

# A safer catch? The effect of catch shares on risk-taking and fishing safety

The West Coast Sablefish fixed gear fishery and the West Coast groundfish trawl IFQ program

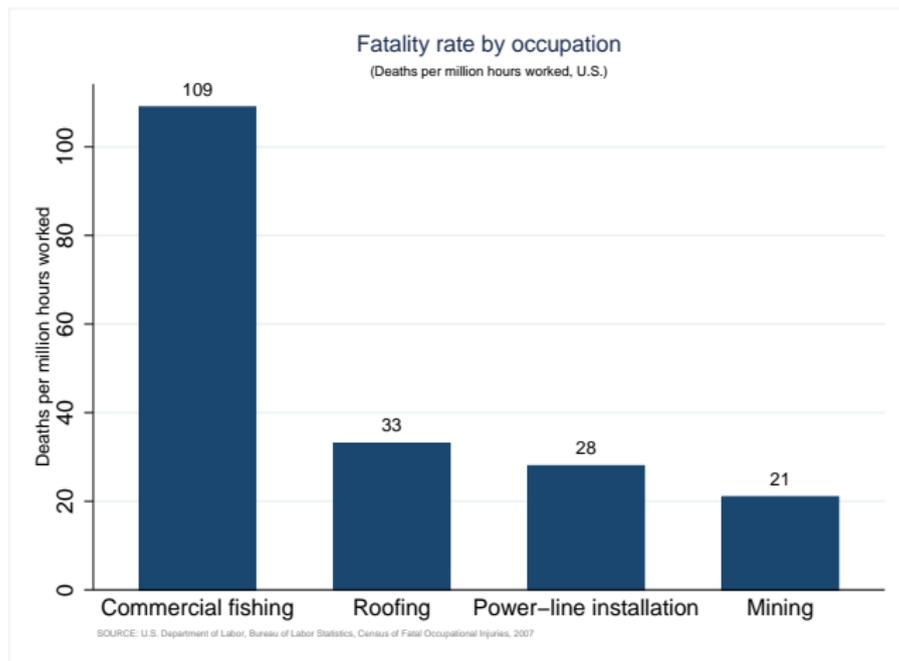
Lisa Pfeiffer<sup>1</sup>

<sup>1</sup>Economics and Social Sciences Research Program, NOAA NMFS NWFSC

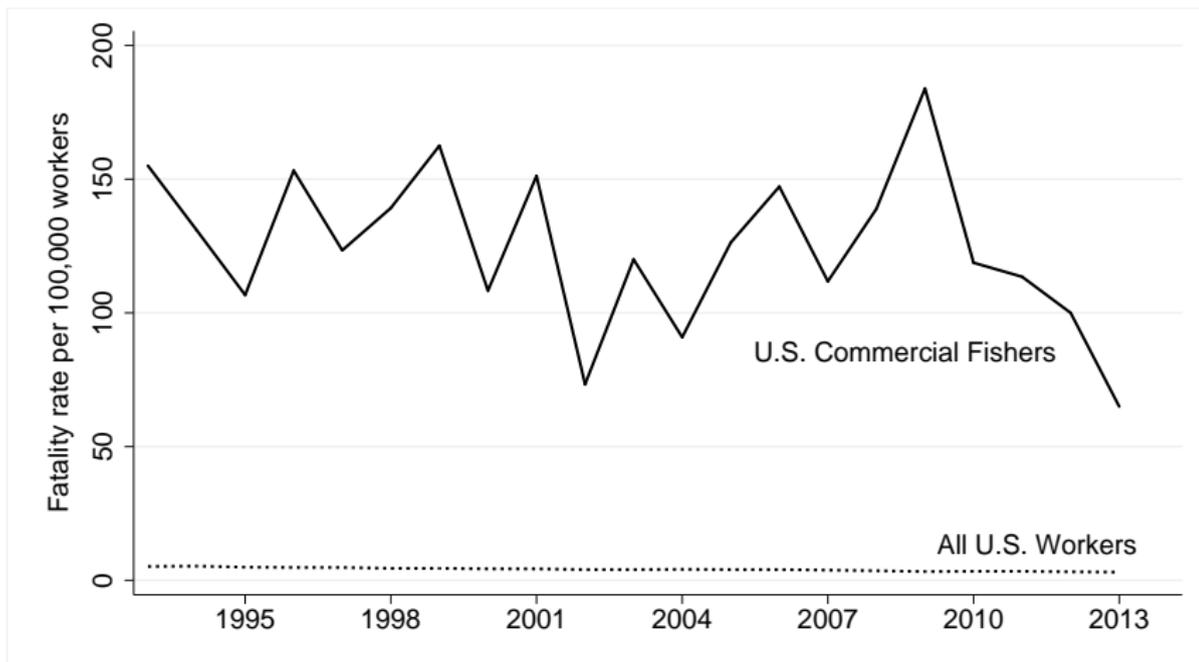
Program Review, August 2017

# “The deadliest catch”

- Commercial fishing is one of the most dangerous occupations



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- Commercial fishermen are often characterized as “risk-loving”
- Ignores the fact that fisheries management itself can create a misalignment of economic incentives that escalate the risk
- Biologically-based regulation (catch limits) have often resulted in “derby” or “race for fish” type fisheries
  - Fishermen respond to limited entry and catch limits by accumulating excess capital
