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# Recreational Leasing of Alaska Commercial Halibut Quota: The Early Years of the GAF Program in Alaska

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## ABSTRACT

The Pacific Halibut Catch Sharing Plan formalized the process for allocating halibut between the Alaska commercial and recreational charter sectors. It included a new program intended to allow for “flexibility” through inter-sectoral trading, permitting charter operators to lease commercial halibut pounds to relax client harvest restrictions. Here we evaluate the first two years of lease market activity and participation. Participation from some commercial quota holders in the lease market suggests that the program provided beneficial flexibility; in fact, the number of transfers to the charter sector was greater than transfers within the commercial sector for some quota types. We also identified a high proportion of self-leasers. However, transfers to the charter sector were on average smaller than within-sector commercial transfers, and total poundage leased by the charter sector was low compared with commercial transfers. Usage of leased quota by the recreational charter sector enables the harvest of larger fish or additional fish, and provides flexibility in catch composition on halibut closure days. Finally, the value-per-pound may be higher in the charter sector, as commercial-to-charter transfer prices approached the commercial ex-vessel price.

## KEYWORDS

Alaska; Pacific halibut; commercial fishery management; individual transferrable quota; inter-sector quota allocation; Guided Angler Fish; GAF program; recreational fishery management

## Introduction

One of the most politically challenging and controversial issues in ocean management is the allocation of resources between different stakeholders, including energy development, conservation, aquaculture, and commercial and recreational fishing. Recently, many have proposed the development of marine spatial plans (e.g., Douvere 2008; Foley et al. 2010) and marine zoning (e.g., Day 2002; Sanchirico et al. 2010) as a means to develop a transparent process for the allocation. Some of the early examples of the application of these ideas include the allocation of areas for wind energy, such as in Rhode Island and Massachusetts (e.g., Collie et al. 2013).

While explicitly addressing allocation questions across so many stakeholders might be a relatively new discussion in ocean policy and politics, there is a long history of allocation disputes between fishing sectors (e.g., fixed and mobile gear), between commercial

and recreational fishing (e.g., Bishop and Samples 1980; Coleman et al. 2004; Carter, Agar, and Waters 2008; Borch 2010; Holzer and McConnell 2014), and between commercial, recreational, and conservation interests. The debate surrounding the implementation of marine reserves is an example of the latter, where a marine reserve is the allocation of space (and the biomass therein) to the conservation sector (Sanchirico 2004). Examples of the current disputes between commercial and recreational include, but are not limited to, the allocation of red snapper in the Gulf of Mexico (Agar 2014), Pacific halibut in Alaska (NOAA 2013), and summer flounder in the Mid-Atlantic (Terceiro 2001).

Concurrent with these allocation disputes, regional fishery management councils (FMCs) around the U.S. have been increasingly adopting catch share programs — including individual fishing quota (IFQ), limited access privilege (LAP), and territorial use rights fisheries (TURF) programs. In fact, since 2008 there have been eight new catch share programs implemented in U.S. marine fisheries.<sup>1</sup> U.S. catch share programs have almost exclusively been applied in the commercial fishing sector, with IFQ or other fishing privileges being allocated among those in the harvesting and/or processing sectors, or in fishing communities (see, e.g., Fina 2011; Holland et al. 2015). The potential for catch shares to be used in the recreational for-hire (charter) sector has been recognized for some time (e.g., National Research Council 1999; Wilen and Brown 2000; Abbott and Wilen 2009) but was only recently tried in the Gulf of Mexico red snapper and gag head boat recreational fisheries (Abbott and Willard 2017).

The adoption of catch share programs, however, has not quieted down the controversy surrounding allocation, because in many cases the total shares allocated to the fishers are based on the past history of catches. The implication is that the catch share programs can formalize the often ad hoc allocation decisions of the past. On the other hand, catch share programs open the possibility of a non-regulatory means of addressing the allocation question. That is, if trading is allowed, whether within the commercial fishing sector only (e.g., quota can be traded across gear types/sectors) or between commercial and recreational sectors, then the market will find the “right” allocation over time. In particular, the theoretical expectation is that the value of the quota will be equalized across the sectors at the margin (trading price) and in turn this will lead to efficient allocation between the sectors (see, e.g., Arnason 2009; Holzer and McConnell 2014).

While there are examples within commercial fishing of sectors being allowed to trade (e.g., West Coast Groundfish mobile and fixed gear fleets; see, e.g., Holland et al. 2015), there are very few catch share programs designed to include both recreational and commercial fishery participants, even though the National Catch Share Policy (NOAA 2010) explicitly states that FMCs should “consider allowing the inter-sector transferability of catch share privileges to respond to changes in demand and promote future access opportunities wherever catch share privileges are used in multisector fisheries.” An exception to this and, to our knowledge, the first commercial-to-recreational market transfer program in the United States, is the Guided Angler Fish (GAF) program, which was implemented in 2014 as part of the Catch Sharing Plan (CSP) for Pacific halibut fisheries in Alaska (NOAA 2013). The GAF program introduced inter-sector quota trading into the Alaskan Halibut commercial catch share program<sup>2</sup> and is unique among fishery catch share programs in that it allows for one-way inter-sector transfers,

permitting recreational users to lease commercial quota (Call and Lew 2015). The goal of the GAF program was to address ongoing allocation conflicts between the commercial and recreational charter sectors amidst continuing declines in Pacific halibut stocks (NOAA 2013). The GAF program provides Alaska recreational charter (guided) operators more flexibility in their operations that translates into their ability to offer their clients improved halibut angling opportunities (NOAA Alaska Region 2014).

In this article we evaluate the first two years of the GAF program. Examining the early outcomes of the GAF program is critical for a number of reasons. First, it is important to understand how market approaches to allocation work in practice, especially in fisheries with relatively small-scale operators, as the conditions for them to lead to the efficient allocation might not be present (e.g., full information, no transaction costs). Second, the GAF program has faced opposition from the charter halibut community, with charter operators generally holding a negative view of the CSP and the GAF program, and a majority believing the GAF program negatively impacts their businesses (Lew, Putman, and Larson 2016). A small minority (about 15%), however, view the program favorably. Prior to implementation, support for the program tended to come from commercial operators (see, e.g., SEAFA (2011); ALFA (2012); UFA (2013)). The divergent views, along with proposals from the recreational sector to change the design of the program (NPFMC 2016a), highlight the importance of documenting the changes from the program to date, even if there are not sufficient data points to statistically measure the impacts and examine potential outcomes under alternative fishery conditions and program designs. Finally, there are recent efforts to implement catch shares in other recreational fisheries<sup>3</sup> and the National Catch Share Policy emphasizes the thorough assessment of the transferability of catch shares (NOAA 2010).

Using unique confidential datasets of commercial quota holdings and transactions, GAF transfers, and charter logbook catch and effort over the first two years of the GAF program, we investigate participation, activity, and market performance of the program.<sup>4</sup> Our contributions include exploring the characteristics of commercial sales and sellers, such as the type of commercial quota sold as GAF and the characteristics of the commercial quota sellers, and examining use of GAF by the charter sector. That is, we compare the size, number, and price of commercial and GAF transactions within commercial quota submarkets (in this fishery, quota carries an area, class, and blocking designation; we use the term “submarket” to refer to a unique quota area, class, and blocking combination). Despite the aforementioned support from commercial operators, one fear of commercial fishers and communities is that if trading is allowed between the sectors that the higher valuations of halibut in the recreational sector will result in quota leaving the commercial sector (Abbott, Maharaj, and Wilen 2009).<sup>5</sup> Smaller commercial operations are more likely to raise this concern due to smaller quota holdings. Motivated by these concerns, we compare commercial-to-commercial and GAF prices, which provide market signals on the relative value of quota in the two sectors. Finally, we are the first to investigate how the introduced flexibility provided by GAF is being utilized by charter businesses. By analyzing commercial sector participants and transfers in more detail, as well as the use of the GAF in the charter sector, we are able to provide a more thorough understanding of the program’s impacts on both the recreational and commercial sectors.

