

HOW DO GEAR, PARTICIPATION, AND DEALER SELECTION DECISIONS RELATE TO VALUE?

A price analysis of the U.S. West Coast Sablefish
Melissa Krigbaum

Contractor in support of the Economic Data Collection program
NW Fisheries Science Center
Lynker Technologies

Graduate student at the University of Washington
School of Aquatic and Fishery Sciences
Advisor: Chris Anderson

*Preliminary Results Do Not Cite

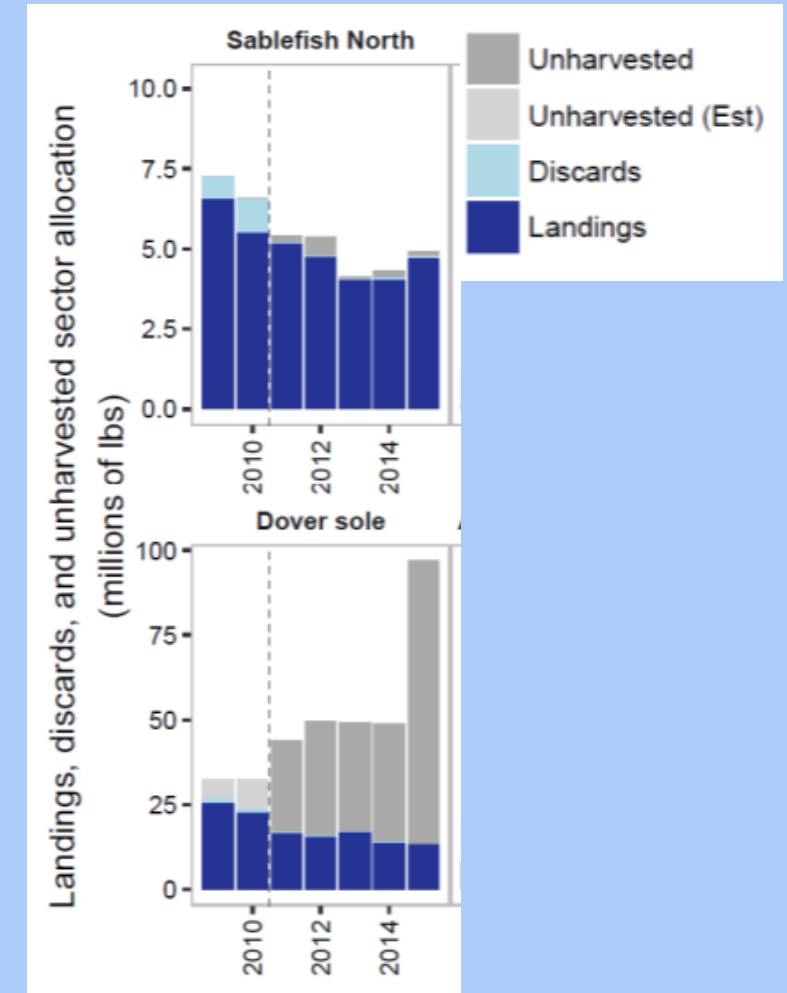
Sablefish on the West Coast

- Commercially important, \$31M ex-vessel revenue of \$61M in 2016
- Targeted by the **limited entry trawl sector**
 - *Catch share program 2011*
 - *Gear-Switching flexibility provision*
- Targeted by the **limited entry fixed gear sector**
 - *Primary Sablefish Endorsement with tier limits*
- Targeted by **open access fishers**, managed by trip limits