  - Overcapitalized, unprofitable fishery in which the season lasts a very short time
  - Dangerous fishing conditions

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## “The deadliest catch”

- Fisheries management also has the tools to fix it
- *Individual fishing quotas (IFQs) or Catch Shares*
- Allocate a specific portion of the total allowable catch to individual entities
- Eliminates the incentive to catch the fish before anyone else does
- Fishermen no longer have the incentive to work without rest, delay vessel repairs, fish in dangerous weather, or overload their vessels
- This has obvious implications for fishing safety

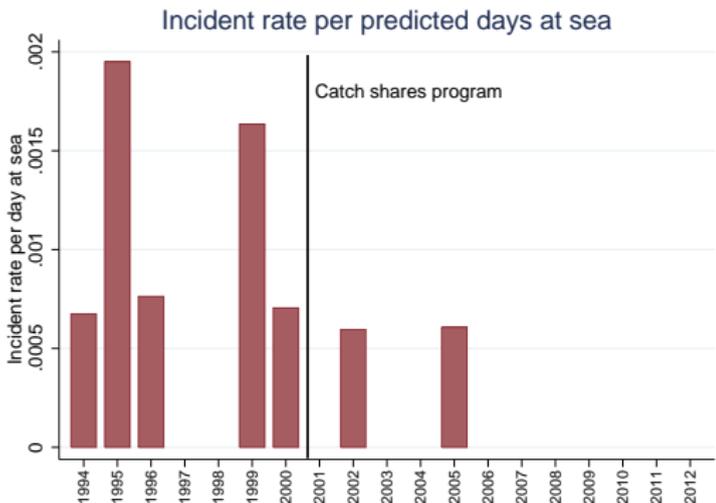
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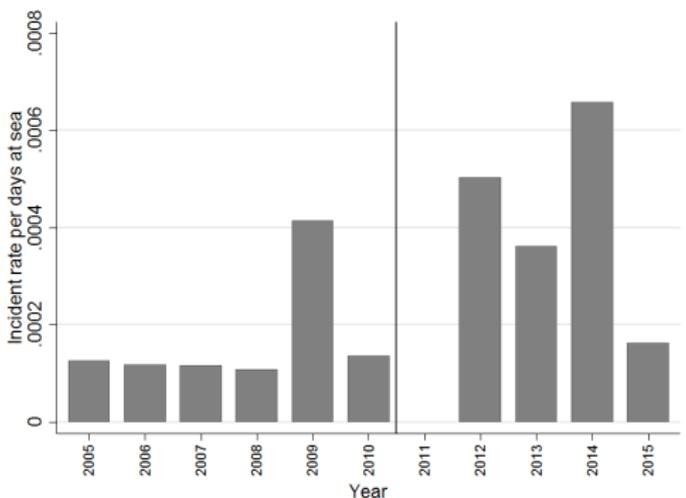
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# Incident rate



