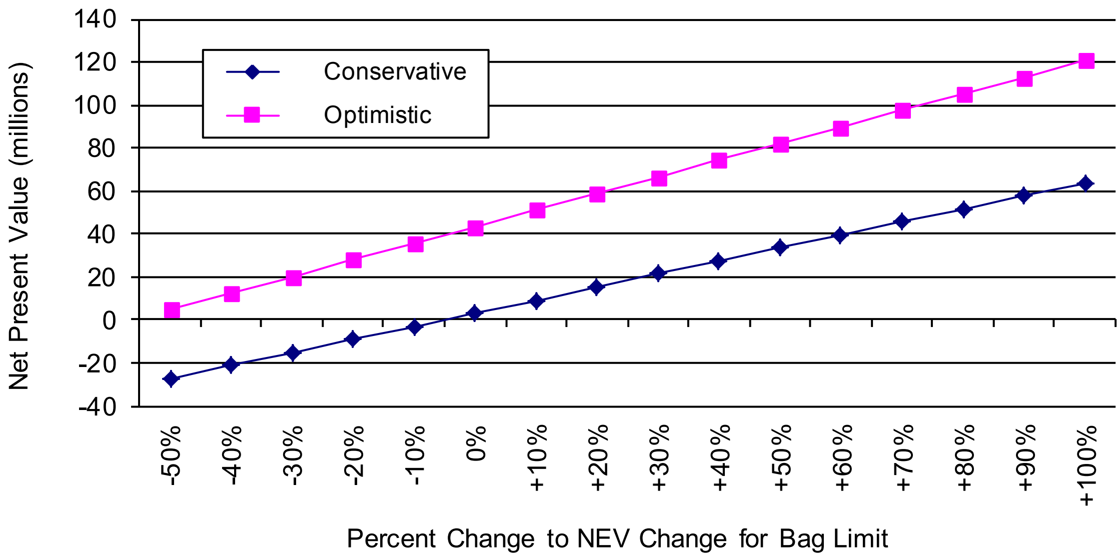
Figure IV.2
Sensitivity of Cost Benefit Analysis Assumptions to Net Present Value Results



Notes: 1. The "NEV Change for Bag Limit" is recreational fishing marginal willingness to pay (WTP) for a one fish increase in bag limit in southeast Alaska as reported in the Lew and Larson (2012) study. The study methodology generates this statistic with the assumption that all other trip attributes are held constant.

Source: Study.

V. QUOTA SHARE TRANSFER MECHANISMS

A. Problem Statement

In the absence of policy directed inter-sector re-allocation to achieve a desired recreational sector total allowable catch (TAC), methods and procedures need to be defined to transfer shares. Procedural details for the transfer capability have been an ongoing North Pacific Fishery Management Council (NPFMC or Council) issue since the late 1990's. Methods such as making the recreational guided angler sector a catch-share system were undertaken in the early 2000's (Wilen and Brown 2000, NPFMC 2001) and derivatives for what is now the Catch Accountability through Compensated Halibut (CATCH) Project concept were considered in the late 2000's (NPFMC September 2007). The methods have been creative and complex, and the common tenet has been the recognition that the commercial catch-share program, as a new policy institution, created private sector assets for a group of individuals and firms. While the CATCH Project goal is to gain an adequate TAC in order to have a desired management outcome (e.g. any size, one fish daily bag limit in times of low halibut resource abundance), meeting this objective requires specific mechanisms including procedures to transfer assets from one group to another.

This chapter first describes several transfer mechanism options that have precedents in other world fisheries, but would be new to the Alaskan situation. The options are then analyzed to evaluate probable economic effects. Effects are couched in terms of what might happen to quota share (QS) market prices and the fall-out if the price is dramatically altered. Price change is an inclusive indicator because, from the guided angler sector perspective, it will determine funding necessary to purchase sufficient QS. From the commercial fishing sector perspective, it will illuminate what might be the future QS price for a commercial fishing sector to commercial fishing sector transfer.

The goals for having the existing commercial-to-commercial transfer program (albeit greatly constrained) includes allowing for capacity reduction, promoting operational efficiency, providing for new entrants (such as crew wanting to become vessel owners and operators), dealing with deceased owners, or allowing owners to leave the industry. This goal was promoted through the original objectives for the halibut individual fishing quota (IFQ) program:

- To limit and discourage corporate ownership of the fisheries
- To reward active participants in the fisheries
- To reward long-time participants over relative newcomers to the fisheries
- To reward those who invested in the fisheries by purchasing vessels, over those who simply worked in the fisheries as crew
- To limit windfalls to fishers receiving QS's, regardless of federal policies precluding any charge for QS's distributed in the initial allocation and
- To discourage speculative entry into the fishery

In general, the overriding social objective of the IFQ program was to ensure the prevailing commercial fishery structure and protection of existing coastal communities. This was partly to be achieved through the constraints on QS transfers. Constraints address who may sell, qualifications of buyers, and sale amounts (NMFS RAM April 2012).

Within the constraints, there is an "open and functioning" market for the commercial-to-commercial QS transfers where potential buyers make offers and sellers make asks and market players have access to successfully negotiated prices. With such conditions, prices will be competitive and reflect expectations of profitability. What is a missing indicator is signals on operational profitability that are revealed from prices on leased quota pounds (QP). Leasing is not allowed in the catch-share program except in limited circumstances (call-up of owners in the military, etc.) and for certain vessel classes (freezer vessels). Newell et al. (2005a) found in the New Zealand individual transferable quota (ITQ) fisheries, a consistent relationship between lease prices (economic rent proxy for a profitability factor) and QS prices. Karpoff (1985) and Huppert et al. (1996) found similar relationships between limited entry permit prices and fishery economic rents in Alaska salmon fisheries. Without the lease price gage, a QS buyer will rely on a more complex set of calculations to determine the acceptable asset price offered by a seller. For that reason, this chapter describes rational asset pricing theory and applies methods to the commercial QS transfer situation. Comparisons and contrasts are made in calculated and observed prices (Table V.1).

The calculated and observed asset value information is used in this chapter to show what might happen to QS prices under three hypothetical transfer mechanisms. There certainly can be other mechanisms or hybridizations of the three that are described. However, the breadth of the three should be sufficient for illustrating what may happen for an adopted CATCH Project designed transfer method.

1. Purchase consistent with existing transfer rules. A broker would be assigned responsibilities for making an offer using a predetermined "not to exceed" set price.

2. Purchase using a one-time waiver or general waiver applied to the new CATCH Project holding entity, of some transfer rule constraints. The Council would decide the transfer constraints to be waived and the rules. Purchases could be made using several methods such as:

    - Right of first offer for the QS, but then others in the commercial fishing sector could participate if the purchase for the guided angler harvest common pool was relinquished, and
    - Reverse auction for guided angler harvest common pool purchase only. A reverse auction is where sellers offer their items at a price they are willing to accept for a quantity. The buyer will purchase the lowest price bids first, and then accept bids until they meet their ceiling of available funds. The buyer has the option to accept or reject the approved bid.

3. Quota bank in bycatch fisheries catch-share programs whereby savings in assigned individual bycatch quota (IBQ) are voluntarily deposited and made available for

purchase. A purchase by the halibut recreational and commercial fishing sectors would be for the assumed discard mortality portion of the halibut prohibited species catch (PSC) limits. The estimated mortality would be added to recreational angler harvest opportunities or commercial fisheries sector catch. A purchase of the deposited IBQ by another participant in the bycatch fishery would be to assist the new owner when their assigned IBQ was not sufficient. Conservation demands for allocations made available for bycatch may affect the amount of QP realized in the future from IBQ purchasers. The market distortions for this issue are discussed at length in this chapter.[19]

An important feature of the options would be that the transfer mechanism must be two-way as called for in the NOAA Fisheries Catch-Share Program policy guidance paper (NOAA 2010). A test of this feature would be to demonstrate how recreational TAC is reduced in favor of halibut commercial fishery sector TAC, or a bycatch fishery IBQ being increased. The policy guidance for such a feature is described in general so that Councils have flexibility on building social constraints for such back and forth purchases.

B. Distorted Asset Values

Catch-share programs are usually designed to increase efficiency through transferability of QS from one holder to another. This allows holders to acquire enough QP to make their operations sufficient to cover variable and fixed costs. There can be restrictions such as caps on the amount of QS held by any one holder in order to prevent monopolies from forming. The Alaska halibut commercial fishery catch-share program social objective was to preserve the initial industry and community structure. In addition to caps, QS has been blocked in large proportions and sales must be for the whole block. But purchasing whole blocks will cause holder caps to be exceeded even if an attractive price can be negotiated. These transfer constraints, when considered in total, will act to reduce average asset value but increase marginal asset prices given the limited available quota due to constraints on ownership and trading rules.