Project Motivation - Gear Switching

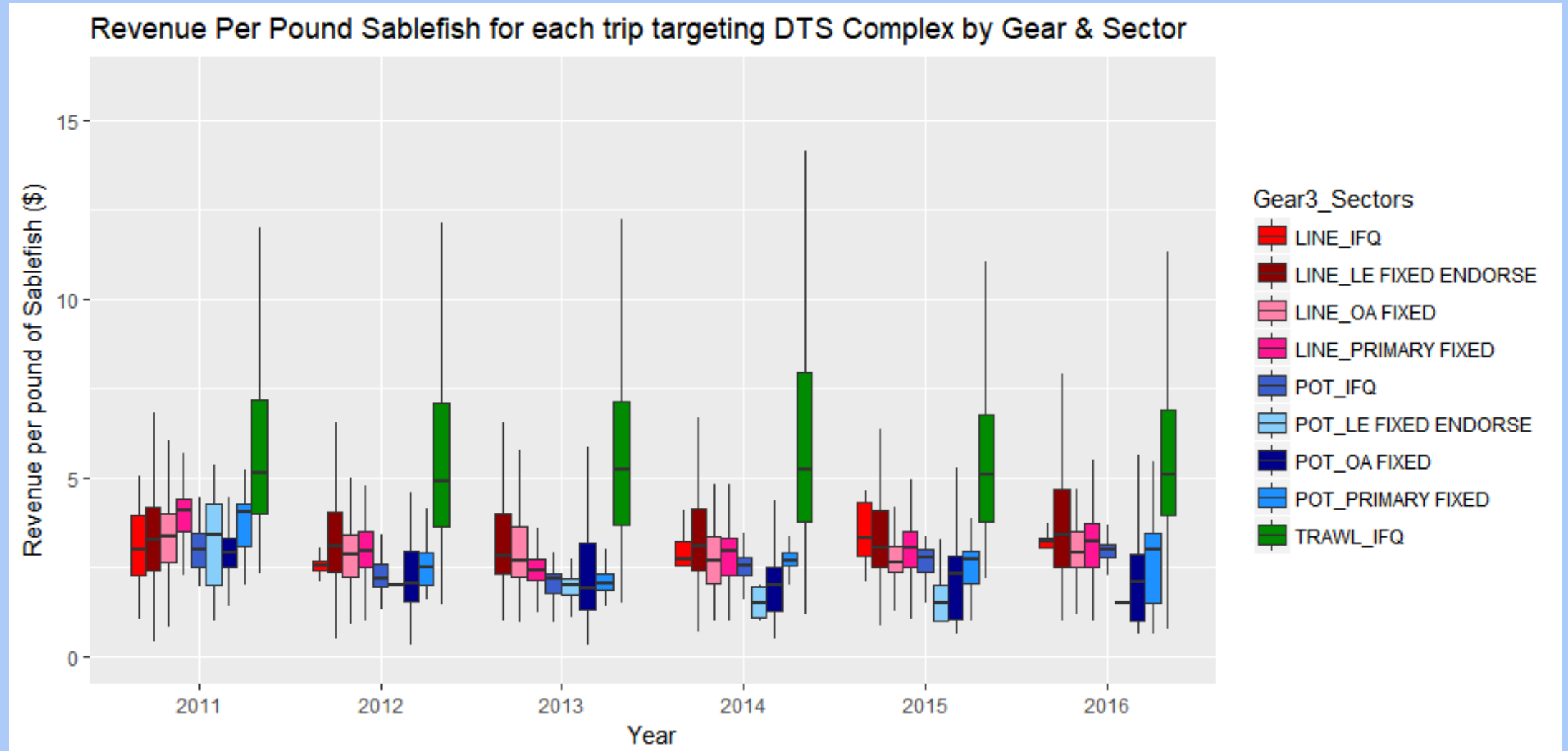
- Total effort by gear-type allocated by market forces – Flexibility provision
 - *Entry and exit by fixed gear operators into trawl sector*
 - Relative profitability, who values most?
 - Is this flexibility optimal?
- Trawlers → Dover sole and Thornyheads landings
 - *Historically low attainment – suboptimal*
 - *N Sablefish Quota is constraining*
 - *Allocative efficiency*



Source: PFMC and NMFS. 2017. West Coast Groundfish Trawl Catch share Program Five Year Review. Pacific Fishery Management Council. Portland, OR.

