Gulf of Mexico Grouper-Tilefish Individual Fishing Quota Impact on Captain and Crew:

Sentiment and Self-Stated Labor Outcomes

By:

ECS Federal Inc.

QuanTech, Inc.

Jacob LaRiviere

August 2017

GGT Crew Report 1-17

NOAA Contract No. EA133F-14-BA-0013

QuanTech Subcontract No. 208759

Acknowledgements: Thanks to Larry Perruso for several iterations of helpful feedback, Daemian Schreiber, David Cox and Quantech for tremendous help in implementation and design of the survey instrument, many GGT stakeholders including NOAA officials for survey feedback, Jason Murray for feedback on empirical work, and most importantly captain and crew who gave their valuable time to the survey effort.

Gulf of Mexico Grouper-Tilefish Individual Fishing Quota Captain and Crew Survey Results

This document summarizes and describes results from an in-person survey conducted in the summer and fall of 2016 on captain and crew of the Gulf of Mexico Grouper-Tilefish (GGT) fishery. The goal of the survey was to evaluate captain and crew self-reported outcomes and beliefs regarding the Individual Fishing Quota (IFQ) program in the GGT fishery. The IFQ program began on January 1, 2010, thus responses represent captain and crew experiences after five full years with the IFQ program.

Executive Summary

In summer 2016 Quantech, a surveying firm, implemented a carefully designed survey instrument to 153 captain and crew who has at some point participated in the Gulf Grouper and Tilefish (GGT) fishery. The majority of responses were from Florida although Texas was also represented. The survey elicited sentiment from captain and crew about the GGT fishery adopting IFQ management in 2010. A wide range of target species and gear types were represented and the survey was split with around 60% primarily crew and 40% primarily captain. The survey asked a series of questions regarding participation before versus after IFQ implementation and subsequently asked if different fishery participation outcomes (e.g., level of pay, stability of pay, safety, likelihood of share remuneration, etc...) had increased greatly, increased slightly, not changed, decreased slightly or decreased greatly.

There were four main findings from the survey. First, **work availability, labor choice and labor mobility were all reported to be significantly lower in the fishery**. This is expected and consistent with one stated goal of IFQs: to reduce over-capitalization in the fishery. Fewer total vessels fishing implies reduced firms and therefore less choice for fishermen.

Second, **for captain and crew who stayed active participants reported income measures were roughly unchanged**. For captains, there was a mild increase in average annual income. Crews reported a very slight reduction in stability of annual income. Both captain and crew reported a slight decreased ability to earn a large income. In each case, roughly one third of subjects reported greatly decreased stability, average and upside of income measures implying that a subset of industry participants were made worse off from the move to IFQs. Further work would be required to determine what causes these distributional issues. They could results from natural fluctuations in stock correlated with IFQ implementation, for example.

Third, **the strongest result from the survey was a significant increase in reported safety in the GGT fishery**. Less than 10% of subjects reported a slight or great decrease in safety. This is a remarkably strong result for a survey of this type. Self-reported safety attitudes can be verified with reported injuries in future work.

Fourth, **captain and crew reported similar modest decreases in satisfaction from fishing post-IFQ implementation**. It's unclear what caused this decrease. The satisfaction results are most similar to responses from decreased ability to earn a large income. Captain and crew also reported a lack of

perceived fairness that IFQ ownership was not linked to active IFQ participation. More work is needed to understand mechanisms, however, but both of these two explanations are plausible.

Summary Statistics

In summer 2016 Quantech, a surveying firm, implemented a carefully designed survey instrument to 153 captain and crew who has at some point participated in the GGT fishery. Quantech implemented surveys in person recording responses electronically on tablets which populated excel files.

One simple way of dividing up survey respondents is by whether subjects fished before or after IFQs and, if they did fish, were they captain or crew. Table 1 shows the breakdown of when subjects participated in the GGT fishery and how they participated in it. The majority of the respondents are crew, although captains are well represented.