In this backdrop, restrictions on who may be a QS holder for recreational interests will undoubtedly accelerate recent trends in QS price increases. The existing market balanced QS price will be undermined with the introduction of a new market player. The new player (recreational guided angler sector) does not have the same incentives to seek a price to attain commercial fishing vessel operational profitability. The player is only restrained by the amount of funds raised for a purchase. Given the limited available QS, this situation will favor sellers and lead to significant price increases. This position (or perceived position) could undermine the goals of the catch-share program by unfairly increasing marginal prices, reducing ability of catch share participants to consolidate holdings, and reducing opportunities for new entrants. If there are to be policies to allow the guided angler sector to acquire commercial fishing sector QS and yet protect the existing program goals, there may need to be approaches that can relax constraints on QS amounts and vessel classes which can participate in the sales.

QS transfer rates have been consistently decreasing since the halibut ITQ program was implemented, and now hover around 2.5 percent in both Area 2C and 3A (Figure V.1). The amount needed for the CATCH Project to ensure a "any size, one fish" purchase (for example approximately 500 thousand to one million pounds in Area 2C depending on stock abundance and allocation shares) would greatly exceed recent market trading amounts even if the acquisition was spread over multiple years and resulting in significant increases in market prices. One assumption for the structuring is that a purchase loan will be needed with payments made from new angler fees via license endorsement. The endorsement would be similar to the king salmon stamp except it would only be required for anglers using guided services.

A second effect is whether ex-vessel prices might be incrementally affected from a decrease in halibut supplies. A Herrmann and Criddle (2006) study found a traditional supply-demand relationship, but that was using data before the downturn in world economic conditions coupled with increasing import demand from China. It would be difficult to justify using their econometric model given this year's situation for a flat and even year-end price decrease with drastic falling management TAC's. The Herrmann and Criddle study acknowledges that determining an ex-vessel price may be better predicted by simply using an annual lagged wholesale price markdown. In other words, the worldwide situation of inventories, substitutions (including aquaculture), currency exchange, and other global market variables dictate price and not the fluctuations in Alaska supplies. While the project budget resources are not sufficient to develop our own econometric model, we suggest the CATCH Project plan would not appreciably influence changes to ex-vessel prices due to the reduction of halibut supplies.

The means, timing, and amount of a CATCH Project plan's holding entity offer to purchase commercial halibut QS may distort QS and Charter Halibut Permits (CHP) future markets. In order to explain how the distortion might occur, we first make a theory based market asset value calculation for IFQ QS and CHP in Appendix C.

C. Factors Affecting Charter Halibut Permit Prices

The CHP transfer program is in its infancy. CHP price initially may not reflect long term prices because there may be a larger number of transfers when a limited entry program begins as compared to later years. There will be adjustments to correct for imperfections in original allocation, there will be adjustments to obtain profitable operation given other vessel revenues, and there will be speculative activity that will diminish in the long term. These effects will be complicated if the CATCH Project succeeds with the addition of quota now becoming an asset owned or quasi-owned by the recreational guided angler sector.

The CHP "asset" and QS "asset" price effects will be interdependent of each other depending on the rules employed in purchasing and managing halibut quota. In general the inter-sector transfer of QS should represent the added benefits to the charter fleet (typically measured by net present value (NPV)) due to more favorable conditions for the client. Because this QS is owned by a collective (either industry or the state) rather than an individual, the net value of the QS (including value generated from its management) to each individual permit holder will be represented by the value of the permit. If the purchase brings greater net benefits to the industry, then the value of the permit will increase; conversely if the QS (and its costs and management) brings a decrease in benefits, then permit values will decrease. The amount of benefit to the industry depends on the financial instrument, how it is managed, and who pays (e.g., the angler via a stamp, the guided angler sector via a tax, or government via a subsidy). If the acquired QS deposits in a common pool result in a significant increase in recreational demand (e.g., greater willingness to pay and/or participate despite the costs of a stamp or other financing mechanism) then in the short run, profitability in the charter fleet will increase and the increased profits will be represented by higher permit values. However, the latent capacity in Area 2C would dampen the longer term profitability since increased profits will incentivize the number of active vessels participating. Although permit prices might rise in the short run, over the longer term their value may drop to reflect the decreasing profitability per vessel due to competition. If there is increased customer demand in the longer term and additional QS is purchased, then there could be equilibrium in permit prices. Without the demand growth and decreasing availability of fish per vessel given the QS caps, then (in economic jargon) rents would be dissipated. In fact permit prices could drop significantly depending on who is responsible for the financing, that is industry (directly via an industry tax, or indirectly via an angler stamp) or government (subsidy). In Area 3A, this becomes far less a problem since most permits are already active. Any increase (decrease) in overall net profitability due to the purchases will increase (decrease) the value of the permit without the additional negative impacts due to latent fleet capacity. The guided angler sector must understand and address the latent permit issue when developing quota purchasing and management decisions – otherwise overall benefits may be dissipated.

D. Factors Affecting Quota Share Prices

This section briefly discusses some of the factors that will influence asset value and QS trading prices when a new player such as the recreational guided angler sector attempts to become a QS market trader.

1. Quota Share Demand and Supply Variables

The market for QS, like many markets for good and services, is complex and characterized by a host of supply and demand variables that influence QS price. These factors include input markets for fixed and variable costs, output markets for harvested product, institutional factors that support (or constrain) market trades as well as supporting the functioning of the management and regulatory system, and environmental conditions that may impact the size and resiliency of the halibut stock. In general, secure property rights, efficient regulatory management, and unconstrained input, output, and QS trading and leasing markets will work to maximize the asset value, rents, and price of halibut quota. The converse, however, is also true – the more constraining the rules on market transactions, the lower the economic value and rents, and the lower the price for halibut quota.

The QS management scheme was purposefully designed to be constrained and less than economically efficient in order to meet other social objectives including maintaining the social structure of Alaskan fishing communities, supporting small family businesses, and geographically protecting harvesting and processing opportunities. The various rules on quota trading designed to achieve these objectives complicate any scheme to broaden the market to include other sectors including the guided angler sector. Not only does the scheme need to be consistent with a broad range of social objectives, but the trading rules limit the availability of quota in any time period or geographic area. This creates four simultaneous economic forces: 1) constrained and rule-bound markets reduce the value and price of QS below the level that would exist if the market was efficient and unconstrained (lower pressure on price); 2) rules that control and constrain trades also limit the available QS supply (higher pressure on price); 3) a new sector entering the market will increase overall demand for QS (higher pressure on price); but, 4) rules designed to protect traditional participants may increase the constraints and participation costs of new sectors (lower pressure on price). Some forces will act to decrease the level of QS purchases and/or QS price; other forces will act to increase it. While this complicates our ability to predict the price of trades it does suggest that price will be influenced by strategies employed to purchase QS.

Like any market, demand variables, supply variables, and the institutional structure that defines market structure and functioning will determine market price. The key factor influencing price will be the new demand arising from the guided angler sector. Everything else being equal this demand will shift out overall demand for QS resulting in increasing prices for quota (assuming that the marginal net value to the guided angler sector is greater than the existing price (about \$32 per QP). The other major factor influencing the QP is the available quota "supply" variable and decrease in available TAC (due to decreasing stocks and allowable harvest) as measured by available pounds (by about half compared to the long run average) and the increase in ex-vessel value (by about one third) indicating that QS price is elastic but not perfectly elastic (i.e., opposite and equal percentage changes in price and quantity). And given the price elasticity, large purchase quantities that remove QS from the commercial fishing sector and production for seafood markets may increase ex-vessel price even more due to the own quantity effect (although the effect will probably be small). So although QS price is lower as a relative percentage of available harvestable QP, price of absolute poundage quota is at record high levels—as is ex-vessel price. The combined 1) increase in demand from a new sector, 2) existing high QS price, and 3) removal of product from output markets will combine to work to increase pressure on price (all else being equal). In addition, if markets are forward looking and can anticipate future events, they will "capitalize" rational expectations into today's traded price which represents the asset value of discounted future earnings (or trades).

2. Increasing Quota Availability in QS Markets

One approach to decrease price pressure is to increase the availability of total pounds that can be traded in the QS market. The relative percentage asset value would be expected to increase but marginal QS price would decrease. This potential increase in pounds could be derived by increasing the participation of other sectors or cost effective decreases in fish mortality and wastage. For example, making bycatch quota available from the trawl fleet would increase overall supplies—so would decreases in hooking mortality for fish that escaped the gear or were discarded. Improved "bioeconomic" management that determines the value of alternative harvest and management strategies (including quota trading that accounts for opportunity costs) may also help provide greater economic and social value. And given implementation of precautionary management, improved science will reduce uncertainty and potentially increase available harvests.

3. Increasing Asset Value—"Asset Thinking"

Designing a new organization and purchasing scheme to acquire QS -- while influencing/reshaping the institutional structure to support participation in tradable QS management -- influences the value and price of the fishery right-based assets including QS and CHP values. Intelligent and innovative institutions and organization that provide incentives to increase efficiency in TAC use while decreasing management and transactions costs will increase the CHP. These institutions would include open and transparent purchases, special auctions that increase available quota at the lowest possible price, freedom and flexibility to purchase quota in response to changing needs and market conditions, flexibility to lease or sell quota, addressing the problem of excess fishing permits, and finding strategies that also address social objectives in the commercial, recreational, and subsistence sectors. Marginal benefits to the guided angler sector will increase over time, allowing the sector to generate benefits from market purchases. Overall asset values will increase for both the commercial and guided angler sectors. Higher asset values will allow each sector to improve their business operations and underwrite capital investments.