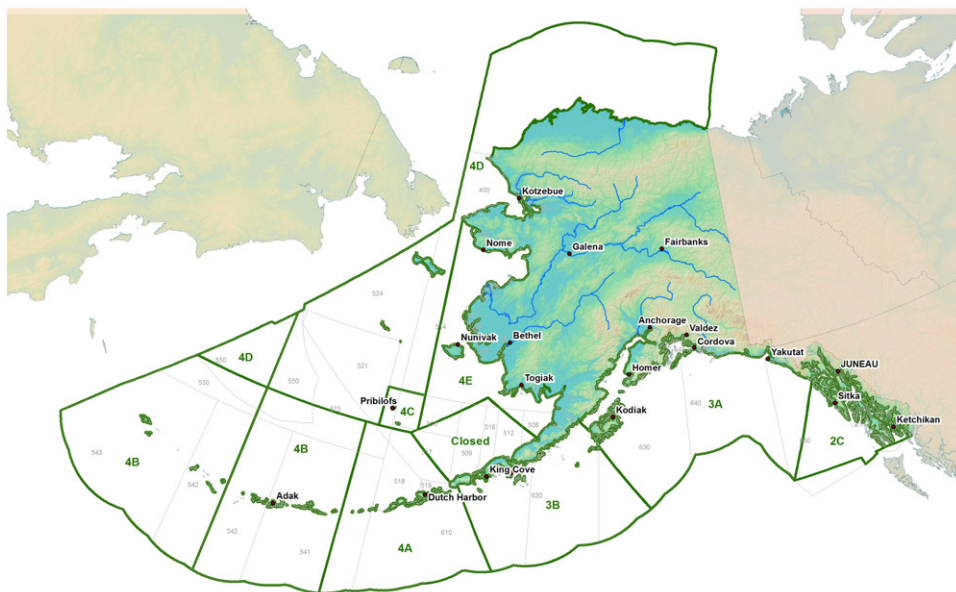
In the remainder of the article we provide an overview of the commercial IFQ program, the GAF program, and the data used in our analysis. We then provide a summary of the transfers occurring during the first two years of the GAF program and a short description on GAF usage within the recreational sector.

## Commercial halibut individual quota program background

In this section we provide a brief overview of the commercial IFQ program with an emphasis on elements most relevant for evaluating the impact of the GAF program on the commercial sector. A more detailed summary of the commercial program is available in Kroetz, Sanchirico, and Lew (2015) and Szymkowiak and Himes-Cornell (2017).

The commercial halibut individual fishing quota program was implemented in 1995 and operates as an individual transferable quota (ITQ) program. At the beginning of the program, commercial fishers were granted shares of area-specific total allowable catches (TAC) based on past participation in the fishery (in the halibut fishery there are seven management areas; Figure 1). The shares are called quota shares (QS) and are issued as percentages of the area TAC. Each year, a fisher owning shares can expect to receive an allocation of individual fishing quota (IFQ) pounds equal to the percentage of the TAC owned.

There are limitations on use and transfer of QS and IFQ pounds in the fishery. First, IFQ pounds cannot generally be bought or sold alone. However, participants can transfer IFQ pounds so long as the associated QS that accompanies the pounds is all transferred. Second, some QS holdings must be bought and sold as “blocks.” At the inception of the program participants receiving relatively small quantities of quota were allocated their share as a “block,” which can only be transferred as a unit. This differs from unblocked QS for which there is no limit on the size of a transfer. In addition, the number of blocks a participant can hold is limited, and those holding more than one



**Figure 1.** Pacific halibut fishing areas. Available: <https://alaskafisheries.noaa.gov/maps>

**Table 1.** 2014 commercial IFQ pounds transferred and number of transfers by area, class, and blocking status.

	Area 2C		Area 3A	
	Blocked	Unblocked	Blocked	Unblocked
<b>Class A</b>	14,453 (7)	3,178 (3)	Confidential	Confidential
<b>Class B</b>	16,820 (9)	9,568 (6)	27,198 (11)	77,806 (17)
<b>Class C</b>	154,519 (74)	25,358 (11)	157,231 (96)	198,824 (27)
<b>Class D</b>	51,416 (42)	Confidential	44,690 (48)	Confidential

Note: These statistics only include commercial-to-commercial transfers. The number of transfers for each submarket (area/class/blocking combination) is shown in parentheses. Totals are not reported due to confidentiality.

block of QS may not hold unblocked QS. In practice, this results in small-scale fishers tending to only hold blocked QS.

The use of IFQ pounds can also be restricted based on the characteristics of the commercial vessel from which it is fished. All QS carries a class designation related to commercial vessel length and type that is then passed on to the IFQ pounds allocated each year. There is one class of IFQ pounds, Class A, that can be fished on any type (catcher-processor or freezer vessel) and any length of vessel. Class B, C, and D IFQ pounds must be fished on a catcher-vessel meeting length limitations (with D vessels smaller than C and C less than B). [Table 1](#) summarizes the quantity of IFQ pounds transferred in 2014 by blocking status and class in Areas 2C and 3A, the International Pacific Halibut Commission regulatory areas to which the GAF program applies.

### The Guided Angler Fish (GAF) Program

The Guided Angler Fish program of the Catch Sharing Plan allows charter halibut permit (CHP) holders to lease IFQ from commercial fishers in the Alaska Halibut fishery on a yearly basis (NOAA Alaska Region [2014](#)). When CHP holders lease IFQ it is turned into “Guided Angler Fish,” or simply “GAF.” We use the term “GAF program” to refer to the regulation and “GAF” to refer to the units of fish CHP holders can acquire. The GAF program works in conjunction with the Charter Halibut Limited Access Program (LAP). The LAP program, implemented February 1, 2011, requires all recreational charter operators with clients that catch and retain halibut to have a valid CHP on board those trips (NOAA Alaska Region [2016a](#)).

Each CHP is valid for a specific regulatory area (Area 2A or 3A; [Figure 1](#) is a map of the fishing areas) and for a maximum number of anglers (called endorsements). At the end of 2014, there were approximately 565 individuals holding at least one CHP in either Area 2C or 3A; there were approximately an equal number of CHP holders in each area, and seven individuals held permits in both areas (see NPFMC ([2016b](#)) for more detail on CHP permit holders).

Since 2007 in Area 2C and 2014 in Area 3A, anglers (charter clients) in the guided charter sector have faced harvest restrictions that differ from those for non-charter (unguided) anglers, which have been two halibut per day with no size restrictions over this period. Charter fishing regulations vary by area and year (see International Pacific Halibut Commission (IPHC) [2014](#), [2015](#) for more detail on specific regulations). For example, in 2015 in Area 2C, charter anglers had a one fish daily bag limit and a reverse slot limit that requires halibut to be less than 42 inches or greater than 80



inches (roughly 26–208 pounds) (International Pacific Halibut Commission (IPHC) 2015). In Area 3A, charter anglers were subject to a two-fish daily bag limit with a maximum size limit of 29 inches for one fish (roughly 8 pounds) and an annual limit of five halibut. Furthermore, charter operators in Area 3A were limited to one trip per day per vessel and could not fish for halibut on Thursdays during the high season (International Pacific Halibut Commission (IPHC) 2015).

Generally, a charter operator holding GAF can use the GAF to allow a client angler to harvest halibut up to the limits imposed on unguided anglers, which for both 2014 and 2015 was two halibut of any size per day with no day of the week restriction (International Pacific Halibut Commission (IPHC) 2014, 2015).<sup>6</sup> Therefore, in Area 3A in 2015 for example, GAF can be used to retain a second halibut larger than 29 inches that does not count against the annual limit, or it can be used to harvest a halibut of any size on a closure day. In Area 2C, a GAF can be used to harvest one halibut of any size, which can be in addition to the one fish with the reverse slot limit allowed for all charter anglers or in place of it should the fish be outside the permitted size.