Table 1: Composition of Respondents to Survey

	Fished Before Jan 1, 2010		Fished After Jan 1, 2010	
	n	percent	n	percent
Primarily Captain	53	35%	65	42%
Primarily Crew	80	52%	83	54%
Other	1	1%	1	1%
Didn't Fish/Refused	19	12%	4	3%
Total	153	100%	153	100%

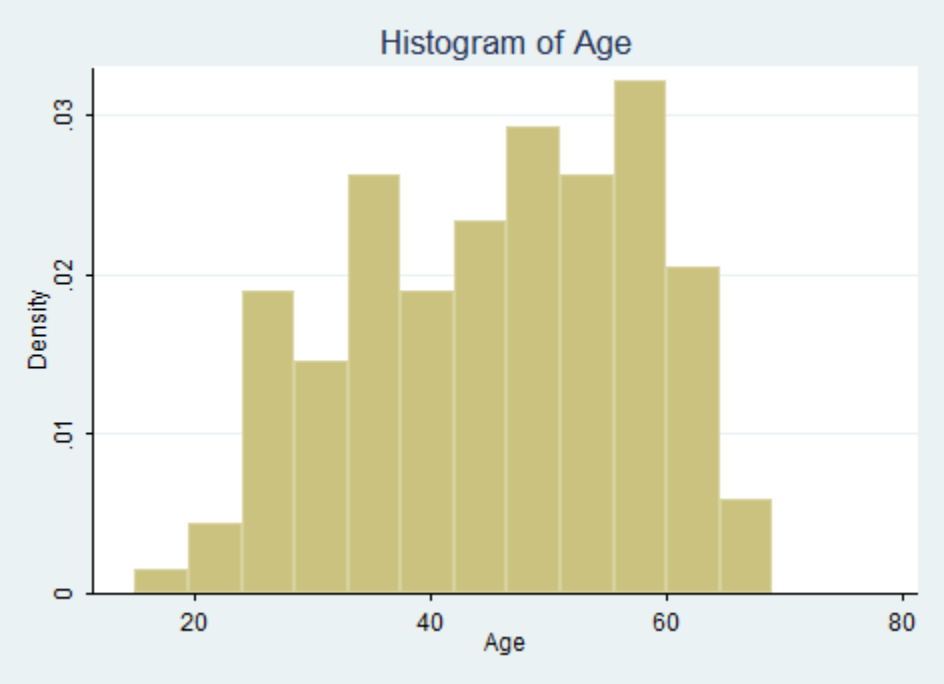
Table 1 highlights one important limitation of this survey: it is a single cross section in 2016. Almost all respondents (97%) participated in the survey actively participated in the GGT fishery after IFQs had been implemented. 87% of respondents surveyed reported participating before IFQ implementation. Since there is no baseline survey from 2009, all self-reported outcomes regarding how labor mobility, safety, income, opportunity, etc. were impacted by the implementation of IFQs rely on *recalled* pre-2010 outcomes and experiences of the 87% of subjects who participated before 2010. Importantly, that 87% is self-selected: they have stayed in the fishery throughout the IFQ transition. Other captain and crew did not and their attitudes are not well-represented here. Despite best efforts of surveyors to repeatedly identify and survey captain and crew whom had left the fishery, incorporating their attitudes in the survey proved very challenging.

It's unclear whether captain and crew who stayed in the fishery would have higher or lower opinions of IFQs compared to those who left the fishery. We can compare attitudes of the 19 subjects who only fished post-IFQ implementation to compare their sentiments to the pre-IFQ participants, but we acknowledge this is an imperfect check with a small sample size. Finally, some subjects abstained from answering some questions meaning that total observed answers vary slightly from question to question.