4. Quota Share Purchasing Strategy

Whether the "single buyer purchasing for the purpose of making deposits in a common pool" or many individual buyers making smaller purchases, the strategies selected for undertaking the purchases will influence the purchase price. Many individual smaller purchases spread across time will be expected to result in lower prices than fewer larger transactions (although large purchase transaction costs may be higher). A single entity making a few larger purchases may invite more "game playing" by market players and potentially irrational speculation. An intelligently structured institution for discovering the lowest prices such as a reverse auction may help in lowering average prices but may also generate institutional anxiety and stakeholder demands for greater controls. If reverse auctions can be accompanied by modifications of constraints on QS transfer, they may prove to be the "best" instrument for purchasing the necessary QS. However, if that is not possible, the large number of rules and constraints on purchases for any single time period or area or gear type suggests that a strategy focused on smaller purchases spread across time may be a more effective overall strategy.

5. The Role of Leasing

Whether a buyer or seller of a QS asset, the ability to lease QP provides a powerful tool to meet business needs and even-out the flow of required quota over short periods of time. This is especially critical given that harvestable poundage varies due to changes in the stock biomass. In addition, the guided angler sector needs for different regional management sectors vary considerably (2C versus 3A). This complexity of meeting annual needs given variability in stock biomass and other market variables, requires leasing mechanisms to improve options and address the challenges of meeting annual requirements. Prohibitions on leasing or inflexible leasing rules reduce the value of the underlying asset, and limit strategies that best meet the needs of both the recreational and commercial fishing sectors via cross-sector leasing. Mutually advantageous leases can also be designed for periods longer than one year if institutional rules allow.

The Council adopted Catch Sharing Plan's (CSP's) Guided Angler Fish (GAF) program allows the ability to temporarily transfer QP (in the form of leasing) between the commercial and guided angler sectors; it is possible that caps on the amount of QP leased per angler will create inefficiencies in the market. When the marginal benefit of QP for a recreational angler on a charter boat is higher than that for a commercial vessel, overall social benefits can be increased when that QP is transferred to the angler. The angler would pay at least the value of marginal benefit to the commercial owner, and gain the difference between his marginal benefit and the seller's marginal benefit. Furthermore, a prohibition on the *sale* of quota may create further inefficiencies. Leasing QP's allows a fisherman to catch that number of pounds *once,* whereas purchasing QS allows a fisherman to catch a share of the TAC in perpetuity. If a charter fleet operator values QS higher than a commercial operator, allowing the QS to be permanently transferred can benefit both parties by reducing the uncertainty over future business costs, thereby strengthening the incentives of the charter fleet operator to optimally invest in fish resource supplies that will reap benefits in the future. If the charter fleet industry were to be incorporated into the commercial ITQ system, these mechanisms would be available to them. Without this taking place, and with the inability of QS to be freely transferred between sectors, social welfare may suffer.

6. Market Membership or "One Time" Market Player

The guided angler sector must determine whether it is in their interest to limit their involvement in the QS market to a series of one time purchases or longer term arrangements to meet future needs. Economic thinking suggests that the sector may best meet their needs by using creative leasing arrangements and QS sales and purchases with commercial and bycatch sectors. This would not only increase the asset value of QS ownership, but provide the greatest ability to adapt and be inventive while also rewarding other sectors for their ability to adapt, innovate, and retain flexible options. This is especially critical given the changes in stock size and allowable harvests that require flexible strategies for meeting short and long term needs.

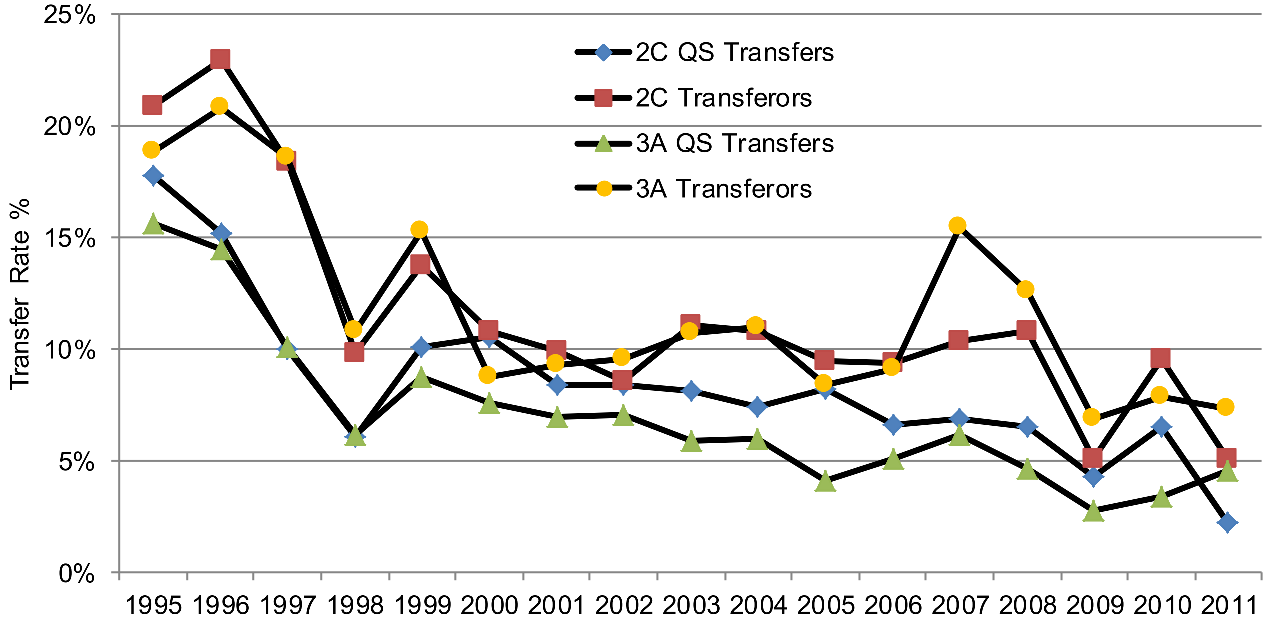
Table V.1
Halibut Quota Share Transfers by IPHC Areas in 1995 to 2011

	Area 2C				Area 3A			
Year	Nominal $/IFQ	Real $/IFQ	IFQ Selected for Pricing (000's)	Total IFQ Transferred (000's)	Nominal $/IFQ	Real $/IFQ	IFQ Selected for Pricing (000's)	Total IFQ Transferred (000's)
1995	7.58	10.53	996.9	1,600.9	7.37	10.23	1,792.9	3,126.4
1996	9.13	12.44	681.1	1,367.8	8.40	11.45	1,582.6	2,889.3
1997	11.37	15.22	517.7	999.5	9.78	13.09	1,276.5	2,511.7
1998	10.14	13.43	220.9	635.2	8.55	11.32	666.6	1,601.0
1999	NA	NA	NA	1,055.2	NA	NA	NA	2,168.9
2000	8.20	10.47	423.3	886.5	7.94	10.14	615.0	1,396.7
2001	9.22	11.51	413.0	737.9	8.63	10.78	771.8	1,518.5
2002	8.97	11.02	363.5	710.3	8.35	10.26	711.3	1,592.6
2003	9.76	11.75	274.5	693.4	9.81	11.81	565.7	1,340.8
2004	13.70	16.04	365.5	779.2	13.88	16.25	875.8	1,500.1
2005	18.06	20.46	311.9	901.2	18.07	20.47	385.9	1,051.2
2006	18.43	20.23	246.5	703.1	18.09	19.85	586.0	1,279.2
2007	19.62	20.93	183.3	582.3	20.53	21.90	814.9	1,605.4
2008	25.90	27.03	206.4	405.6	26.83	28.00	498.9	1,124.3
2009	20.14	20.80	75.6	213.6	24.47	25.27	244.2	596.4
2010	22.71	23.18	108.1	286.8	21.06	21.50	218.6	668.3
2011	32.53	32.53	11.0	51.0	32.31	32.31	236.4	654.7

Notes: 1. Real prices are adjusted to 2011 dollars using the GDP implicit price deflator developed by the U.S. Bureau of Economic Analysis.
2. IFQ pounds used for pricing is less than actual pounds transferred because of confidentiality rules and data problems for transactions selected for compilation in the table.
3. IFQ pounds are the share of TAC pounds transferred for the particular area and year. IFQ pounds represent a potential amount of harvestable fish. Across all management areas, about 98 percent of TAC was harvested in 2011.

Source: NMFS RAM (April, October 26, and November 6, 2012).