Revenue per pound of Sablefish

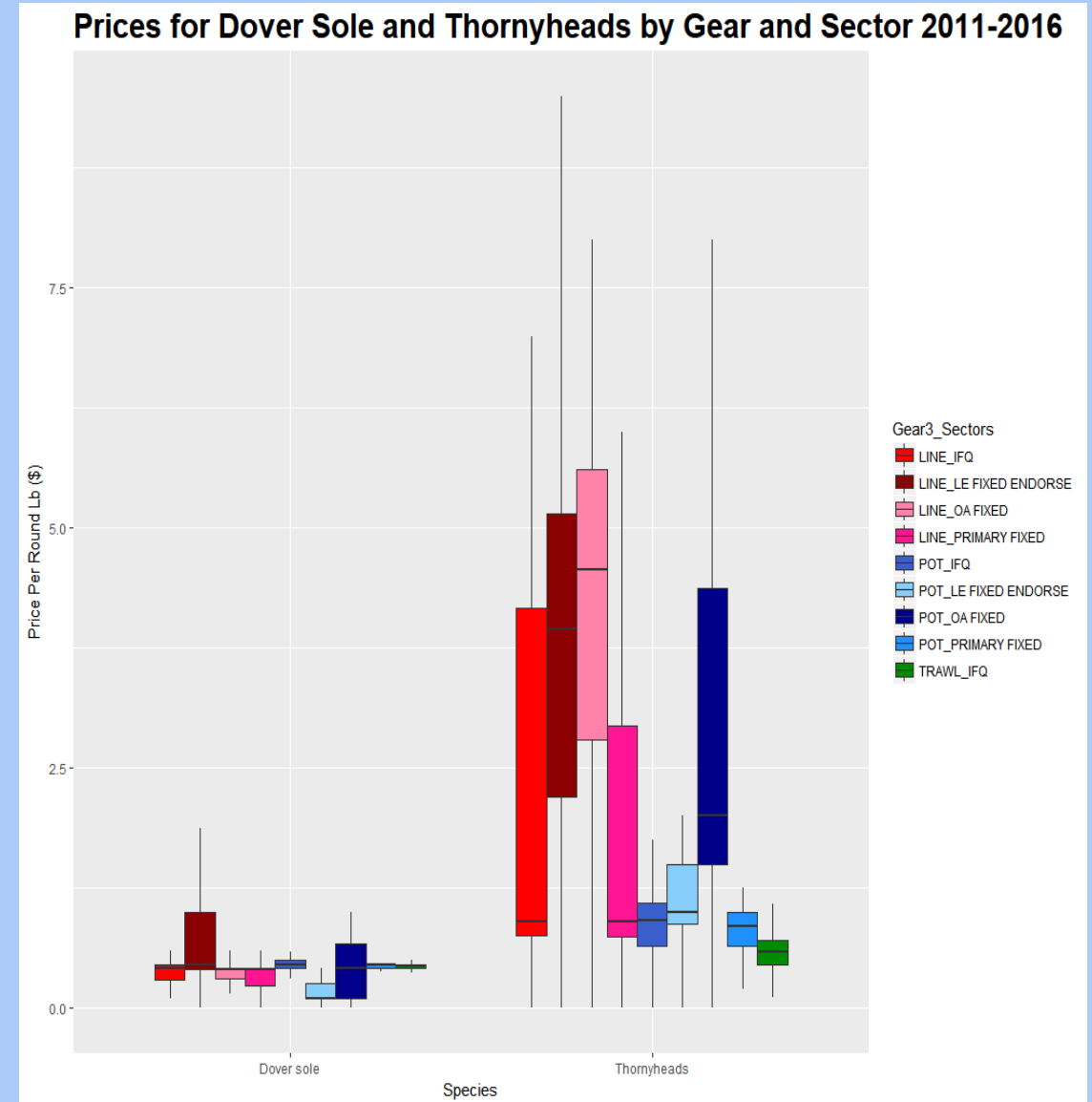
- Constraining quota in multi-species fishery, valued beyond price of single species