The GAF program allows transfers (i.e., leasing) of commercial sector IFQ to CHP holders subject to restrictions on how much IFQ can be transferred to and held as GAF (see NPFMC 2016d for a complete description of the program). IFQ holders in Area 2C are limited to transferring up to the greater of 1,500 pounds or 10% of their initially issued annual halibut IFQ for use as GAF (NOAA Alaska Region 2014). In Area 3A, IFQ holders may transfer up to the greater of 1,500 pounds or 15% of their initially issued annual halibut IFQ (NOAA Alaska Region 2014). CHP holders are limited to transferring in 400 or fewer GAF if they are endorsed for six or fewer anglers or 600 or fewer GAF if they are endorsed for more than six anglers (NOAA Alaska Region 2014).<sup>7</sup>

IFQ are issued in pounds but GAF are issued as number of halibut (NOAA Alaska Region 2014). Each year prior to the start of the fishing season, NMFS establishes a conversion factor for transferring IFQ to GAF for each area based on the average net weight of GAF harvested in that area by the recreational sector in the previous year. At the end of the season, unused GAF are returned to the IFQ permit holder, using the same conversion factor that was applied during the initial transfer (NOAA Alaska Region 2014). There are two ways to return quota: the GAF permit holder can submit an application for voluntary return that will occur on September 1, or the NMFS automatically returns unused quota to the original IFQ holder 15 days before the end of the commercial season (NOAA Alaska Region 2014).

GAF transfers must occur before GAF halibut are caught, and GAF cannot be transferred or subleased within the charter sector (NOAA Alaska Region 2014). If an IFQ holder also holds a CHP, they are allowed to transfer IFQ to themselves, but cannot fish both commercial and charter halibut on the same vessel on the same day (NOAA Alaska Region 2014).

## Data

We use a unique dataset composed of confidential quota transfer data supplemented with data on permit ownership and attributes, as well as other publicly available data, in the analysis. The halibut commercial transfer database is described in detail in Kroetz, Sanchirico, and Lew (2015). Since the inception of the program, transfers have been

recorded by NMFS. The transaction data include the buyer, seller, number of QS (asset) units sold, number of IFQ pounds from the current year’s allocation transferred, QS/IFQ characteristics including area, class, and blocking designation, price paid, reason for transfer, and the relationship between the buyer and seller.

We also have confidential GAF transfer data for 2014 and 2015, the first 2 years of the GAF program. The fields in the database are similar to those in the commercial transfer database and include information on the buyer and seller, the number of IFQ pounds transferred, the attributes of the IFQ pounds (area, class, blocking), the price per pound paid, the reason for the transfer, and the relationship between the buyer and seller. [Table 2](#) contains summary statistics describing GAF program transfers. The database contains 384 transactions designated as part of the GAF program in 2014 and 2015.

To understand how the flexibility provided by GAF is utilized, we also have information on GAF usage for 2014 and 2015 derived from Alaska charter logbook data collected by the Alaska Department of Fish and Game (ADFG) (Powers and Sigurdsson 2016). The confidential data includes all catch and harvest of sport-caught species on Alaska charter trips at the trip- and angler-level for 2014–2015 in IPHC areas 2C and 3A. This includes 50,152 charter fishing trips in 2014 and 51,336 charter fishing trips in 2015, of which 1,079 trips across both years involved use of GAF.

There are two types of transfers that are unique to the GAF program: self-transfers and “return” transactions. We treat these transfers separately in our analysis. First, we identify self-transfers, where the GAF recipient and the IFQ owner have the same NMFS ID, a unique personal identifier assigned by NMFS. There are 75 transactions that meet this criterion and none have a price listed. Second, we identify “return” transactions, which are associated with the provision that unused quota be transferred back to the IFQ holder if unused. We identify these transactions in the database as any transaction where the IFQ pounds on a GAF permit are transferred to a commercial IFQ permit. There are 127 of these records; they all occur in September or October, and none of these transactions have prices. Therefore, we cannot say anything about how much charter operators are compensated by commercial operators if IFQ is returned, although survey results indicate lease agreements typically did not include refunds for unused IFQ (Lew, Putman, and Larson 2016).

Of the 257 GAF program transfers from the commercial to charter sector there are recorded prices for 186 transactions, 80 occurring in 2014 and 106 occurring in 2015. The vast majority of transactions occurred in Area 2C.

Fundamental to the transfer market is the need to convert IFQ, measured in pounds, to GAF, measured in fish. When a transfer occurs between the two sectors IFQ pounds

**Table 2.** GAF transfers.

	Area 2C		Area 3A	
	2014	2015	2014	2015
Total transfers	92	121	19	25
Pounds transferred	29,498	36,934	11,654	10,337
Transfers with prices	71	93	9	13
Commercial transferors	32	34	10	10
Charter transferees	30	27	13	13
Conversion factor (Scheurer 2016)	26.4	67.3	12.8	38.4
GAF fish harvested (Scheurer 2016)	800	269	428	143

Note: These statistics only include commercial-to-recreational transfers.



are converted to GAF halibut. The conversion factors are area-specific and in 2014 were based on past yearly harvest, but in 2015 onward were based on the weight of the GAF landed in the previous season. The change from an area-average to a GAF-average conversion factor between 2014 and 2015 was likely the cause of the 2015 conversion factor being approximately twice that of the 2014 conversion factor (Table 2). In effect, this approximately doubled the IFQ needed to purchase a GAF, and therefore potentially significantly increased the cost of acquiring a GAF between 2014 and 2015.

To gauge market participation, we count the number of unique individuals transferring from the commercial sector (transferors) and receiving in the charter sector (transferees). We find that participation is increasing over the 2 years and that Area 2C has three times more participants than Area 3A. Finally, there is significant heterogeneity in the use of GAF by the charter sector across years and areas. Relatively more GAF was harvested in 2014, and more GAF is used in Area 2C relative to 3A.

## Analysis

### *Commercial IFQ transferred as GAF*

In this section we characterize the GAF transfer market, focusing on the supply and demand for GAF (more information on the individual sectors is available in Kroetz, Sanchirico, and Lew (2015); NOAA RAM (2015); and NPFMC (2016b)). To understand the way the GAF program functions we begin by examining characteristics of the commercial quota sold as GAF and compare GAF and commercial transfer number and volume. This focus is important because IFQ pounds purchased by the charter sector are unavailable to commercial fishers. Therefore, the dominant pathway through which the GAF program could impact the commercial sector is through purchase and movement of IFQ pounds from the commercial to the charter fleet resulting in changes to the scale and number of commercial fishing operations. We also explore the mechanism potentially inducing commercial fishers to transfer IFQ pounds to the charter sector. Specifically, if the profitability of a pound fished by a charter boat is significantly higher than that for the marginal pound when fishing commercially, the market price for quota could increase, making it more profitable for commercial fishers to sell IFQ than to fish it.

The total number of GAF transactions and pounds is small in total (Table 2), but we also explore the GAF transfers within submarkets (Table 3) relative to commercial submarket transfers (Table 1) and the TAC. Examining quantities traded within submarkets yields insight into the scope of the policy impact. Additionally, this focus on submarkets is appropriate due to the significant limits that exist on the use of quota in the commercial fishery.

Most IFQ transferred to GAF comes from smaller vessel class submarkets (the 2C Class D Blocked, 2C Class C Blocked, 2C Class C Unblocked, 3A Class D Blocked, 3A Class C Blocked, and 3A Class C Unblocked). See NPFMC (2016d) for more detail on the program. The number of GAF transactions comprise a significant percentage (Figure 2(a)), sometimes over 50%, of the number of transactions in the Area 2C submarkets we examined (Class C Blocked and Unblocked, Class D Blocked).<sup>8</sup> However, when graphed in terms of pounds transferred, the GAF transfers are a much smaller

**Table 3.** 2014 pounds transferred as GAF and number of transfers by area, class, and blocking status.

	Area 2C		Area 3A	
	Blocked	Unblocked	Blocked	Unblocked
<b>Class A</b>	Confidential	Confidential	Confidential	Confidential
<b>Class B</b>	Confidential	Confidential	1,408 (3)	Confidential
<b>Class C</b>	11,897 (39)	4,148 (12)	2,996 (4)	1,665 (5)
<b>Class D</b>	13,453 (41)	Confidential	2,934 (6)	Confidential

The number of transfers for each submarket (area/class/blocking combination) is shown in parentheses. In 2015 the distribution of trades and quantities transferred is similar. Totals are not reported due to confidentiality.

percentage, consistent with the fact that GAF transfers are comprised of fewer pounds on average than commercial-to-commercial transfers ([Figure 2\(b\)](#)). A useful reference point is the TAC. In the Area 2C, Class C Blocked submarket, commercial transfers make up approximately 3–9% of the 2008–2015 TACs, whereas GAF pounds transferred comprised less than 2% of the TAC; in Area 2C, Class D Blocked submarket commercial trades total approximately 6–11% of the TACs from 2008 to 2015, whereas GAF transfers total less than 4% (NOAA [2015a](#), [2015b](#)).