Figure V.1
Halibut Permanent Quota Share Transfer and Transferor Rates by IPHC Area in 1995 to 2011



Notes: 1. Rates are calculated based on the year-end remaining QS and holders. The rates reflect total units transferred even if a particular unit is transferred more then once, therefore the data is not necessarily unique QS units or persons. Halibut QS units can be transferred in small amounts by persons who remain in the fishery and some halibut QS units can be leased.

2. The rate bump-up in 2007 was due to the regulation change allowing medical transfers.

Source: NMFS RAM (November 6, 2012).

VI. GLOSSARY

ADFG	Alaska Department of Fish and Game
AFSC	Alaska Fisheries Science Center
CATCH	Catch Accountability through Compensated Halibut
CBA	cost-benefit analysis
CDQ	community development quota
CEA	cost effectiveness analysis
CGE	computable general equilibrium
CHLAP	Charter Halibut Limited Access Program
CHP	Charter Halibut Permits
COAR	commercial operator annual report
CQE	community quota entity
CSP	Catch Sharing Plan
FMP	fishery management plan
GAF	Guided Angler Fish
GHL	Guideline Harvest Level
IBQ	individual bycatch quota
IFQ	individual fishing quota
IO	input-output
IPHC	International Pacific Halibut Commission
IPQ	individual processor quota
ITQ	individual transferable quota
LAMP	local area management plan
MCA	multi-criteria analysis
MSA	Magnuson Stevens Act
MWR	U.S. Military Morale, Welfare and Recreation Program
NEPA	National Environmental Policy Act
NEV	net economic value
NMFS	National Marine Fisheries Service, now NOAA Fisheries
NPFMC or Council	North Pacific Fishery Management Council

NPHA	Northern Pacific Halibut Act
NPV	net present value
PFMC	Pacific Fishery Management Council
PSC	prohibited species catch
QP	quota pounds
QS	quota share
QSP	quota share pool
RAM	Restricted Access Management
REI	regional economic impact
SHARC	Subsistence Halibut Registration Certificate
SPCE	stated preference choice experiment
TAC	total allowable catch
TNB	total net benefits
WTP	willingness-to-pay

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ENDNOTES

1. *Stewart et al. (2013) finds "the 2012 stock [sic] assessment indicated that the Pacific halibut resource [sic] has been declining continuously over much of the last decade as a result of decreasing size-at-age, as well as poor recruitment strengths. The population decline is estimated to have slowed and the stock trajectory is now relatively flat at 35 percent of the reference level, just above the harvest policy threshold (30 percent). Despite reductions in harvest levels in 2011 and 2012, the assessment estimates that, in retrospect, harvest rates have been well above the coastwide targets implied by the current harvest policy."*

2. *The combined Area 2C and 3A recreational guided angler sector harvests increased by 2.1 million pounds between 1995 (first year of the commercial sector individual fishing quota (IFQ) program) and the historical high year 2007. In 2007, this increase represented 4.2 percent of all Alaska removals.*

3. *Radtke (2008) testified before the North Pacific Fishery Management Council (NPFMC) Scientific and Statistical Committee (SSC) that insufficient economic analysis was being used for making halibut fishery management policy changes.*

4. *The Alaska halibut fishery history, species biological traits, current management regime, and abundance issues are aptly described at http://www.adfg.alaska.gov/index.cfm?adfg=halibut.printerfriendly. The International Pacific Halibut Commission (IPHC) and NOAA's National Marine Fisheries Service (NMFS) manage the Pacific halibut fishery through regulations established under the Northern Pacific Halibut Act of 1982 (NPHA). The IPHC promulgates regulations governing the Pacific halibut fishery under the Convention between the United States and Canada for the preservation of the halibut fishery of the North Pacific Ocean and Bering Sea. Regulations proposed by the IPHC are subject to approval by the Secretary of State with concurrence from the Secretary of Commerce.*

   The NPHA authorizes the North Pacific Fishery Management Council (NPFMC) to develop regulations in addition to, and not in conflict with, approved IPHC regulations. The NPFMC regulations may be implemented by NMFS only after approval by the Secretary of Commerce. The Alaska Department of Fish and Game (ADFG) manages most recreational fisheries in Alaska. This responsibility includes issuing angler fishing licenses; licensing fishing guides; licensing charter vessels; administering the charter vessel logbook program; estimating recreational harvest and effort using creel census, logbook, and mail survey information; and managing non-halibut species. Due to the overlap of halibut and non-halibut recreational fishing, NMFS collaborates with the State in the management of recreational halibut fisheries.

5. *There have been concerns about localized depletions that can differentially harm sectors and that the flexibility in switching fishing grounds decreases in order of the commercial sector, recreational guided angler sector, recreational unguided angler sector, and lastly the personal use sector.*

6. *Community quota entities (CQE's) are non-profit organizations that represent one or more municipal governments and are incorporated under Alaska laws or tribal regulations.*

7. *A list of other alternatives was assigned for Charter Halibut Stakeholder Committee review in December 2005 by the North Pacific Fishery Management Council (Council). The list was clarified in many related Council actions following the original list development. The related Council actions addressed such items as specifying and modifying the Guideline Harvest Level plan, devising a compensated quota share (QS) re-allocation plan, switching the official catch data to a charter logbook program, etc.*

8. *The adopted Catch Sharing Plan (CSP) first subtracts all other removals (non-halibut fisheries mortalities, recreational unguided angler sector, subsistence, commercial fishing wastage, etc.) before applying a share defined as available harvest for the commercial and charter fleet. The annual management measures selected to keep the charter fleet within limits will account further for uncertainty in what the management measures can accomplish and still allow fishing every day of the week and a full charter season.*

9. *This has incentivized Area 2C charter fleet operators to draw advantages from the definition of guided recreation by offering outfitting fishing services that fall within unguided regulations. The unintended consequence has been to increase the recreational unguided angler sector catch in Area 2C.*

10. *As recently as December 2012, the Council offered to develop a discussion paper on acceptable charter fleet common pool resource holding entities.*

11. *We reviewed NPFMC (2008a and 2008b) documents for the North Pacific Fishery Management Council's (Council's) October 2008 decision concerning the new Catch Sharing Plan (CSP) and implementing Guideline Harvest Level (GHL) regulations in International Pacific Halibut Commission (IPHC) Area 3A. We also reviewed the economic information available for the Council's 2007 decisions for implementing GHL regulations in IPHC Area 2C in the NPFMC (2007c and 2007d) documents. We perused other North Pacific Fishery Management Council (NPFMC) and National Marine Fisheries Service (NMFS) EA/RIR/IRFA's that were prepared for the implementation of GHL's, charter permit moratoriums, and catch sharing plans using charter individual fishing quotas (IFQ's). Finally, we reviewed the NPFMC (May 2012) EA/RIR/IRFA to revise halibut prohibited species catch (PSC) limits. Because reducing bycatch mortality would allow increases in directed fisheries harvests, there was expectation that marginal economic value measurements showing the tradeoffs would be offered. Again only some use of direct values for the longline and sport fisheries was provided along with the often repeated qualitative economic arguments for changed social welfare. The level and extent of quantitative economic information has been about the same since the documents presented to the Council for the February 2001 meeting concerning establishing a GHL.*

12. *It was disappointing to find that a North Pacific Fishery Management Council (Council) motion from the December 2011 meeting specifically asked for only direct value economic effects and only "economic impact" information if it could be developed. To the degree that staff assisted on the motion drafting attests to the self-directed tasking for developing or securing from others the data reductions and modeling necessary to complete quantitative economic effects descriptions.*

13. *NEI (2009) estimates in 2006 nonresident employees comprised 22 percent of the seafood processing workforce. In regards to harvesters, non-resident permit and vessel owners accounted for $1.08 billion of the $1.48 billion landings for all Alaska fisheries. This means that nearly three-quarters of the total harvest value accrued to nonresident harvesters.*

14. *On financial grounds, the measurement is incomplete until the costs of production are subtracted. It is impossible to determine from revenue data alone whether a businesses is earning profit. Using a revenue measurement in allocation decisions can promote waste and inefficiency because it focuses on maximizing output with no consideration of the costs of increasing output.*

15. *It would take additional work to determine if results should be declared "context-dependent" (e.g., status and characteristics of stock, geographic location, specific setting at the time of the study) and that values cannot be applied outside the framework of the study.*

16. *The INR (2006) described economic and social values important to fish resource user group allocation decisions for the Columbia River spring Chinook fishery. Applicable literature addressing that fishery's allocation conflicts included Carter and Radtke (1986). Some unedited passages from their report are repeated in this report.*

17. *The problem with a pilot program is that International Pacific Halibut Commission (IPHC) regulatory areas would have to be first divided into sub-regions so that allocations could be sub-divided. If the example of subdividing IPHC Area 4 is used as a template, this would be a lengthy and involved process. While an interim holding entity could probably be identified and a voluntary angler halibut stamp program instituted, there is the problem of what to do with acquired quota share (QS) if the program fails. Also, sub-regions compete for customers among themselves so higher angler costs may divert clients to non-pilot sub-regions. Or if it becomes obvious that relaxed management is driving higher customer interest, then areas not receiving benefits from the program may have to lower client fees in order to maintain demand. The complications for having an innocuous pilot program design may preclude its approach.*

18. *While our suggested cost-benefit analysis (CBA) modeling has some complexity, it was still necessary to omit factors, which causes the CBA to be characterized as limited. Using* posteriori *acquired information will undoubtedly find some factors to be minimal or net canceling. The factors include: 1) producer (commercial*

harvester and processor, and charter fleet operator) opportunity costs are undefinable, 2) producer surplus from charter fleet, guide services, marinas, lodges, and other recreational related businesses is comparatively small, 3) consumer willingness-to-pay (WTP) and existing seafood prices would be unaffected, 4) high skill occupations such as hired skippers can readily find jobs elsewhere, 5) the effects from other user groups such as personal use harvests, etc. are relatively negligible, 6) non-consumptive use and non-use values cannot be fully quantified and must be qualitatively discussed or used in case examples, and 7) interactions with other fisheries are not economically significant. Incorporating data and methods that would overcome these analytical difficulties and instead allow estimates for these simplifying factors would complicate the analysis, but should not materially change the results. Having to use simplifying factors should not be an excuse to not perform a quantitative analysis (NMFS March 2007).