There are some important sociodemographic characteristics to consider. First, the overwhelming majority of the subjects were white: 1.3% reported Native American, 1.3% African American, and 97.6% White with 11 subjects reported being Hispanic, Latino or of Spanish origin. Second, the vast majority if subjects are from Florida: 133 (87%). Texas accounts for 15 (10%) of subjects with no other state

accounting for more than one survey respondent. Third, all but 4 subjects reported speaking English as their primary language at home. Fourth, Figure 1 shows the age distribution of subjects which is somewhat skewed left: average age was 45 while median age was 47. We thus conclude that the survey was largely conducted on slightly older English speaking Floridians. Regional, racial and age differences in attitudes, insofar as they exist, will thus not be well-represented in this survey. This is entirely understandable given the budget constraints faced by regulators to perform this work. Due to the sociodemographic similarity of subjects, most of the analysis below reports unconditional t-test to identify differences before or after IFQ implementation.

Figure 1: Self-reported Age of survey respondents.



Labor Mobility

The survey asked which species in the GGT fishery subjects targeted both before and after IFQ implementation: Gag, Red Grouper, other shallow water Groupers, Deep Water Groupers and Tilefish. The survey also asked about primary gear type: Longline, Bandit, Rod and Reel, Handline, and Spearfishing. Table 2 reports results for subjects both before and after IFQ implementation. Given differing sample sizes before and after IFQ implementation we report percentages.

There is clear evidence that labor specialization increased after IFQ implementation. The average number of targeted species fell from 4.28 to 4. That fall is statistically significant at the with a p-value of .999 (e.g., significant at a <1% level). In magnitudes, the size of the impact is that one in every four fishermen fish one fewer species post IFQs. There is also some substitution away from long line although this difference could very well be driven by small sample size: whereas the same vessel can and do target multiple species, captain and crew often focus on a single gear type thus reducing the

amount of data in the lower panel of Table 2. There is some movement toward bandit gear but this could be due to a larger trend toward that gear type generally.

Table 2: Labor mobility Pre-IFQ and Post-IFQ

	Gag	Red	Shallow	Deep Water	Tilefish	Don't Know	Average Species
Before Jan 1, 2010	88.8%	94.0%	94.0%	77.6%	69.4%	0.0%	4.28
After Jan 1, 2010	81.8%	83.9%	89.9%	79.2%	63.8%	0.7%	4

	Longline	Bandit	Rod and Reel	Spearfishing	Other
Before Jan 1, 2010	63.4%	27.6%	6.7%	.75%	1.5%
After Jan 1, 2010	59.7%	29.5%	8.7%	0.0%	2.0%

NOTE: Average species calculated only on subjects who fished both before and after IFQ implementation.

There are some secular trends which should not be attributed to IFQs. For example, of the 130 individuals who fished before and after IFQs, 11% moved from being crew to captain relative to only 2% moving from captain to crew. Attributing this to IFQs would be a mistake since we don't observe background mobility before IFQ implementation. Many of the remaining subjects stayed within their vessel role of captain or crew (36% and 50% respectively). Similarly, conditional on fishing the number of hours spent working outside the fishery stayed effectively flat for both captain (84%) and crew (82%). However, that is a statement about local economic opportunities on land relative to those at sea.

Self-reported attitudes about labor mobility are a focus of the study. Table 3 describes several attitudes related to labor mobility: availability of work, choices for employment and ability to switch to another vessel. One stark finding shown in panel (a) regarding availability of work is that over half of captain (58%) and crew (52%) reported that availability of work had decreased either greatly or slightly since IFQ implementation. Only 22% and 19% reported increased availability of work. This is not surprising given that IFQs extend seasons and decrease overcapitalization by eliminating incentives to race to fish. Panel (b) describes choices for employment. It shows that subjects report decreased choices for employment between for captain (46%) and crew (50%). 15% of captains and 17% of crew reported increased choice. This finding is consistent with more stable employment and less turnover across vessels. Panel (c) describes the ease with which crew can switch vessels. Results show that 49% of captains and 43% of crew report decreased ability to switch to another vessel. 11% and 17% report increased ability to switch across vessels.

In sum, labor reports a decreased availability of work. Conditional on working there is less choice and flexibility to move across vessels. It's important to note that these labor outcomes by their nature also implicitly reflect local market conditions: if there was a wide variety of well-paying jobs locally, it is likely that labor would have more bargaining power in the fishery.