### ***GAF quantity transferred***

One of the dominant characteristics of GAF transactions is that the number of pounds transferred is small relative to IFQ pounds transferred within the commercial sector ([Table 4](#)). While Area 3A transfers tend to be larger than those for Area 2C, GAF transfers are on-average approximately one-sixth the size of transfers within the commercial industry.

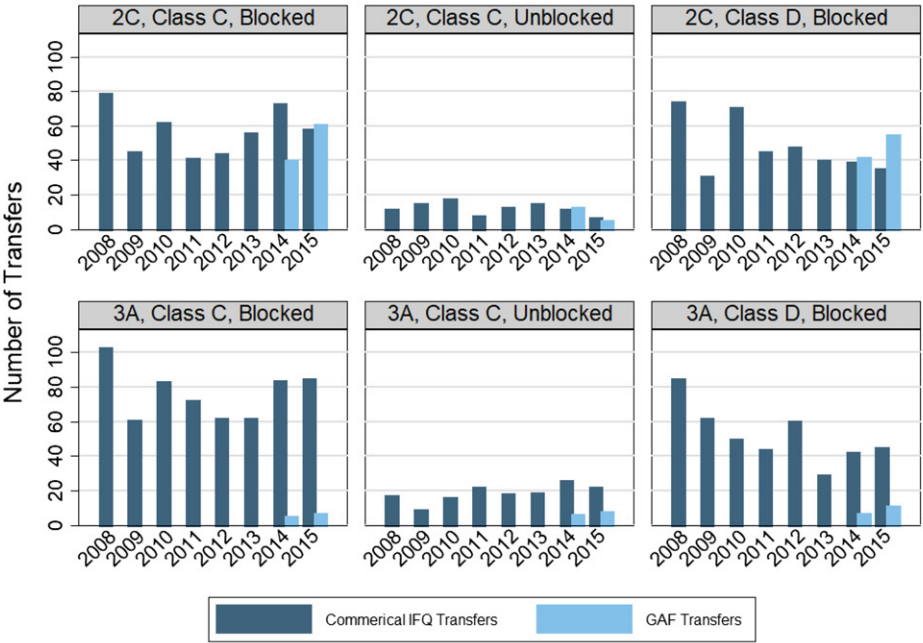
Regarding the nature of the activity in the market, we investigate the share of the IFQ quota holdings being converted into GAF and whether the limits on how many pounds of IFQ can be converted into GAF are binding.<sup>9</sup> [Figure 3](#) shows the share of IFQ quota being converted for different size IFQ holders. Operators with relatively little IFQ tend to transfer nearly all of their allocation as GAF; those who hold more IFQ generally transfer a lower percentage of their total IFQ holdings.

This result could be due to three types of limits pertaining to how much IFQ an owner can transfer. First, the owner may be allocated fewer than 1,500 pounds in a given year and therefore cannot trade more than they own. We find that just under half of the IFQ owners that transfer IFQ pounds to GAF were allocated fewer than 1,500 pounds of GAF in the year of transfer, and that the vast majority of these owners transfer 90% or more of their pounds.

Second, the owner may be allocated greater than 1,500 pounds but fewer than 15,000 pounds (10% equals 1,500) in Area 2C or 10,000 pounds (15% equals 1,500) in 3A and therefore is constrained by the 1,500 pound limit. There are 23 owners in 2014 and 25 in 2015 that own greater than 1,500 pounds. Of those, only nine (five in 2014 and four in 2015) own more than 15,000 pounds (10% equals 1,500) in Area 2C or 10,000 pounds (15% equals 1,500) in 3A.

Third, the owner may be allocated greater than 15,000 pounds (10% equals 1,500) in Area 2C or 10,000 pounds (15% equals 1,500) in 3A and be bound by the 10% or 15% limits, respectively. Of those that hold between 1,500 and 15,000 pounds in 2C or 1,500

(a) Number of Transfers



(b) Pounds Transferred

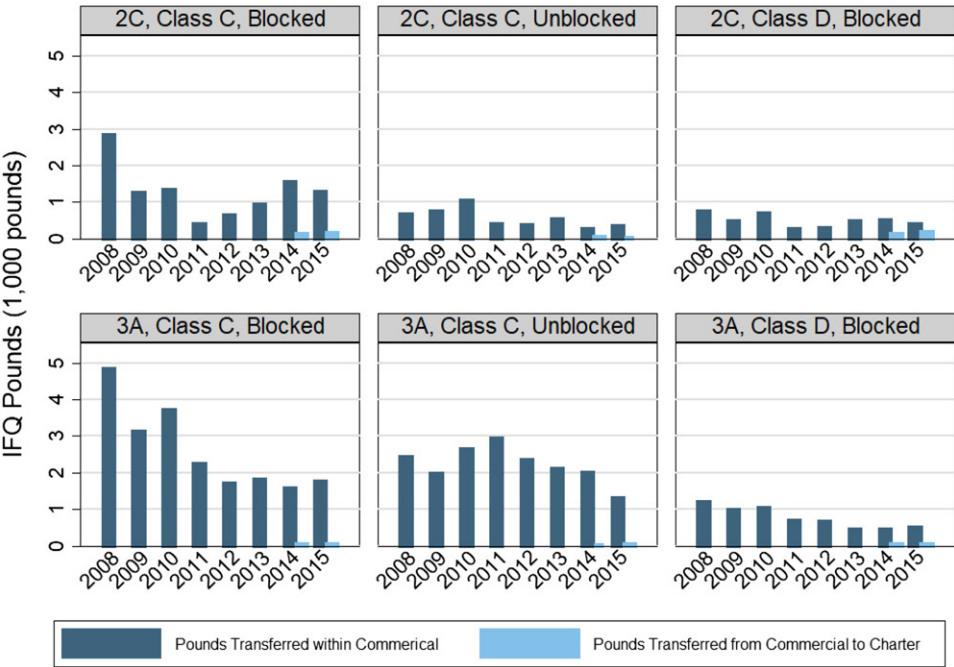


Figure 2. Number of transfers (a) and pounds transferred (b) by sub-market and year.

**Table 4.** Average IFQ pounds in transfer, by transfer type.

	Area 2C		Area 3A	
	2014	2015	2014	2015
Commercial to charter (GAF)	321 (92)	305 (121)	613 (19)	413 (25)
Commercial to commercial	1,811 (152)	1,842 (124)	2,571 (201)	2,731 (204)

The number of transfers used to calculate the average is in parentheses.

and 10,000 pounds in 3A, many hold only slightly more than 1,500 pounds and transfer close to their full allocation.