19. *Other alternatives for acquiring bycatch quota may include: 1) allowing the individual bycatch quota (IBQ) sector to purchase and own halibut quota with relatively few rules on asset ownership and leasing; 2) reducing the bycatch cap in the IBQ sector and directly transferring available quota to another sector; and 3) implementing a bycatch penalty tax on the IBQ sector and using the tax revenues to permanently purchase quota from the IBQ sector (with options to lease quota back to the IBQ sector within reasonable limits).*

Appendix A

Indirect Economic Effects Demonstration Model Description

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A. Introduction

We describe modeling methods in this appendix for making four different analyses: net economic value (NEV) and regional economic impact (REI) estimates per unit of catch for the commercial and recreational user groups. The approaches use a static model applicable to depicting short range effects.[1] The term "economic effects" used in this narrative is meant to be a general reference to all four economic analyses. Table A.1 shows the per unit results.

B. Commercial Fishing

The Alaska Fisheries Science Center (AFSC) ongoing economic modeling project for the entire commercial fishing industry provides the basis for making estimates of NEV and REI arising from the halibut commercial fishery. One objective of the project is to develop a computable general equilibrium (CGE) model of fishing-related effects on the Alaska economy. One of several applications of the CGE model is described by Waters and Seung (2010). Data descriptions and an input-output (IO) modeling extension for this research project have been completed by TRG (2007).

1. Net Economic Benefits

Commercial fishing NEV is the sum of consumer and producer surplus. Herrmann and Criddle (2006) argue that policy considerations for halibut allocations between sectors can change consumer market relationships. However, the amount being considered for potential purchase by the recreational guided angler sector is relatively small compared to the existing commercial harvest quotas in Alaska and B.C. Market substitutions and product availability should not be significantly impacted by these small changes in quota (i.e. changes in consumer surplus is near zero). A calculation of producer surplus is an accounting of the profitability of the fleet that

1. Most economic analysis will be incomplete because not all changes in long range values and external costs are addressed. Long range value changes are those that can be expected to occur after a plan's actions are absorbed. (When these future changes are included, the revenue or costs streams are reduced to annual net present values in order for them to be used in the analysis. The choice of the discount rate to use in calculating net present value is controversial [Hanley and Spash 1993].) Because of the uncertainty in knowing these adjustments, analysts generally assume the change in the short term will approximate what happens over the course of the long term. Short term value changes are the immediate gains or losses to be expected to occur if the baseline conditions are changed.

   External costs are also not usually evaluated. Prices of products or services sold in the open market often do not reflect all the costs of making the product or providing the service. External costs are passed on to others in society, often in the form of dirty air, polluted water, or less biodiversity. External costs are difficult to identify and hard to quantify, but they can significantly decrease the value to society of production processes. Although it would not be easy to allocate these costs to resource management plan strategies, they could make up a significant part of the costs of producing outputs and should be evaluated along with market and nonmarket values.

participates in the halibut fishery and the profitability of the primary processor sector. There are subsequent indirect producer surpluses to other industries, but these two sectors are illustrative of the main NEV generators.

A more thorough examination of this accounting is described in TRG (2003). The accounting in algebraic notation of per unit NEV becomes:

Harvest Sector

ExV - L = VE + FE + NI
NEV% = (dFE + NI + L) / ExV
NevP = Nev% * P

Where:

ExV:	ex-vessel revenue	dFE:	proportion of fixed expenses attributable to NEV
HP:	harvest pounds		
P:	ex-vessel price = ExV / HP	NI:	net income
L:	net lease payments	NEV%:	net economic value as a percent of ex-vessel revenue
VE:	variable expenses		
		NevP:	net economic value per harvest pound

Processor Sector

NEV = dFE + NI * Y

Where:

NEV:	net economic value per round pound	dFE:	share of fixed expenses counted for net economic value, i.e. a booking correction using industry financial balance sheets
NI:	net income per finish pound		
Y:	yield or finish pound ÷ round pound		

The vessel category for longliner and the processor category for shoreside are used to approximate the profitability for the harvester and processor producer surplus for this example. This preponderance of landings and purchases makes the chosen vessel and processor categories justified for use in a demonstration. Other vessel and processor categories harvesting halibut should be considered for a more thorough analysis. Table A.1 shows the commercial per unit NEV estimate using the above equations adjusted to 2011 dollars to be $1.27 per pound (net weight) in 2011.

2. Regional Economic Impacts

REI per unit factors are from TRG (2007). Table A.1 shows the REI per pound (net weight) adjusted to 2011 dollars is $2.76 for Alaska, $5.90 for Washington and Oregon, and $11.14 for total U.S. level in 2011.

C. Recreational Fishing

1. Net Economic Benefits

Changes in trip costs, expected catch rates, fishery regulations, environmental quality, and other trip and participant attributes affect the expected net benefit associated with recreational fishing, and therefore the decision to participate and enjoy a recreational fishing trip. Individual anglers combine their skills, experience, time, travel, and equipment to decide to make a particular recreational trips (Bockstael and McConnell 1981) as is the as is the price of similar recreational substitutes. Demographic status (income, education, age, etc.) can be important in determining an angler's added value for fishing above and beyond the actual costs of a fishing trip. This added value above and beyond actual travel costs (representing disutility) is technically referred to as consumer surplus or NEV. The algebraic notation of a per unit NEV is:

NEV = WTP - TC

Where:

WTP: willingness to pay for satisfaction of the trip
TC: actual cost for achieving trip satisfaction

Willingness-to-pay (WTP) is sometimes used with the meaning for being net of actual costs and there will be instances of the dual meaning in this report. The context of the reference should make the meaning obvious. There is substantial body of literature on how to measure WTP using revealed and stated preference surveys and whether it is reliable for monetizing a recreational experience. A start in gaining an understanding is provided in Johnston et al. (2006) who includes several reviews of studies in Alaska on this topic. Surveys to determine WTP and analyze are expensive and it is fortuitous that the economic analysis of marine recreational fishing in Alaska has several recent study results to rely upon (see Section III.B).

Criddle et al. (2003) focused on explanatory variables that are predictable or subject to management control such as expected catch through bag limits and trip costs in order to make NEV modeling better suited for forecasting WTP and participation rate responses. They used a measure for compensating variation to show net benefit to consumers. It is an additional cost that, if added to the cost of a particular recreational fishing trip, would leave the recreational fisher indifferent between taking and not taking the trip. The estimated average daily compensating variation for fishing trips in 1997 was $110.47 for Alaskans and $159.17 for non-residents (adjusted to 2011 dollars). Weighting for the share of resident and non-resident charter-based angler days in 2011 and adjusting for dollar value, the average NEV per day is equivalent to about $132 in 2011 and $9.77 per pound for Area 2C and $4.63 per pound for Area 3A using recent fishing success rates and average per fish catch weight (Table A.1).

2. Regional Economic Impacts

Southwick Associates Inc. et al. (2008) provided direct value trip expenditures and REI per angler day estimates applicable to the regional level for bottomfishing. Table A.1 shows the per unit values borrowed for applicability in this study's demonstration model.

Table A.1
Economic Value Average Per Unit Parameters for the
Commercial and Recreational Guided Angler Sectors

Economic Level	Commercial Sector: Harvester and Processor REI Per Pound	NEV Per Pound: Harvester	NEV Per Pound: Processor	NEV Per Pound: Total
Alaska	$2.76			
Washington/Oregon	$5.90			
U.S.	$11.14	$1.08	$0.19	$1.27

Notes: 1. REI is measured by total personal income and includes the multiplier effect at the state level. REI is adjusted from the source study year to 2011 using ex-vessel price change. NEV is adjusted to 2011 dollars using the GDP implicit price deflator developed by the U.S. Bureau of Economic Analysis.
2. Pounds are based on net weight (dressed, headed and gutted).
3. Harvester and processor NEV per pound is based on contribution to profit, which is the sum of net income after variable costs and half the fixed expenses of a longliner vessel or shorebased processor budget.