Table 3: Attitudes toward labor mobility

3a: Change in Availability of Work by Vessel Role

Crew Role	Increased Greatly	Increased Slightly	Stayed the Same	Decreased Slightly	Decreased Greatly	Don't Know	Total
Captain	5	9	12	13	25	1	65
	8%	14%	18%	20%	38%	2%	44%
Crew	5	11	23	10	33	1	83
	6%	13%	28%	12%	40%	1%	56%
Other	0	0	0	0	1	0	1
	0%	0%	0%	0%	100%	0%	1%
Total	10	20	35	23	59	2	149
	7%	13%	23%	15%	40%	1%	100%

3b: Change in Choices for employment

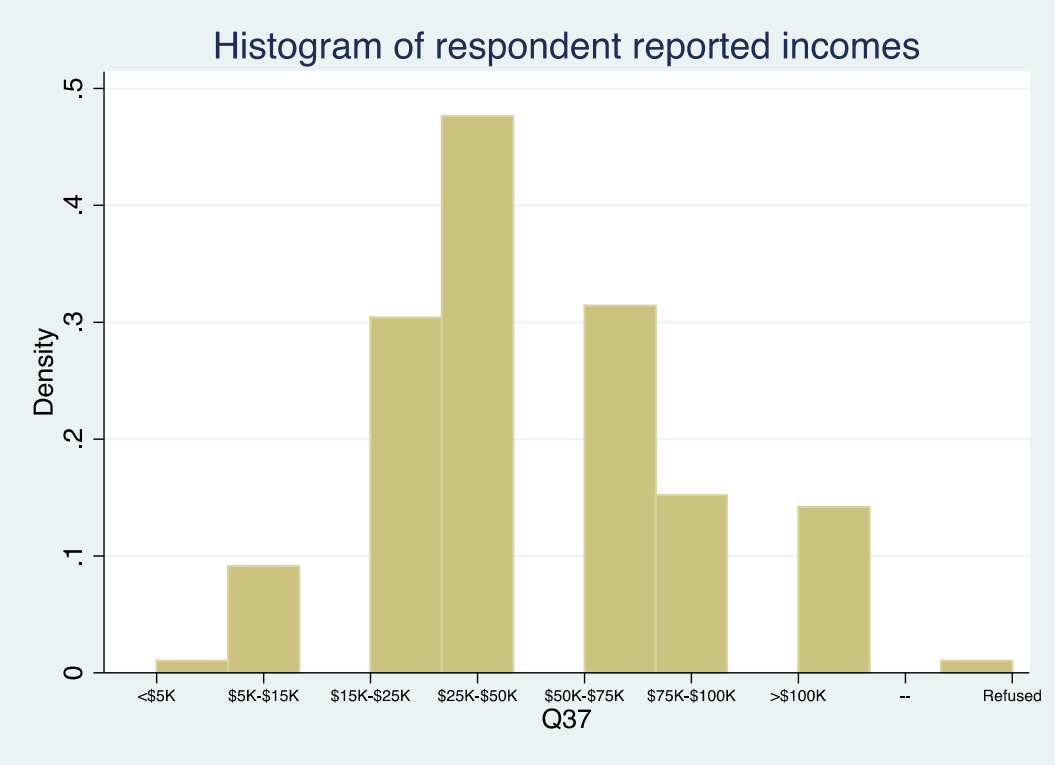
Crew Role	Increased Greatly	Increased Slightly	Stayed the Same	Decreased Slightly	Decreased Greatly	Don't Know	Refused	Total
Captain	4	6	21	10	20	3	1	65
	6%	9%	32%	15%	31%	5%	2%	44%
Crew	4	10	26	16	26	1	0	83
	5%	12%	31%	19%	31%	1%	0%	56%
Other	0	0	1	0	0	0	0	1
	0%	0%	100%	0%	0%	0%	0%	1%
Total	8	16	48	26	46	4	1	149
	5%	11%	32%	17%	31%	3%	1%	100%