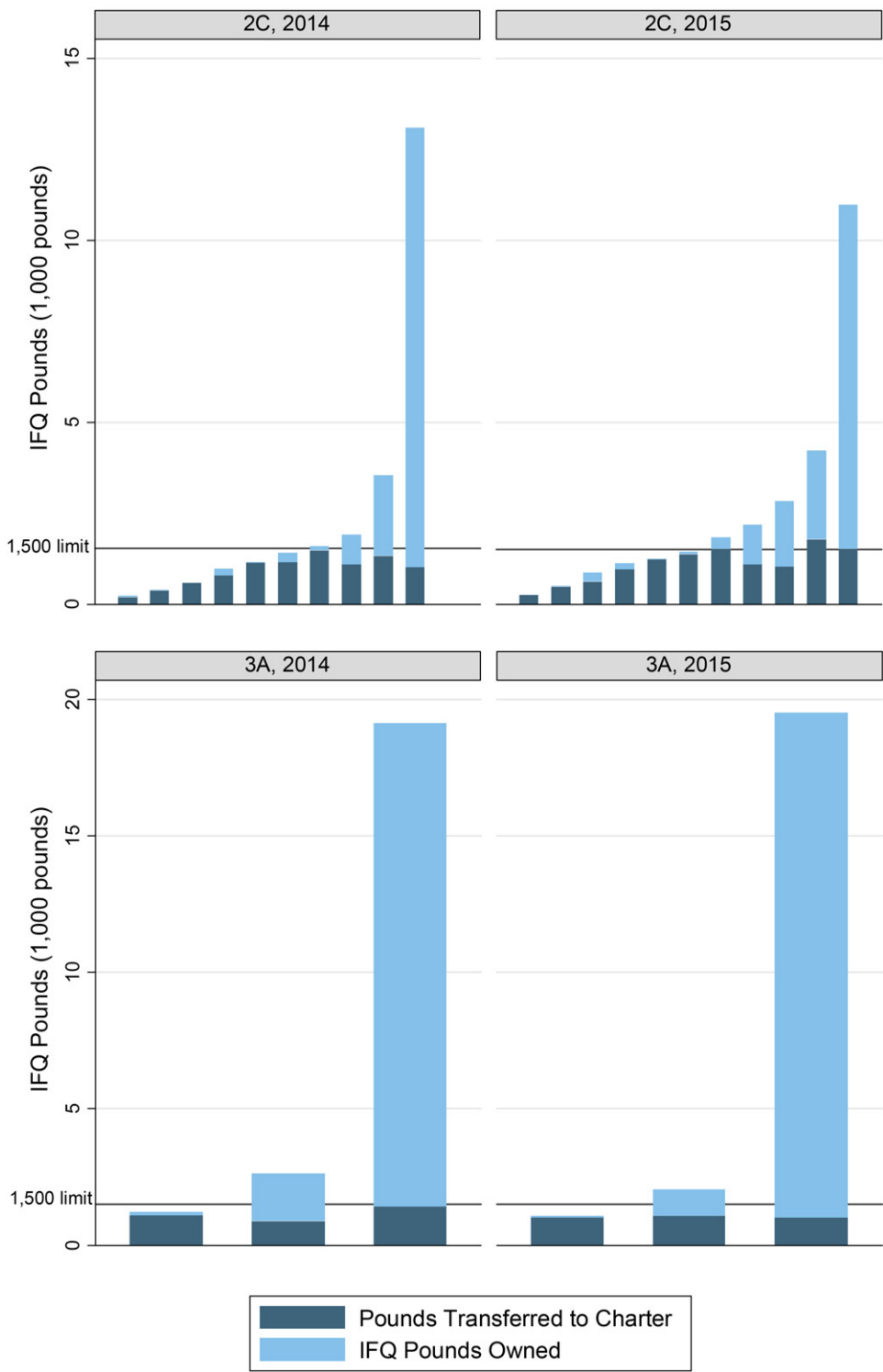
### ***Self-leasing***

Of the 257 trades between the commercial and charter sectors in 2014 and 2015, 40 are self-leases; that is, the same individual transfers their IFQ pounds to their charter operation. This is possible because regulations allow an individual to own one or more CHPs as well as commercial halibut QS and IFQ.<sup>10</sup> To examine whether eligible individuals leased to themselves, we decompose the universe of 2014 CHP holders (565 individuals) into those who own commercial QS and those who do not (Table 5). Of the 565 CHP holders, 40 also own commercial QS in an area that matches at least one of their CHP, and therefore are eligible to transfer IFQ to their charter operation. If an individual holds at least one CHP and owns at least 1 pound of IFQ in the same area, we consider them a potential self-leaser. We find that CHP holders who can self-lease take advantage of it rather than engaging in a lease with another IFQ holder: in 2014, of the 40 CHP holders who could self-lease, 14 did while fewer than three engaged in market leases (see Table 6). The breakdown is similar by area.

### ***Transfer prices***

We compare GAF prices paid per pound to commercial ex-vessel and transfer prices.<sup>11</sup> We begin by comparing the GAF price and the commercial ex-vessel price.<sup>12</sup> The GAF price is calculated as a weighted average of priced transactions in a given year that are not self-leases. The commercial ex-vessel price should represent an upper-bound on the willingness-to-pay of a commercial fisher for a pound of IFQ. Specifically, commercial fishers will receive the ex-vessel price upon landing and will incur expenses in the harvesting process. The proximity of the GAF price to the ex-vessel price reveals a relatively high willingness-to-pay for halibut pounds by the charter sector that may be greater than that in the commercial sector (Table 7).

We also use commercial asset transfer prices to develop a back-of-the-envelope estimate of the commercial quota lease price. We are constrained to using asset prices because leasing is only permitted in the commercial sector under very limited circumstances and, therefore, there is not an active lease market. We calculate the average per-pound lease prices by averaging the prices listed for transfers with reported prices that meet our criteria for an “arms-length” transfer (e.g., we drop self-transfers, and transfers between family members), and weighting by the number of current-year IFQ pounds in the transaction. Because commercial transfer prices include IFQ as well as a percentage of future TACs, we need to make substantial assumptions to estimate a lease price (see



**Figure 3.** Individual transfers to charter sector relative to commercial IFQ holdings. Each bar represents the average IFQ owned and average pounds transferred of 3–5 individuals who lease IFQ to the Charter sector. Individuals are grouped to preserve confidentiality and the groups are formed by grouping the three smallest IFQ owners, the next three largest, and so on.

**Table 5.** Individuals (identified by NMFS IDs) with a CHP in 2014.

	Do not own quota	Own quota
Area 2C	239	19
Area 3A	281	19
CHP in Both Areas	5	Confidential

Totals are not reported due to confidentiality.

**Table 6.** 2014 self-lease potential and observed leasing activity.

	Open-market lease	Self-lease	Did not lease
Could Self-Lease	Confidential	14 (2%)	24 (4%)
No Self-Lease Potential	24 (4%)	0 (0%)	501 (89%)

The percentages are based on the self-leasing potential (own both commercial IFQ and a CHP permit) and observed leasing activity for the 2014 CHP holders. Totals are not reported due to confidentiality.

**Table 7.** GAF, commercial ex-vessel and commercial quota prices (\$2016).

	Area 2C		Area 3A	
	2014	2015	2014	2015
GAF lease price	5.02	5.46	5.90	4.41
Commercial ex-vessel price	5.48	5.99	5.65	6.13
<i>Estimated commercial lease price</i>				
Class C blocked	3.65	4.17	2.60	3.89
Class D blocked	3.32	3.87	2.48	3.46

GAF lease prices and estimated commercial lease prices are weighted averages, with the weights equal to the number of IFQ pounds in the transaction.

Newell, Papps, and Sanchirico (2007) for a full discussion) including that expectations for the future are similar to that for the current period to calculate an implied lease price (equal to the asset price per pound multiplied by a discount rate). To determine the discount rate to use, we collected data on Canadian Pacific halibut asset and lease prices (DFO 2016). We use 9% because for the years where both asset and lease prices are available, the rate of return ranged from 6.4 to 10.6%, with an average rate of return of 9%.

In reporting estimated commercial lease prices we present prices for the Class C and Class D blocked IFQ transfer submarkets; the predominant sources of GAF transfers. We find that the per-unit price paid by the charter sector for GAF is higher than that observed in the commercial sector for within-sector IFQ transfers.