Sources: TRG (2007), NPFMC (2008a), IPHC (2012).

Recreational Guided Angler Sector

Economic Level	Success Rate (Days Per Fish)	Weight (Pounds Per Fish)	REI Per Day	REI Per Fish	REI Per Pound	NEV Per Day	NEV Per Fish	NEV Per Pound	Spending Per Day	Spending Per Fish	Spending Per Pound	Tax Generation Per Day: State and Local	Tax Generation Per Day: Federal
Area 2C													
Alaska	1.58	21.3	$240.42	$379.23	$17.80				$578.95	$913.22	$42.87	$34.78	$29.86
U.S.						$134.64	$212.37	$9.97					
Area 3A													
Alaska	0.58	16.7	$467.74	$273.51	$16.42				$889.44	$520.09	$31.22	$26.83	$25.51
U.S.						$131.98	$77.17	$4.63					

Notes: 1. REI, NEV, spending, and tax generation are adjusted to 2011 dollars using the GDP implicit price deflator developed by the U.S. Bureau of Economic Analysis. REI is measured by total personal income and includes the multiplier effect at the state level. NEV is at the national level.
2. The "per day" measure is an average angler day calculated from trip duration in the source study.
3. The source study for REI, spending, and tax generation uses sportfishing expenditure data from 2007, and IMPLAN models based on 2006 Alaska economic data. The source study for NEV uses sportfishing expenditure and willingness to pay net of actual cost data from 1997.
4. The success rates are days per fish for charter fleet anglers in 2011. The success rates are catch weighted averages for the respective IPHC regulatory areas.
5. Pounds per fish are 2006-2010 weighted average for charter fleet anglers. Pounds are based on net weight (dressed, headed and gutted).
6. Recreational economic effects are for saltwater guided and unguided anglers and are weighted average by residency. The economic effects include package trip and other trip expenditures, and exclude license and stamps, and equipment/real estate expenditures.
7. Tax generation includes local, state, and federal taxes from package trip and other trip expenditures, and excludes equipment/ real estate expenditures.

Sources: Southwick Associates Inc. et al. (2008) for REI, spending, and tax generation per day; Criddle et al. (2003) for NEV per day; Sigurdsson and Powers (2012) for success rates in 2011, NMFS (2012) for weights.

Appendix B

Conceptual Economic Optimization Model

Appendix B
Conceptual Economic Optimization Model

A conceptual Catch Accountability through Compensated Halibut (CATCH) Project plan optimization model can be mathematically analyzed in a simple, equilibrium static framework. This will illustrate that the fundamental challenge for the recreational guided angler sector is to maximize benefits (this can be firm net revenues, community benefits, some weighted combination of both, etc.) given that their QS purchases impact their costs as well as angler participation rates where:

- CATCH Project plan is to maximize total net benefits (TNB)
- Benefits produced by each angler trip is (B)
- Angler's participation (angler trips) is (A)
- Quota share (QS) cost is (C)
- Angler participation is positively influence by the quality/quantity of harvestable fish and fishing which is directly associated with available QS A(Q) (where Q represents the QS supply curve)
- Angler participation is negatively influenced by the fees they must pay which is directly associate with QS costs A(C(Q))

The problem is to select the optimal level of QS, Q* that will maximize TNB where:

$$TNB = B \cdot A(Q, C(Q)) - C(Q) \qquad (1)$$

The optimal level of QS to purchase (Q*) occurs when the marginal benefits of acquiring an extra unit of QS equals the marginal costs of acquiring that QS. Taking first derivatives and setting to zero generates the solution for the optimal level of QS (Q*):

$$B\partial A/\partial Q \; - \; B[\partial A/\partial C \; \partial C/\partial Q] \; - \; \partial C/\partial Q \; = \; 0 \qquad (2)$$

$$B\partial A/\partial Q = \; B[\partial A/\partial C \; \partial C/\partial Q] \; + \; \partial C/\partial Q \; = \; \text{Quota Price } (P^*) \qquad (3)$$

Equation (2) has three terms:

i. $B\partial A/\partial Q$ is the marginal benefit due to acquiring an extra unit of QS that increases marginal participation rates per angler.
ii. $B[\partial A/\partial C \; \partial C/\partial Q]$ is the marginal costs due to reduction in angler participation rates resulting from the higher user fees (costs) associated with paying for QS.
iii. $\partial C/\partial Q$ is the direct marginal cost associated with purchasing the additional unit of QS.

Equation (3) shows that at the optimal level of QS and purchase price (Q*, P*) the CATCH Project must account for the impacts on participation of recreational anglers from both available quota pounds (QP) and cost effects. The QS purchase price will equal the marginal benefits and costs for the guided angler sector. The challenge is to simultaneously calculate the optimal QS purchase (and price) given that QS costs have a positive influence in participation rates but also a negative influence given user fees to finance QS purchase. This requires the CATCH Project to understand:

- Their own industry goals and needs (NB) including their collective profit functions ($\sum \prod$)
- The behavior of recreational anglers in response to larger fish and/or a higher quantity of fish as well as response to costs and fees (i.e., recreational demand and willingness to participate and pay (WTP))
- The determinants of QS supply (the supply curve represented by Q) derived from commercial fishing sector profit functions constrained by regulation and biological resource production functions.

Appendix C

QS and CHP Market Asset Value Calculation

Appendix C
QS and CHP Market Asset Value Calculation

A. Introduction

We use methods from of Newell et al. (2005a) that econometrically examined factors between fishing rents and quota share sale prices in the New Zealand individual fishing quota (IFQ) market-based system to calculate a theoretical asset value for quota share (QS) and permits in the Alaska halibut fishery IFQ program and charter fleet limited entry permit program.[1] The theory and example from the New Zealand system, which is relatively unconstrained for permit leasing and sales, is a contrast to Alaska's constrained system. Using this contrast adds clarity to how asset values can be distorted in permit system design. The factors that Newell et al. (2005a) explored are loan interest rates, risk, and expected changes in future fishing rents. The authors use lease prices as a proxy for fishing rents to represent the annual flow of profits from holding quotas and we use the profitability factor called breakeven price for a profitability factor.

The authors found results to be consistent with theory. The results indicate that QS asset prices are positively related to declines in interest rates, lower levels of risk, expected increases in future fish prices, and expected cost reductions from rationalization under the quota system. They argue IFQ programs are a promising market-based system for avoiding the common pool problem in fisheries, particularly when trade of quotas between fishers is permitted. When there are competitive quota markets, rational asset pricing theory suggests that the price of quotas should reflect the expected present value of future profits in the fishery.

For IFQ programs to deliver an efficient solution to the common pool problem in practice, it is critical that quota markets are competitive and convey appropriate price signals. Price signals sent through the quota market are therefore an essential source of information on the expected profitability of fishing and an important criterion for decisions to enter, exit, expand, or contract individual fishing activity. Quota prices also send signals to policymakers about the economic and biological health of a fishery. For example, Arnason (1990) showed that under the assumption of competitive markets, monitoring the effect of changing the total allowable catch (TAC) on quota prices could be used to determine the optimal TAC. By implication from the Newell et al. (2005a) study results, the New Zealand quota system as a whole has functioned reasonably well and the prices at which quotas have sold appear to reflect expectations about future returns on specific fish stocks.

Newell et al. (2005a) conclusions were drawn from results in a previous study (Newell et al. 2005b) that investigated the performance of IFQ markets. The dataset from New Zealand covers 15 years of transactions across the 33 species that were in the program as of 1998 and includes price and quantity data on transactions in more than 150 fishing quota markets. Markets exist in New Zealand both for selling the perpetual right to a share of a stock's TAC, as well as for leases

1. Individual fishing quotas, in which the total catch is capped and shares of the catch are allocated, is an example of a fisheries management market-based system. An IFQ system results when transfer of the shares is permitted, and the least efficient vessels will find it more profitable to sell their quota rather than fish it. Over time, this should both reduce excess capacity and increase the efficiency of vessels operating in the fishery.

of that right to catch a given tonnage in a particular year. Newell et al. (2005b) found that market activity appears sufficiently high to support a reasonably competitive market for most of the major quota species and that price dispersion has decreased over time. Investigating the asset and lease markets *separately,* they find evidence of economically rational behavior in each of the quota markets and their results show an increase in quota asset prices, consistent with increased profitability.

We extend the analysis of Newell et al. (2005b) who econometrically examined the relationship *between* the annual lease and sale of the perpetual quota asset markets. With competitive markets, rational asset pricing theory suggests that the price of an income-producing asset in period t, p_t, should be determined by the real per-period profits from the asset, π_t, and the real discount rate (r):

(1) $$p_t = \sum_{j=0}^{\infty} \frac{\mathrm{E}_t(\pi_{t+j})}{\prod_{k=0}^{j}(1+\mathrm{E}_t(r_{t+k}))},$$

where E is the expectations operator. Equation (1) states that the current quota asset price should be equal to the present discounted value of all future expected earnings, where the lease prices represent the annual flow of profits from holding quotas. The price of the quota asset, therefore, will vary across fish stocks and over time based on changes in expected future lease prices or changes in the expected discount rate over time.