3c: Change in Ability to switch to another vessel

Crew Role	Increased Greatly	Increased Slightly	Stayed the Same	Decreased Slightly	Decreased Greatly	Don't Know	Refused	Total
Captain	3	4	23	9	23	2	1	65
	5%	6%	35%	14%	35%	3%	2%	44%
Crew	5	9	31	15	21	2	0	83
	6%	11%	37%	18%	25%	2%	0%	56%
Other	0	0	1	0	0	0	0	1
	0%	0%	100%	0%	0%	0%	0%	1%
Total	8	13	55	24	44	4	1	149
	5%	9%	37%	16%	30%	3%	1%	100%

Income

The survey asks respondents several questions relating to income, asking whether their current income was in one of several income ranges. All but one respondent reported their current income. Most responses were between $15,000 and $50,000 and of those most were crew. Captains earn significantly more than crew, with many earning above $75,000. While some crew earn that much, the overwhelming majority earn less.



The survey asked three scaled response questions on the changes to income after the implementation of the IFQ program. The three questions were about changes in the overall level of income, changes in stability of income and changes in the 'potential or opportunity' to make a large annual income from fishing. The responses to these questions were highly correlated with each other. Table 4 shows the results.

Across these questions, roughly one third of respondents reported overall level of income, stability of income and potential for large incomes as increased greatly or slightly, one third reported that they stayed the same or decreased slightly and one third reported that they decreased greatly. Captains reported slightly more stable income and also an opportunity to earn higher incomes relative to crews post-IFQs. Importantly, we can't attribute these reported income measures to IFQs directly: to do so we

would need to know what background levels of changes to income levels and stability in five normal years.

Table 4: IFQs and Self-Reported Income Measures

Subtable 4a: Change in average annual income

Crew Role	Increased Greatly	Increased Slightly	Stayed the Same	Decreased Slightly	Decreased Greatly	Don't Know	Total
Captain	14	15	10	6	18	2	65
	22%	23%	15%	9%	28%	3%	44%
Crew	12	21	16	9	23	2	83
	14%	25%	19%	11%	28%	2%	56%
Total	26	36	27	15	41	4	149
	17%	12%	22%	12%	34%	2%	100%

Subtable 4b: Change in stability of annual income

Crew Role	Increased Greatly	Increased Slightly	Stayed the Same	Decreased Slightly	Decreased Greatly	Don't Know	Total
Captain	13	15	11	4	21	1	65
	20%	23%	17%	6%	32%	2%	44%
Crew	4	19	22	12	25	1	83
	5%	23%	27%	14%	30%	1%	56%
Total	17	34	34	16	46	2	149
	11%	23%	23%	11%	31%	1%	100%

Subtable 4c: Change in potential or opportunity for large annual income from fishing

Crew Role (Q8)	Increased Greatly	Increased Slightly	Q20_3 Stayed the Same	Decreased Slightly	Decreased Greatly	Don't Know	Total
Captain	12	12	11	7	22	1	65
	18%	18%	17%	11%	34%	2%	44%
Crew	9	12	24	6	30	2	83
	11%	14%	29%	7%	36%	2%	44%
Total	21	24	36	13	52	3	149
	14%	16%	24%	9%	35%	2%	44%

These three measures of changes to income are relatively consistent within respondents: captain and crew who answered incomes increased, also reported increased stability and incomes ability to earn a large income. Calculating polychoric[1] correlations between the three variables (with "Don't know" responses omitted) shows very consistent individual level answers.

Given that survey participants also reported their own incomes (in addition to *changes* in income asked with this questions), we can correlate answers to how IFQ implementation impacted incomes with income levels. The correlation between changes in income levels and reported annual income is 0.5; higher incomes were more likely to report increased in average income. This is consistent with small efficiency gains to IFQ implementations: higher earners reported earning greater incomes. This is also consistent with some hypothesized results of a catch share systems as lower skilled captain and crew might exit the fishery. This is a tenuous result (.5 correlation) so forming policy from it is not appropriate. Rather, further research is merited.