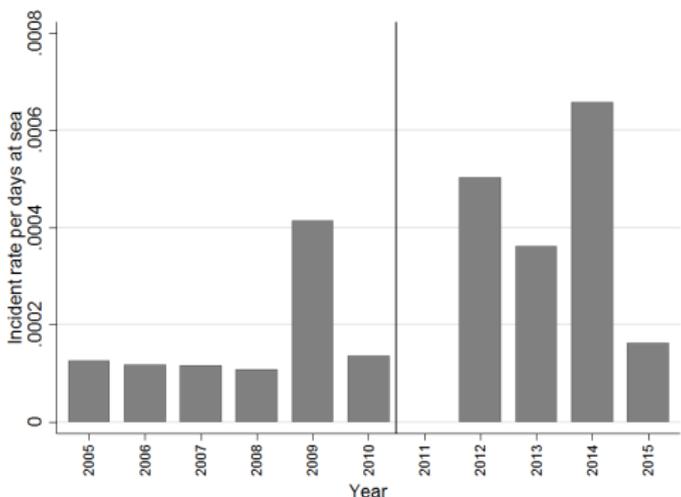
- Annual incident and/or fatality rates are used to inform MSA National Standard 10

# Incident rate



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  - neglecting to report incidents to avoid Coast Guard actions
  - difficult to statistically estimate probability of very rare events
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# Risk Exposure

- Fishermen make many choices that affect their exposure to risk
- Fishing in poor weather has been shown to contribute to safety incidents, vessel losses, and deaths
- Thus, we use fishing in poor weather as a proxy for risk taking behavior, and estimate the effect of catch shares on the propensity to fish in poor weather

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# The West Coast Sablefish Fixed Gear fishery

- "Primary" sector underwent a transition to catch shares in 2001
- Fishery was overcapitalized, season was only open for a few days, and vessels were not financially viable
- Safety issues:
  - fishing in poor weather or unsafe mechanical situations
  - operating at a high speed with lack of rest
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# Data

- “Incident” data from US Coast Guard
  - collisions, sinkings, pollution events, falls overboard
- Landings data (fish ticket) from Pacific Fisheries Information Network
  - determine fixed gear sablefish trips
  - estimate spatial and temporally varying expected revenue
  - total of about 400 vessels, but not all participate in each year
- Observer data from NWFSC used to estimate trip length and trip start date
- Weather re-analysis data from the National Center for Environmental Protection to get daily “max” wind speed in each port

## Methods

- Fixed effects logit model at the level of day, vessel

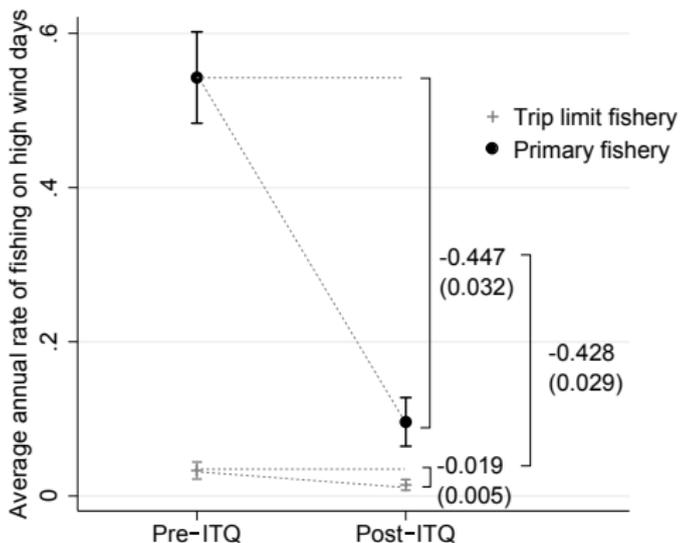
*Begin trip = f(management regime, expected revenue in each management regime, high wind indicator in each management regime)*

- Difference-in-differences, using “Daily” and Open Assess Sablefish fishery for comparison (+ vessel fixed effects)

$$\text{Avg. ann. fishing rate} | \text{High wind}_{ift} = \alpha_i + \beta \text{PostIFQ}_{it} + \gamma \text{Primary}_{if} + \theta \text{PostIFQ}_{it} * \text{Primary}_{if} + \epsilon_{ift}$$

# Results

Has the IFQ program in the sablefish fixed gear fishery decreased risky behavior?



Source: Pfeiffer and Gratz (2016). The effect of rights-based fisheries management on risk taking and fishing safety. *Proceedings of the National Academy of Sciences* 113(10): 2615-2620.