### **Charter sector GAF use**

The charter sector harvests Pacific halibut subject to regulations set forth by the North Pacific Fisheries Management Council (NPFMC).<sup>13</sup> As noted earlier, beginning in 2007 in Area 2C and 2014 in Area 3A, anglers fishing on charter vessels have been subject to restrictions on Pacific halibut harvest that differ from unguided anglers (e.g., daily bag and size limits, day of the week fishery closure). The GAF program allows charter operators to offer clients the ability to relax the restrictions on fishing for Pacific halibut on a charter fishing trip, up to the regulations applicable to unguided anglers. One would expect GAF to be used to relax the more restrictive charter-specific regulations, specifically halibut bag and size restrictions and the day of the week closure. In this section, we examine how charter businesses chose to utilize GAF, with a focus on the ability to relax the restrictions, and discuss the values implied by this usage.



### *Day of week closure*

In 2015, a Thursday halibut fishery closure was implemented in Area 3A during the peak season (mid-summer) (International Pacific Halibut Commission (IPHC) 2015). For charter operators, one potential use of GAF is to allow charter clients the option to fish for (and retain) halibut on closure days while also potentially fishing for other species.<sup>14</sup> During the 2015 peak season, the number of charter trips on Thursday halibut closure days in Area 3A is 80% lower than the number of trips on other days of the week (there is no similar difference in trips during the weekdays in 2014 or outside the mid-summer season in the 2015). Therefore, we find that operators that held GAF (GAF holders) were no more likely to take trips on Thursday closure days ( $p = .12$ ) compared with those without GAF (non-GAF holders).

While GAF holders do not seem to be relaxing the closure restriction in terms of going out on more trips on Thursday, we do find some differences in the catch composition on trips taken by GAF holders on the closure day. Per the regulation, any trips by non-GAF holders on the closure day are targeting species other than halibut, and trips with GAF holders could either target halibut or other species. Regardless of what else may be targeted on the trips by GAF holders, the operators with GAF can retain the catch of halibut on the Thursday closure. We find evidence for use of this additional flexibility in two ways. First, we find that 13% of trips taken by GAF holders on Thursday closure days used GAF. This represents a significant increase relative to the other days of the week, where we find that only 2% of trips with the potential to use GAF do in fact use it. Second, we find a difference in catch composition of non-halibut species between trips taken by GAF and non-GAF holders. Specifically, the catch of non-halibut species among GAF holder trips increased 75% relative to other days of the week, compared with an increase of 150% for non-GAF holder trips. The implication is that non-GAF holder and GAF holder charter trips are indeed targeting more non-halibut on closure days relative to other days, but the difference is less pronounced on trips taken by GAF holders.

### *Bag and size restrictions*

GAF can also be used to augment an angler's halibut harvest up to the bag and size limits applicable for unguided anglers, which was two fish of any size during the study years. In Area 3A, the mean number of halibut harvested per angler on trips that use GAF (1.47 fish per angler) is not statistically different from trips that do not (1.51 fish per angler) ( $p = .32$ ) at the 5% level. However, we find evidence there is a replacement of smaller halibut, caught in accordance with the maximum size restriction, with a larger halibut allowed by using the GAF. This swap manifests as a drop in non-GAF halibut harvested — from 1.51 fish per angler on non-GAF trips to 1.02 non-GAF fish per angler on GAF trips — and a similarly-sized increase of 0.45 GAF fish per angler in the harvest on GAF trips (see Table 8). Thus in 3A, GAF appears to add value on the intensive margin to the halibut catch by permitting the charter angler to keep larger fish.

In Area 2C charter anglers are limited to harvesting one halibut (with size restrictions), so GAF could potentially be used to double a client's harvest. Indeed, the mean halibut harvest per angler on trips that used GAF is higher than those that did not (Table 8). Moreover, since the mean angler harvest rate on GAF trips (0.71 fish per

**Table 8.** Halibut harvest rates on charter fishing trips.

IPHC area	Mean number of halibut harvested per angler over 2014–2015			
	Trips not using GAF (a)	Trips using GAF (b)	Trips using GAF	
			GAF (c)	Non-GAF (d)
2C	0.71 (0.0019)	1.13 (0.014)	0.37 (0.0078)	0.76 (0.012)
3A	1.51 (0.0035)	1.47 (0.033)	0.45 (0.023)	1.02 (0.031)

For trips using GAF, mean harvest per angler (column b) is broken down into halibut caught in accordance with guided angler regulations (column d) and halibut that required GAF usage (column c) (Standard errors of means in parentheses).

angler) is roughly equal to the rate on non-GAF trips when excluding the GAF harvest (0.76 fish per angler), but increases markedly when GAF harvest is included (1.13 fish per angler), it appears GAF are being used to harvest a second halibut.<sup>15</sup> Therefore, in addition to the values derived from fishing halibut on Thursday closure days and larger fish in Area 3A, the GAF usage in Area 2C supports significant value on the extensive margin of an additional fish.

### Conclusion

Participation in inter-sector trading by both the for-hire and commercial sectors reveals some initial support for the GAF program, despite the previously noted negative sentiment toward it among charter operators. Analyzing the number and volume of transfers at the submarket level suggests that the impacts of the GAF program on the commercial sector are complex and heterogeneous. In several IFQ submarkets and years, GAF transfers make up over half of the total number of transactions. These submarkets are also those with the smallest-scale fishers. This suggests differential impacts of the GAF program among commercial fishers, with small-scale fishers the most likely to experience an impact. Therefore, at least in the short-run, any changes to the program are also likely to be borne by small-scale commercial fishers, as those leasing IFQ through the GAF program tend to own relatively small quantities of IFQ and tend to lease the entire amount as GAF. Further analysis could also examine whether IFQ prices change in the submarkets due to the GAF program.

We also find that the charter sector leases very little GAF relative to the program limits across the years and areas, and no CHP holder approaches the limit on the IFQ they could lease. This is interesting in light of the high GAF transfer prices we observe, both relative to commercial quota prices and the ex-vessel price. Given the small quantities leased relative to commercial leases, it may be that a higher per-unit price reflects additional transaction costs from engaging with charter operators. Another political-economy explanation that could be explored in future work is that some charter operators are not engaging in the GAF program because of their negative perception of it (Lew, Putman, and Larson 2016) and lack of participation could lead to changes in the program. A more thorough understanding of charter sector outcomes requires additional work to understand how the additional flexibility these programs provide is utilized by the charter sector. For example, how do CHP-GAF participants market this to potential charter clients? Do these trips demand a higher price?

There are also interesting unanswered questions related to factors influencing how the GAF program has evolved and may evolve over time. First, uncertainty over the future of the GAF program may impact how fishers responded in the early years, potentially discouraging them from investing time in understanding the GAF program and associated market. Second, the lack of an ability under the GAF program to buy permanent allocations may impact the ability of charter operators to plan for the future and therefore diminish the value of inter-sector trades; at minimum there is a transaction cost to returning to the market for quota each year. Third, current conditions and future expectations about halibut stocks and TACs within International Pacific Halibut Commission (IPHC) areas 2C and 3A and the region at-large, as well as characteristics of other regional fisheries, may impact the choices of commercial halibut and recreational fishers and therefore the use and outcomes of the GAF program. And finally, the demand and supply for GAF is, in part, a function of the existing management regime (Abbott 2015).

Recent actions by, and issues before, the NPFMC suggest changes that could affect the market for GAF may be on the horizon. These include the creation of a recreational quota entity that represents the charter sector and could buy (and sell) QS from commercial holders and use it to add to the recreational charter sector's annual allocation under the CSP (NPFMC 2016a), potentially resulting in relaxed restrictions on charter fishing regulations relative to those seen in recent years. This recent action and others being considered suggest an evolving management landscape that could significantly alter the incentives and opportunities for both sectors with respect to the GAF program and that should be accounted for in future analyses examining market activity and participation.

While uncertainty on the future of this particular inter-sectoral trading program exists, the evidence to date suggests that inter-sectoral trading programs between commercial and recreational sectors can achieve marginal reallocations of fishing quota to sectors that value the quota higher. As inter-sectoral programs are considered for adoption at a larger scale, extensions of this work are needed to better understand benefits and costs of these types of programs and their distribution across stakeholders.