Table 5: Income Question Polychoric Correlation Matrix

	Level	Stability	Opportunity
Level	1		
Stability	0.84	1	
Opportunity	0.82	0.86	1

Another important industry characteristic driving fishing income is share of revenue. Captain and crew are almost always paid as a percentage of revenue. The survey asked how the share of revenue changed since IFQ implementation. Understanding how IFQs impacted revenue shares help to understand the dispersion of incomes before and after IFQs. Table 5 shows results.

Table 5: Change in share of revenue

Crew Role	Increased Greatly	Increased Slightly	Stayed the Same	Decreased Slightly	Decreased Greatly	Don't Know	Total
Captain	9	15	10	8	21	2	65
	14%	23%	15%	12%	32%	3%	44%
Crew	12	17	16	9	27	2	83
	14%	20%	19%	11%	33%	2%	44%
Total	21	32	27	17	48	4	149
	14%	21%	18%	11%	32%	3%	100%

[1] A standard measure of correlation between ordinal variables.

Changes in share of revenue tracks the general pattern observed in the other income questions though the pattern is slightly less consistent: roughly one third repost shares increasing, 15-20% reported no change in shares and roughly 45% report decreases in share; the polychoric correlation between the income level question and the revenue share question is 0.71. On average, then, shares decreased although for many fishermen they increased. It unclear whether IFQs caused this decrease directly, whether it was caused by general labor market conditions (e.g., fewer GGT jobs thereby bidding down wages), or some other change. Changes in shares post-IFQ could thus be responsible for differences in reported income measures before and after IFQs rather than changes in vessel level revenue.

Safety and Personal Satisfaction

The survey asked respondents directly about changes in perceived safety and personal satisfaction with fishing. Both questions asked whether captain and crew thought that safety had increase greatly, slightly, stayed the same, decreased slightly or decreased greatly. Tables 6 and 7 show the results for each.

For safety, more than 90% of respondents think safety has stayed the same or increased and nearly 40% of respondents believe safety has increased greatly. As with many other questions there is little difference between captains and crew. This is the starkest finding in the survey: less than 10% of respondents reported decreases in safety. There is a positive but relatively weak correlation (0.4) between safety responses and income level responses.

Table 6: Change in Safety Perception by Vessel Role

Crew Role	Increased Greatly	Increased Slightly	Stayed the Same	Decreased Slightly	Decreased Greatly	Total
Captain	26	12	25	1	1	65
	40%	18%	38%	2%	2%	44%
Crew	32	13	31	4	3	83
	39%	16%	37%	5%	4%	56%
Total	58	25	57	5	4	149
	39%	17%	38%	3%	3%	100%

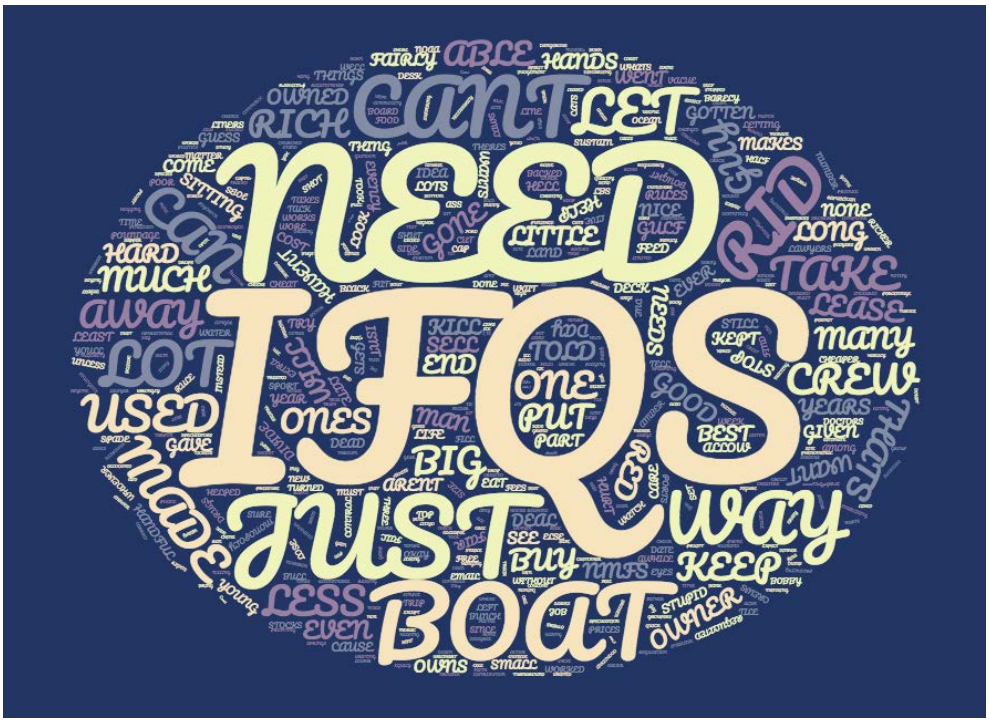
The final question relating to working conditions asks respondents to report changes in personal satisfaction. About one third of respondents report slight or great increases in satisfaction and roughly 45% report slight or greatly decreased satisfaction with fishing. These responses are positively correlated (0.64) with changes in income levels. The implication is income changes might contribute to decreased satisfaction but there is no evidence that income changes fully explain changes in personal satisfaction. Decreases in industry level employment, the changing nature of employment and other factors likely contribute as well.