# Results

Period	Mean probability of taking a trip	Effect of \$1,000 increase in expected revenue		Effect of a high wind day		Marginal rate of substitution
		Change in probability	Estimated coefficient	Change in probability	Estimated coefficient	
Pre-ITQ	23.8%	—	-0.002	-31.3%	-0.376***	—
Post-ITQ	3.5%	4.3%	0.042***	-82.0%	-1.387***	33.0
Percentage change	-85.3%					

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# West Coast Groundfish Trawl IFQ Program

- IFQ program instituted in 2011
- Institutional landscape was very different from the sablefish fishery
  - Managed with a combination of daily, weekly, bi-monthly trip limits, area closures, and gear restrictions
  - Effort was smoothed over the year
- What effects could the catch share program have on safety in this fishery?

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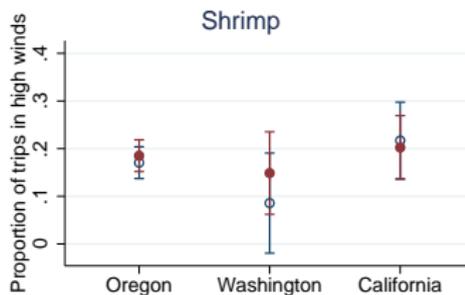
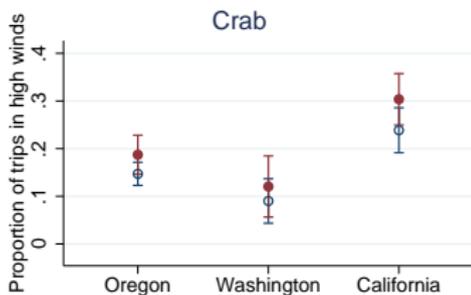
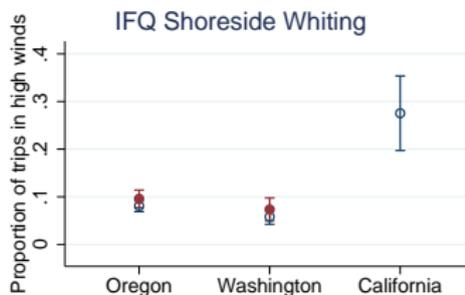
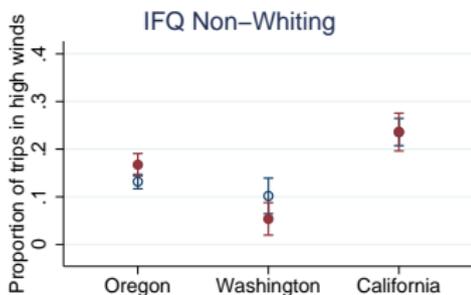
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# Safety and the West Coast Groundfish Trawl IFQ Program



○ Pre-catch shares ● Post-catch shares

# Summary

- Reduction in safety incident rates is the objective, but difficult to measure with available data
- A reduction in risk exposure is likely to be correlated with a reduction in incident rates, and tells us more about the mechanisms of change
- In a race-to-fish fishery:
  - The average fishing rate during high winds decreased by 79% after catch shares in the Sablefish Fixed Gear fishery
  - Robust to a many different methods of analysis
- In a fishery with effort artificially spread throughout the year by trip limits (Trawl IFQ):
  - There was **no change** in risk-taking behavior, measured by the propensity to fish in high wind weather

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## Broader Conclusions

- These studies show that catch shares can have an effect on the decision-making processes that directly affects the safety of fishermen
- Improving safety in the fishery is a listed goal of nearly all catch share management plans
- The results are dependent on the characteristics of the management plan in place prior to catch shares and the details of the catch share program
- Suggest that fishing safety policy should be fishery-specific (at least take management into consideration), rather than national

## Future work

- RFP and contractor to replicate this analysis for catch share programs around the country
- Analyses will be both regional, taking into careful consideration the management institutions in place, and national, using very similar data from all regions to do a meta-analysis
- We hope to contribute to the understanding of how management actions can affect fishing safety
- The results will contribute to MSA-mandated reviews of catch share programs
- The results will suggest improved indicators for monitoring safety in fisheries that work for short timelines and small fleets

# Thank you

[lisa.pfeiffer@noaa.gov](mailto:lisa.pfeiffer@noaa.gov)