Under the simplifying assumption that expected lease prices and discount rates remain constant in the future, the price of the asset would simply equal the lease price divided by the discount rate, or $p_t = \pi / r_t$. The expected rate of return from holding fishing quota (or dividend-price ratio) would be equal to π_t / p_t.

Consistent with asset pricing theory, the Newell et al. (2005b) authors found a statistically (and economically) significant relationship between asset prices and contemporaneous lease prices. Stocks with a higher degree of biological volatility tend to have lower asset prices, and stocks that have rising returns or falling costs from fishing are found to have higher asset prices, *ceteris paribus*. Taken together, these results suggest that the price signals generated by the IFQ system are a good indication of the future profitability of individual fishing quota stocks. The magnitude of some interrelationships is muted relative to what the theory suggests, possibly due to measurement error.

1. Asset Value Definition

Asset value in the fishing industry can be associated with such things as vessels and gear, processing equipment and land, and fishing permits. A form of permit value can be an assignment of harvest quotas to individuals, sometimes called IFQ. The concept of IFQ's for vessels and individual processor quotas (IPQ's) has been implemented for a number of fisheries by the North Pacific Fishery Management Council (NPFMC) as a means for "rationalizing" the fisheries. IFQ's reduce the need for Olympic fisheries by allowing harvesters to target their catch for available markets and reward entrepreneurial innovation by increasing profitability and asset values. IPQ's have the effect of tying a certain harvest share to identified processors. Without asset formation there would be no incentive to sell out and reduce overcapitalization, which is one of the goals of a rationalization program.

The right to receive a certain amount of available resource is a value that would be recognized as an asset. The next prospective holder would have to buy that right. In economic terms, the granting of permit value for this right could be considered a windfall, i.e. a publicly owned resource is being gifted to certain privately held entities. While the value may appear to be a windfall to some, those receiving an IFQ or IPQ share may argue that it is a long deferred return on investments made on promises there would be profits from sustainable fishery management.[1]

The effects of IPQ's may be investment protection for processors. Processors argue about the potential impacts of IFQ programs (Plesha 1993, NRC 1999, GAO 2004). Principally, IFQ's could create some stranded capital and have significant impacts on isolated rural communities. Investments made in plants may be left behind as IFQ programs reshape where, when, and to who harvests are delivered. Others argue that there are markets for many types of so called stranded capital and that industry and policy risks have already been accounted for in business investment decisions (Wilen and Brown 2000).

An asset formation calculation can be accomplished using economic theory. A measure of wealth derived from access to a fishery can be calculated from reviewing the participant's economic returns. Marginal returns are the difference between marginal revenue minus marginal cost of effort. Or in the example of a vessel harvesting halibut fishery QS, it would be the extra revenue received over and above the breakeven revenue needed to perform the harvest (including the "opportunity" cost of employing labor and capital in the next best alternative). The asset value is then the discounted current and expected future net returns after considering any uncertainty for those returns.

While economic theory correctly describes methods to determine asset value, it is difficult to empirically estimate those values. Instead, Huppert et al. (1996) investigated whether asset value could also be reflected in a QS sale or lease price. The inclusion of fixed costs in determining asset value is problematic (Terry et al. 1997). Also, it is largely unknown how the addition or subtraction of quota to the fishery will impact other asset values, such as permit values.

Whatever the approach used, the theoretical asset formation value can be calculated, but getting an actual value for the QS in an ask-bid market situation is much more complex. Until that occurs, the actual value is unknown. But whatever the value, it is a tangible asset recognized by lending institutions for collateral, and in private ownership is a capital gain subject to provisions for accounting depreciation and disposition (Johnson 1995). Private and government loan

1. Generally economists like to say past investments are sunk costs. In the fishing industry, many decisions were made to facilitate a derby style fishery, to get the most product through as fast as possible. The more even flow throughput made possible by the halibut individual fishing quota (IFQ) program means some harvesting and processing capital investments are not needed for current regulations. Economists argue that past investments should not influence decisions about new regulations.

agencies will recognize assets which will improve any indicator of the owner's net worth in seeking investment financing.

The Alaska halibut fishery IFQ program has been amended over the years since it was implemented in 1995 to address processor and community concerns.[1] Deliveries must be made to a qualified list of processors and there is the option of establishing community quota entity (CQE) holders who have the right to purchase QS for the communities they represent. There has been a specification for a subsistence fishery to protect the rights of tribes and individuals. Each of these assigned fishing privileges could have their own calculation of asset value to be used for comparative purposes with other halibut resource users.

2. Asset Value Estimates

Two examples are used to calculate asset value of the halibut fishery's commercial sector QS. The first uses a discounted stream of profitability based on a calculated harvester breakeven price (Table C.1 and C.2). The second example uses two informal approaches (Table C.3): expectations of profitability on revenues and a rule-of-thumb. Another example is offered for calculating the asset value of a recreational sector Charter Halibut Permit (CHP) using expectations for a charter vessel profitability.

a. Example: Breakeven Price Net Present Value

The economic performance of vessels participating in the halibut fishery provides a convenient example of asset formation. Using results from a recent NOAA Fisheries Alaska Science Center survey of southeast Alaska commercial fisherman and processors, a longliner vessel shows that about 36 percent of halibut harvest revenue is in excess of the variable costs to prosecute the fishery if all other vessel revenues from other fisheries, tendering, etc. are held constant. The net present value (NPV) would be calculated by discounting this benefit (after accounting for opportunity costs) using an appropriate discount rate and adding up over a specified time horizon (typically 30 years).

b. Example: Fishing Industry, Profitability Expectations, and "Rule-of-Thumb"

Another way a QS buyer might calculate an offer is to consider the potential harvest revenue that the QS would generate. Depending on the expectations and situation of the buyer, they might view the QS as a potential for generating a 60 percent lease fee or that about 20 percent of the additional revenues needed after fixed and variable costs are covered to generate a reasonable profit. This second approach to calculating a QS asset value based on profitability alone would not include an intangible value. Therefore, the calculated amount would be more conservative than a single factor approach.

Anecdotal information indicates that the fishing industry sometimes uses a factor of at least seven times the ex-vessel value to arrive at the asset value of an IFQ (Pettinger 2005). The rule-

1. The North Pacific Fishery Management Council (Council) limited access fishing privilege program for halibut and sablefish was recommended by the Council in 1991, approved by the Secretary of Commerce in 1993, and implemented in 1995 (Pautzke and Oliver 1997).

of-thumb appears to be verifiable using the Alaska halibut and sablefish fishery pricing. The average ex-vessel halibut price for IFQ harvests in 2011 was $6.34 per pound for combined Areas 2C and 3A. Welch (May 2012) reports, "Halibut quota in southeast is in the $35 to $39 range." and "Southeast black cod shares are fetching about $35." Petersburg Fishermen's Services, Inc. (2012) reports $32 for Area 3A halibut IFQ, and $34 for western Yakutat sablefish IFQ.

c. Example: Recreational Guided Angler Sector Asset Value

As a comparison, assumptions about charter fleet operation profitability were used to calculate per vessel asset value (Table C.4). The results can be compared to early CHP program permit sales information (Table C.5). The Area 2C asset value per active vessel was in the range of $68 thousand and an average selling price in both 2011 and 2012 for a six angler endorsed permit was about half of that amount. Overlooking possible discrepancies in the assumptions and methods, an explanation could be that the permit market is not yet sufficiently developed to reflect profitability conditions. The selling price could have been bid down because of the large latent capacity.

3. Influence of QS Transfer on IFQ Program Holder and Processor Asset Value

The IFQ asset value estimations are for static levels of commercial TAC. The estimations for IFQ holders depend on their situation to realize future profit expectations. Profit inputs are harvest price, available catch, and operational efficiency. If any of these variables have an incremental increase, then the asset value would be expected to increase. The available catch increase would be governed by stock abundance size. Operational efficiency is directed by the proportion of harvest variable and fixed costs that must be committed to operations. Profitability increases with increasing number of trips because the proportion of fixed costs remains constant. Halibut price is affected by a complicated set of world demand and substitute product supply circumstances that would have little influence by the minor movement of allocations being discussed for the Catch Accountability through Compensated Halibut (CATCH) Project proposals. Conversely, the expectations on longer term stock size would be a major determinant in increasing or decreasing asset values for IFQ holders.

It is important to distinguish between holders and aggregate asset value. Redistributing the amount of halibut that is assigned to the commercial and recreational sector -- accepting there is no price inducement -- is an aggregate asset value issue. Individual holders would be compensated for their asset values under QS purchase arrangements, and at static TAC's the sum of asset values across remaining holders in the commercial fishing sector would decrease (although individual asset values may increase). For QS holders that elect to stay in the fishery, they would be unaffected by an increase in charter harvest allocations as their individual portion of the combined catch limit is preserved.