Table 7: Change in personal satisfaction with fishing

Crew Role	Increased Greatly	Increased Slightly	Stayed the Same	Decreased Slightly	Decreased Greatly	Don't Know	Total
Captain	12	10	11	7	23	2	65
	18%	15%	17%	11%	35%	3%	44%
Crew	14	8	21	11	28	1	83
	17%	10%	25%	13%	34%	1%	56%
Total	26	18	33	18	51	3	149
	17%	12%	22%	12%	34%	2%	100%

Finally, there is additional information in the survey responses in the free form answers. The Figure below presents a word cloud of the free form answers. One possible explanation for decreased satisfaction could be related to the most common complaint in stated survey responses: captain and crew believe it is unfair to allow industry non-participants to own IFQs. Solutions proposed include limiting IFQ ownership to some minimum level of GGT fishery active participation or taxing owners for non-participation. Given the high level of correlation between self-reported greatly decreased levels of satisfaction, income and other labor outcomes, this fairness concern may lead to much frustration felt by industry participants on the survey.

Figure 3: Word Cloud of free form responses



Suggestions for Data Driven IFQ Improvement

There are a couple of gaps in our understanding of how IFQ implementation impacted labor outcomes which could be addressed with future research. First, it proved very difficult to identify labor participants who left the fishery after IFQ implementation. In future management changes, it would be helpful to identify participants before changes are implemented to allow longitudinal data collection rather than the cross-sectional approach taken here.

Second, linking survey answers to more quantitative income information would permit regulators to understand the distributional of IFQs across labor participants. For example, it could be that more skilled participants do better or worse under IFQs relative to beforehand. Without more granular and quantitative data no progress can be made along this dimension. Allowing for big paydays through a regulatory tweak may similarly increase satisfaction (e.g., active participant IFQ lottery). Similarly, understanding what is driving reported changes in income and income variability for captain and crew could be addressed by matching that quantitative data to back out revenue shares. Doing so would allow regulators and the industry to understand what is driving fluctuations in income: naturally occurring background randomness unrelated to IFQs, changes in shares or changes in how revenue is distributed across vessels.

Third, more work understanding the nature of the unfairness complaints would likely help regulators improve perceptions. Implementing a discrete choice experiment (DCE) over regulatory mechanisms would provide a data driven view on these issues. The DCE could be used to understand other preferences of captain and crew regarding industry structure as well.

Fourth, the distributional impacts of IFQs within captain and crew could use further research. The survey results found some weak evidence that higher income earners saw their incomes rise as a result of IFQs. The finding could be an artifact of small sample sizes but further research along those lines would be merited. The best possible path forward would be merging vessel trip logs from both before and after IFQs and determine which vessels continued to fish after IFQ implementation: high earners, low earners, or a proper sub sample of all vessels (e.g., no distributional impacts).