## Notes

1. See [http://www.nmfs.noaa.gov/sfa/management/catch\\_shares/index.html](http://www.nmfs.noaa.gov/sfa/management/catch_shares/index.html) for updated information and an inventory of U.S. catch share programs.
2. Specifically, the GAF program applies to International Pacific Halibut Commission management areas 2C and 3A, which represent the most heavily-used areas for halibut sport fishing. A similar intersectoral leasing program (the Halibut Experimental Recreational Fishery Program) was implemented in 2011 for the Pacific halibut fishery in British Columbia, Canada (Morrison and Scott 2014).
3. For example, the Gulf of Mexico Fishery Management Council is considering catch shares for the For-Hire component of the Reef Fish fishery (NOAA 2015c). Additionally, Rhode Island Party and Charter Association fishers formed a voluntary recreational pilot program, the Rhode Island For-Hire Fluke Cooperative Pilot Program, which was implemented for the 2013 and 2014 seasons in the Rhode Island fluke fishery (Rhode Island Fish for the Future 2014).
4. Additional details on the program and Alaska halibut fisheries can be found in Lew, Putman, and Larson (2016), NPFMC (2016b), and Scheurer (2016).

5. Lew and Larson (2012) find evidence that the value of fish may be higher in the recreational sector.
6. See NPFMC (2016c) for information on guided and unguided operations and work underway examining potential future management changes that would allow for harvesting guided and unguided halibut on the same vessel.
7. We examined whether the transfers to a particular CHP holder approach the limit a CHP permit can accept; none come close.
8. For this calculation we include IFQ that is moving one way or another through official channels regardless of the type of commercial transaction (e.g., we do not remove family sales or self-transfers).
9. There are also limits on IFQ transferred to a CHP permit, but we find they are not binding.
10. We analyze self-leasing at the permit-holder level, using the NMFS ID associated with each CHP and IFQ permit to determine whether the individual owns both a CHP and IFQ in the same area. Because both CHP and QS are area specific, we only count an individual as “owning quota” if the area designation of the quota matches that of at least one CHP.
11. We only consider transfers that include both IFQ pounds and QS. See Kroetz, Sanchirico, and Lew (2015) for more information on the different types of commercial transfers.
12. We use area-specific ex-vessel prices from Commercial Fisheries Entry Commission (CFEC) and Alaska Fisheries Information Network (AKFIN). Available: <https://alaskafisheries.noaa.gov/fisheries-data-reports?tid=287>.
13. Pacific halibut are managed by the IPHC, NPFMC, and NMFS, but the NPFMC is responsible for sectoral allocation and in cooperation with NMFS can impose additional restrictions on the sport fishery or components of it. Other species targeted by the charter recreational sector, like Pacific salmon, are managed by ADFG.
14. The closure applies to harvest of halibut only; charter fishing for other species could still be done on closure days.
15. Another indicator that GAF likely is being used for harvesting larger fish is the 30% increase in the time spent targeting bottomfish (a large portion of which is Pacific halibut) on GAF trips relative to non-GAF trips in Area 2C. This additional time spent targeting bottomfish likely reflects additional effort seeking larger Pacific halibut.

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## References

- Abbott, J. K. 2015. Fighting over a red herring: The role of economics in Recreational-Commercial allocation disputes. *Marine Resource Economics* 30 (1):1–20. doi:[10.1086/679464](https://doi.org/10.1086/679464).
- Abbott, J. K., and D. Willard. 2017. Rights-based management for recreational for-hire fisheries: Evidence from a policy trial. *Fisheries Research* 196:106–116. doi:[10.1016/j.fishres.2017.08.014](https://doi.org/10.1016/j.fishres.2017.08.014).
- Abbott, J. K., and J. E. Wilen. 2009. Rent dissipation and efficient rationalization in for-hire recreational fishing. *Journal of Environmental Economics and Management* 58 (3):300–314. doi:[10.1016/j.jeem.2009.03.002](https://doi.org/10.1016/j.jeem.2009.03.002).
- Abbott, J. K., V. Maharaj, and J. E. Wilen. 2009. Designing ITQ programs for commercial recreational fishing. *Marine Policy* 33 (5):766–774. doi:[10.1016/j.marpol.2009.02.010](https://doi.org/10.1016/j.marpol.2009.02.010).
- Agar, J. J. 2014. Is the 2012 allocation of red snapper in the Gulf of Mexico economically efficient?. NOAA Technical Memorandum NMFS-SEFSC-659, 1–32.
- Alaska Longline Fishermen's Association (ALFA). 2012. Letter to Chairman Olson, North Pacific Fishery Management Council Public Comment. Accessed January 05, 2019. <https://static1.squarespace.com/static/563cfe4fe4b0b371c8422a54/t/564a7d6be4b0cb8688504154/1447722347331/Letter+to+Chairman+Olson.pdf>.
- Arnason, R. 2009. Harmonizing recreational and commercial fisheries: an integrated rights based approach. In *Evolving approaches to managing marine recreational fisheries*, ed. D. Leal and V. Maharaj. Lanham, MD: Lexington Books.
- Bishop, R. C., and K. C. Samples. 1980. Sport and commercial fishing Conflicts-A Theoretical-Analysis. *Journal of Environmental Economics and Management* 7 (3):220–233. doi:[10.1016/0095-0696\(80\)90004-2](https://doi.org/10.1016/0095-0696(80)90004-2).
- Borch, T. 2010. Tangled lines in New Zealand's quota management system: The process of including recreational fisheries. *Marine Policy* 34 (3):655–662. doi:[10.1016/j.marpol.2009.12.005](https://doi.org/10.1016/j.marpol.2009.12.005).
- Call, I. L., and D. K. Lew. 2015. Tradable permit programs: What are the lessons for the new Alaska halibut catch sharing plan?. *Marine Policy* 52:125–137. doi:[10.1016/j.marpol.2014.10.014](https://doi.org/10.1016/j.marpol.2014.10.014).
- Carter, D. W., J. J. Agar, and J. R. Waters. 2008. Economic framework for fishery allocation decisions with an application to Gulf of Mexico red grouper. NOAA Technical Memorandum NMFS-SEFSC-576, 1–100.
- Coleman, F. C., W. F. Figueira, J. S. Ueland, and L. B. Crowder. 2004. The impact of United States recreational fisheries on marine fish populations. *Science (New York, N.Y.)* 305 (5692): 1958–1960.
- Collie, J. S., W. L. Adamowicz, M. W. Beck, B. Craig, T. E. Essington, D. Fluharty, J. Rice, and J. N. Sanchirico. 2013. Marine spatial planning in practice. *Estuarine, Coastal and Shelf Science* 117:1–11. doi:[10.1016/j.ecss.2012.11.010](https://doi.org/10.1016/j.ecss.2012.11.010).
- Day, J. C. 2002. Zoning-lessons from the great barrier reef marine park. *Ocean and Coastal Management* 45 (2–3):139–156. doi:[10.1016/S0964-5691\(02\)00052-2](https://doi.org/10.1016/S0964-5691(02)00052-2).
- Douve, F. 2008. The importance of marine spatial planning in advancing ecosystem-based sea use management. *Marine Policy* 32 (5):762–771. doi:[10.1016/j.marpol.2008.03.021](https://doi.org/10.1016/j.marpol.2008.03.021).
- Fina, M. 2011. Evolution of catch share management: Lessons from catch share management in the North Pacific. *Fisheries* 38 (4):164–177. doi:[10.1080/03632415.2011.564509](https://doi.org/10.1080/03632415.2011.564509).
- Fisheries and Oceans Canada (DFO). 2016. An Analysis of Commercial Fishing License, Quota, and Vessel Values – West Coast Fishing Fleet. Prepared by Stuart Nelson, Nelson Bros Fisheries Ltd. Accessed January 05, 2019. <http://www.pac.dfo-mpo.gc.ca/abor-autoc/atp-ptaa-eng.html>.
- Foley, M. M., B. Halpern, F. Micheli, M. Armsby, M. Caldwell, C. Crain, E. Prahler, D. Sivas, N. Rohr, M. W. Beck, et al. 2010. Guiding ecological principles for marine spatial planning. *Marine Policy* 34 (5):955–966. doi:[10.1016/j.marpol.2010.02.001](https://doi.org/10.1016/j.marpol.2010.02.001).
- Holland, D. S., E. Thunberg, J. Agar, S. Crosson, C. Demarest, S. Kasperski, L. Perruso, E. Steiner, J. Stephen, A. Strelcheck, and M. Travis. 2015. US catch share markets: a review of