A concern for processors will be the incremental reduction in halibut fishery deliveries. The CATCH Project objectives are only to compensate QS holders for asset value. There will be concern from not only processors, but also commercial fishery sector suppliers from the decreased business opportunities. This can be partially offset by increased recreational sector activity, however products and labor requirements are quite different between the two sectors. This will have downstream economic effects to communities where processors are located.

4. Influence of QS Transfer on Charter Halibut Permit Values

One additional issue to consider with respect to implementation of a successful QS asset purchasing and management program is impact on value of CHP's and guided fishing effort. This is particularly important in Area 2C where only slightly more than half of the guided permits are actively used (287 out of a total of 533). Almost all of the available permits are used in Area 3A (419 out of 439). Based on analysis, these permits presently have an average market "asset" value of approximately $68 thousand per active vessel in Area 2C and $72 thousand in Area 3A (Table C.4). Based on permit sales in 2011 and 2012 (Table C.5), these permits have a marginal value of $32 in Area 2C and $48 to 60 thousand in Area 3A, suggesting that average permit holders have opportunities to make small to moderate profits given existing economic conditions. The smaller value in Area 2C represents both the expectations of smaller profits given constraining harvest rules plus the effects of latent capacity.

Table C.1
Southeast Alaska Longliner Gear Vessel Pro Forma Income
Statement and Halibut Fishery Breakeven Price Analysis in 2010

Revenue and Other Income	Volume (Pounds)	Amount	Halibut Fishery	Breakeven Ex-vessel Price	Actual Ex-vessel Price	Ratio
Alaska fisheries						
Halibut	49,794	$176,450	$176,450	$2.70	$3.54	0.76
Sablefish		130,133				
Salmon		34,615				
Other species		18,225				
Subtotal		$359,423	$176,450			
West Coast fisheries		$26,198				
Subtotal ex-vessel revenue		$385,621	$176,450			
Lease income						
Permit lease, quota sale, etc.		$15,905	$0			
Other income						
Tendering, charters, etc.		$33,105	$0			
Subtotal revenue		$434,631	$176,450			

Expenditures	Share	Amount	Halibut Fishery
Variable Expenses	63.54%	$276,183	$112,124
Fixed Expenses	11.11%	$48,281	$22,092
Subtotal expenses	74.65%	$324,464	$134,216
Net income (gross profit before taxes, capital interest payments, etc.)	25.35%	$110,167	$42,234

Notes: 1. The assigned fixed expenses to the halibut fishery cost center is proportional to the subtotal ex-vessel revenue.
2. Actual ex-vessel price is per whole pound for southeast Alaska halibut deliveries by longliner type vessels.

Source: The pro forma income statement for a southeast Alaska longliner vessel business is from Waters and The Research Group (April 2012).

Table C.2
Halibut QS Asset Value Estimation Using Halibut Fishery Breakeven
Price Applied to the 2011 Combined Area 2C and 3A Fishery

Study area volume Alaska 2011 (millions)		16.6
Study area value Alaska 2011 (millions)	$	105.0
Fixed cost at 2011 harvest volume and price (millions)	$	9.9
Variable cost (millions)	$	66.7
Profitability (millions)	$	28.3
Ratio of breakeven price to actual price using SE AK longliner 2010 harvest year budget		76.1%
Ex-vessel price in 2011	$	6.34
Breakeven price in 2011	$	4.82
Breakeven value in 2011 (millions)	$	79.8
Total QS 2011 value (millions)	$	25.1
Assumed risk and uncertainty rate		5%
Discount rate		7%
Expectation period (years)		30

Net present value:	Asset Value (millions)	Asset Value Per Pound
	$ 296.2	$ 17.89
With two times volume:		
	$ 592.4	$ 35.77
With 1.25 times actual price:		
	$ 605.6	$ 36.57

Notes: 1. Net present value (NPV) includes risk and uncertainty rate.
2. Total QS 2011 value is 2011 volume times 2011 ex-vessel price minus price-breakeven price.
Sources: IPHC (2012), NPFMC (September 2012), and Study.

Table C.3
QS Asset Value Based on Price and Net Income Expectations

Expectations	Price	Volume (millions)	Revenues (millions)	Marginal Revenues (millions)	Asset Value (millions)	Asset Price
Price expectations						
Current	$ 6.34	16.6	$ 105.0	$ 25.1	$ 296.2	$ 17.89
Average 1995+	$ 3.54	30.1	$ 106.6	$ 145.2	$ 1,712.1	$ 56.84
10-year high	$ 6.34	16.6	$ 105.0	$ 79.8	$ 941.3	$ 56.84
Net income expectations						
20% harvest revenue	$ 3.54	30.1	$ 106.6	$ 21.3	$ 251.4	$ 8.35
60% harvest revenue	$ 3.54	30.1	$ 106.6	$ 64.0	$ 754.2	$ 25.04
Rule-of-thumb	$ 4.72	26.4	$ 124.7		$ 611.2	$ 23.14

Notes: 1. Asset value based on net present value using seven percent discount rate, 30 year horizon, and five percent risk and uncertainty.
2. Price expectation marginal revenue based on longliner budget halibut revenue breakeven price.
3. Net income marginal revenue based on 20 percent and 60 percent of halibut harvest revenue as examples for expected profitability and expected lease fees.
4. Rule-of-thumb asset value based on seven times harvest revenues using last five years average volume and price.

Source: Study.

Table C.4
Charter Halibut Permit Asset Value Estimate

Inputs and Assumptions	Area 2C	Area 3A
Bottomfishing Angler days in 2011	81,698	126,566
Growth in angler days	0%	0%
Client payment fee in 2011	$ 250	$ 250
Comp factor	10%	10%
Single fishery client payment adjustment	$ (25)	$ (25)
Assumed gross profit rate	10%	10%
Assumed risk and uncertainty rate	5%	5%
Annual revenue	$ 1,571,665	$ 2,434,813
Active vessels in 2011	287	419
Transferable permitted vessels in 2011	372	339
Permitted vessels in 2011	533	439
Fish harvested in 2011	51,794	216,449
Charter mean net weight per fish	14.6	15.1
Pounds (net weight)	756,192	3,268,380
Success rate (days per fish)	1.58	0.58
Success rate (days per pound)	0.11	0.04
Discount rate	7%	7%
Expectation period (years)	30	30

Net present value:

Area 2C Asset Value

Total (millions)	Per Active Vessel	Per Transferable Vessel	Per Fish	Per Pound
$ 19.5	$ 67,954	$ 52,427	$ 377	$ 25.79
With +10% growth in angler days:				
$ 21.5	$ 74,750	$ 57,670		
With -10% growth in angler days:				
$ 17.6	$ 61,159	$ 47,184		

Area 3A Asset Value

Total (millions)	Per Active Vessel	Per Transferable Vessel	Per Fish	Per Pound
$ 30.2	$ 72,109	$ 89,126	$ 140	$ 9.24
With +10% growth in angler days:				
$ 33.2	$ 79,320	$ 98,039		
With -10% growth in angler days:				
$ 27.2	$ 64,898	$ 80,213		

Notes:
1. Net present value (NPV) includes annual risk and uncertainty in addition to application of a discount rate.
2. It is assumed that bag limits stay the same with angler day +/- 10 percent growth.
3. Angler days and fish from Sigurdsson and Powers (2012).
4. Charter mean net weight per fish for Area 2C in 2011 was treated as an outlier, and preliminary 2012 average was substituted. Area 3A uses 2011. The data source for mean net weight is Gilroy and Williams (2012) for preliminary 2012, and NPFMC (September 2012) for 2011. Total pounds are calculated from charter mean net weight per fish, and total fish.
5. The fish and weight unit values for different angler day growth alternatives would not change because they are calculated values using angler days as a basis.

Source: Study.

Table C.5
Charter Halibut Permit Transfers by Area and Type in 2011 and 2012

Year	Area	Business Sold	Classification	Min	Max	Average
2011	2C	N	4 Anglers	***	***	***
		N	5 Anglers	25,000	60,000	35,214
		N	6 Anglers	10,000	66,000	32,031
		Y	4 Anglers	***	***	***
	3A	N	4 Anglers	9,000	50,000	37,625
		N	5 Anglers	***	***	***
		N	6 Anglers	36,000	80,000	62,039
		N	>6 Anglers	20,000	90,000	60,119
		Y	5 Anglers	***	***	***
2012	2C	N	4 Anglers	***	***	***
		N	5 Anglers	20,000	30,000	25,750
		N	6 Anglers	28,000	36,000	31,800
		Y	6 Anglers	***	***	***
	3A	N	4 Anglers	35,000	45,000	38,545
		N	5 Anglers	***	***	***
		N	6 Anglers	25,000	80,000	47,909
		N	>6 Anglers	44,000	1,000,000	340,100
		Y	6 Anglers	***	***	***

Notes: 1. Transactions with a transaction price of zero are excluded from the list.
2. Each row with transferors or transferees less than three is confidential data and is excluded from the list.
3. Data is as of November 30, 2012.

Source: NMFS RAM (November 30, 2012).