- data availability and impediments to transparent markets. *Marine Policy* 57:103–110. doi:10.1016/j.marpol.2015.03.027.
- Holzer, J., and K. McConnell. 2014. Harvest allocation without property rights. *Journal of the Association of Environmental and Resource Economists* 1 (1/2):209–232. doi:10.1086/676451.
- International Pacific Halibut Commission (IPHC). 2014. Pacific Halibut Fishery Regulations 2014. Accessed January 05, 2019. <https://iphc.int/uploads/pdf/regs/IPHC-2014-REGS.pdf>.
- International Pacific Halibut Commission (IPHC). 2015. Pacific Halibut Fishery Regulations 2015. Accessed January 05, 2019. <https://iphc.int/uploads/pdf/regs/IPHC-2015-REGS.pdf>.
- Kroetz, K., J. N. Sanchirico, and D. K. Lew. 2015. Efficiency costs of social objectives in tradable permit programs. *Journal of the Association of Environmental and Resource Economists* 2 (3): 339–366. doi:10.1086/681646.
- Lew, D. K., and D. M. Larson. 2012. Economic values for saltwater sport fishing in Alaska: A stated preference analysis. *North American Journal of Fisheries Management* 32 (4):745–759. doi:10.1080/02755947.2012.681012.
- Lew, D. K., D. Putman, and D. M. Larson. 2016. Attitudes and preferences toward pacific halibut management alternatives in the saltwater sport fishing charter sector in Alaska: Results from a survey of charter halibut permit holders. NOAA Technical Memorandum NMFS-AFSC-326, 58. Accessed January 05, 2019. <http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-326.pdf>.
- Morrison, W., and T. Scott. 2014. Review of laws, Guidance, Technical memorandums, and case studies related to fisheries allocation decisions. NOAA Technical Memorandum NMFS-F/SPO-148. Accessed January 05, 2019. [http://www.nmfs.noaa.gov/sfa/management/allocation/morrison\\_scott\\_allocation\\_report.pdf](http://www.nmfs.noaa.gov/sfa/management/allocation/morrison_scott_allocation_report.pdf).
- Newell, R. G., K. L. Papps, and J. N. Sanchirico. 2007. Asset pricing in created markets. *American Journal of Agricultural Economics* 89 (2):259–272. doi:10.1111/j.1467-8276.2007.01018.x.
- National Oceanic and Atmospheric Administration (NOAA). 2010. NOAA Catch Share Policy. Accessed January 05, 2019. [http://www.nmfs.noaa.gov/sfa/management/catch\\_shares/about/documents/noaa\\_cs\\_policy.pdf](http://www.nmfs.noaa.gov/sfa/management/catch_shares/about/documents/noaa_cs_policy.pdf).
- NOAA. 2013. Pacific Halibut Fisheries; Catch Sharing Plan for Guided Sport and Commercial Fisheries in Alaska. Final Rule. 78 Federal Register 75844.
- NOAA. 2015a. Individual Fishing Quota (IFQ) Allocation and Landings for Fishing Year 2014. January 2, 2015.
- NOAA. 2015b. Individual Fishing Quota (IFQ) Allocation and Landings for Fishing Year 2015. December 31, 2015.
- NOAA. 2015c. National Catch Share Program Update – December 2015. Accessed December 2015. <https://repository.library.noaa.gov/view/noaa/17101>.
- NOAA Alaska Region. 2014. Guided Angler Fish Program Frequently Asked Questions. Accessed February 3, 2014. <https://alaskafisheries.noaa.gov/sites/default/files/gaf-faq1015.pdf>.
- NOAA Alaska Region. 2016a. Charter Halibut Limited Access Program Small Entity Compliance Guide and Frequently Asked Questions. Accessed May 9, 2016. <https://alaskafisheries.noaa.gov/sites/default/files/chlap-secg.pdf>.
- NOAA RAM. 2015. Transfer Report: Changes Under Alaska’s Halibut IFQ Program, 1995 Through 2014. Accessed January 05, 2019. <https://alaskafisheries.noaa.gov/sites/default/files/reports/halibut-transferfrpt2015.pdf>.
- NPFMC. 2016a. C3 Charter Recreational Quota Entity, Final Action. December 10, 2016.
- NPFMC. 2016b. Initial Review Draft - Regulatory Impact Review/Initial Regulatory Flexibility Analysis/Environmental Assessment for a Proposed Regulatory Amendment To Allow a Recreational Quota Entity to Hold Commercial Halibut Quota Share for Use by Halibut Charter Anglers. April 2016.
- NPFMC. 2016c. News & Notes. Council minutes. June 2016.
- NPFMC. 2016d. Twenty-Year Review of the Pacific Halibut and Sablefish Individual Fishing Quota Management Program. December 2016.



- National Research Council. 1999. *Sharing the fish: toward a national policy on individual fishing quotas*. Washington, DC: National Academies Press.
- Powers, B., and D. Sigurdsson. 2016. Participation, effort, and harvest in the sport fish business/guide licensing and logbook programs, 2014. Alaska Department of Fish and Game, Fishery Data Series No. 16-02, Anchorage.
- Rhode Island Fish for the Future 2014. Summary Report: Rhode Island For-Hire Fluke Cooperative Pilot Program 2013–2014.
- Sanchirico, J. N. 2004. Zoning the Oceans: Changing the Focus of US Fisheries Management. New approaches on energy and the environment: Policy advice for the president. R. D. Morgenstern and P. R. Portney. Washington, D.C.: Resources for the Future, 114–119.
- Sanchirico, J. N., J. Eagle, S. Palumbi, and B. H. Thompson. 2010. Comprehensive planning, Dominant-Use zones, and user rights: A new era in ocean governance. *Bulletin of Marine Science* 86 (2):273–285.
- Scheurer, J. 2016. Guided Angler Fish Program 2015 Annual Report. Prepared for NOAA Fisheries, Alaska Region Sustainable Fisheries. Accessed January 05, 2019. <http://www.npfmc.org/wp-content/PDFdocuments/halibut/Implementation/GAFreportFinal2015.pdf>.
- SEAF. 2011. 0648-BA37 Pacific Halibut Fisheries – Catch Sharing Plan. North Pacific Fishery Management Council Public Comment.
- Szymkowiak, M., and A. Himes-Cornell. 2017. Do active participation measures help fishermen retain fishing privileges?. *Coastal Management* 45 (1):56–72. doi:10.1080/08920753.2017.1237243.
- Terceiro, M. 2001. The summer flounder chronicles: Science, politics, and litigation, 1975–2000. *Reviews in Fish Biology and Fisheries* 11 (2):125. doi:10.1023/A:1015260005887.
- United Fishermen of Alaska (UFA). 2013. FDMS Docket Number NOAA-NMFS-2011-0180 Halibut Catch Sharing Plan. North Pacific Fishery Management Council Public Comment. Accessed January 05, 2019. <http://www.ufafish.org/wp-content/uploads/2014/03/UFA-Comments-Halibut-Catch-Sharing-Plan-082613.pdf>.
- Wilen, J. E., and G. M. Brown. 2000. Implications of various transfer and cap policies in the halibut charter fishery. Report to the Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA. Seattle, WA. Accessed January 05, 2019. [http://www.st.nmfs.noaa.gov/st5/RecEcon/Publications/Halibut\\_1st\\_with\\_graphs.pdf](http://www.st.nmfs.noaa.gov/st5/RecEcon/Publications/Halibut_1st_with_graphs.pdf).