Revenue per pound of Sablefish

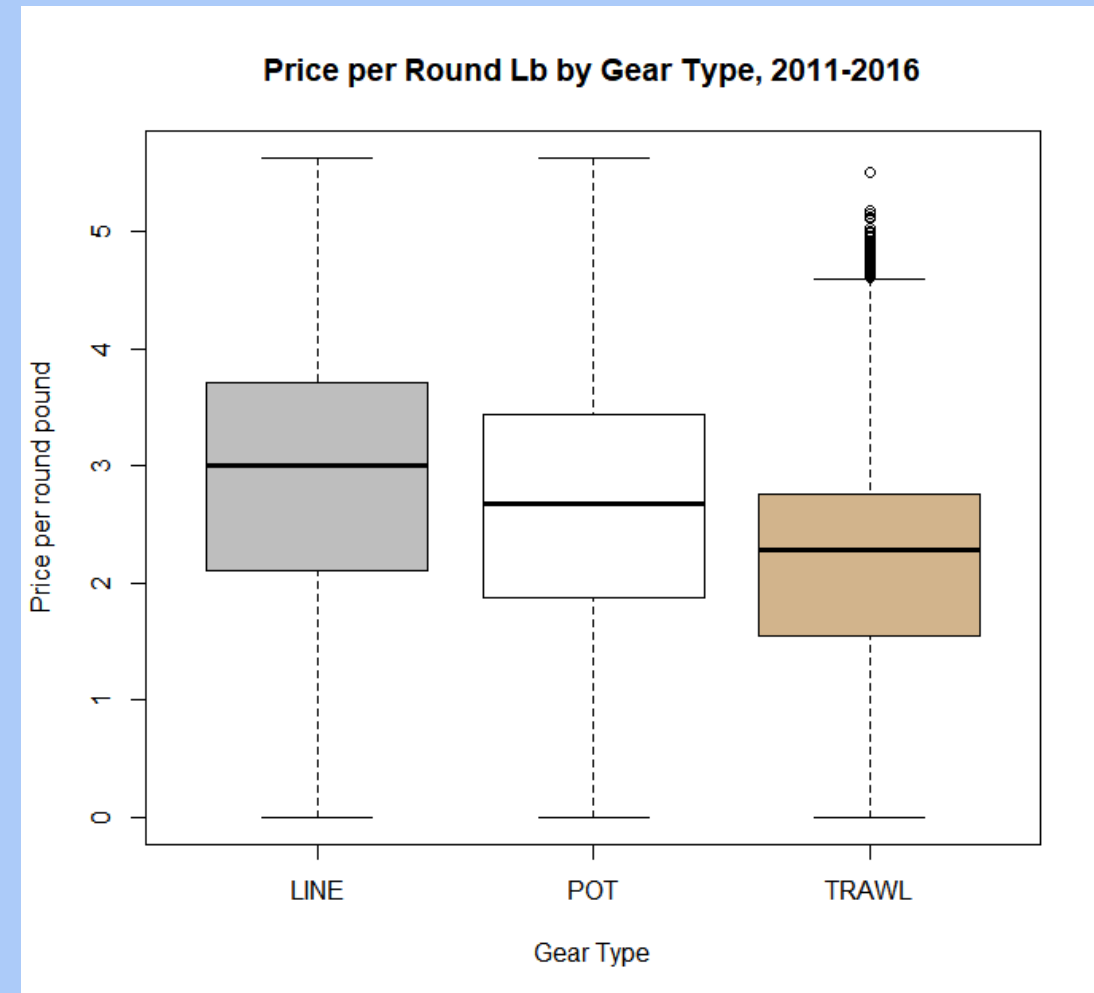
- Must also consider targeting behavior
- Outliers even within DTS complex where Sable not main source of revenue
 - *Number of trips with more than \$30 per pound of Sablefish*
 - 1106 LE Line fishery
 - 149 Trawl IFQ
 - Less than 25 in all other sectors
- Prices of Dover sole & Thornyheads

$$\pi = P_{sab}Q_{sab} + P_{dov}Q_{dov} + P_{thorn}Q_{thorn} - cost(q) + FC$$



Project Motivation

- Large variation in prices for Sablefish
 - *Interquartile ranges*
 - \$1.22 /round pound for trawl-caught sablefish
 - \$1.58 /round pound for fixed- gear caught sablefish
- Do particular factors systematically influence price?



Price Analysis – Data & Methods

- Fishticket data from 2011-2016
 - *All Sablefish landings coast-wide (excl. Tribal & Live)*
- Linear mixed effects models, with dealer and vessel random effects

Grade-level model:

Price per round lb

$$\begin{aligned} &= 0 + \text{Gear} * \text{Size} * \text{Sector} + \text{Condition} * \text{CatchRegion} \\ &+ \text{PreferredDealer} + \text{DovThornBuyer} + \text{DealerSabScale} + \text{Year} \\ &+ \text{month} + \delta_j + \rho_{jk} + \varepsilon_{ijk} \end{aligned}$$

Delivery-level model (Incorporates Size Composition):

Avg price per round lb

$$\begin{aligned} &= 0 + \text{Gear} * \text{Sector} + \text{Condition} * \text{CatchRegion} + \text{PreferredDealer} \\ &+ \text{Year} + \text{DovThornBuyer} + \text{DealerSabScale} + \text{month} + \delta_j + \rho_{jk} + \varepsilon_{ijk} \end{aligned}$$

Key Results: Gear-choice & Size

- *Size plays large role in price*

Size Category	Large /XL	Medium	Small	Extra-Small
Average coefficient of grade	\$3.34	\$2.54	\$1.96	\$1.25
% of landings*	14.6%	34.5%	31.7%	19.1%

*Comparing fish landed in same sector by same gear-type, depending on gear-sector combos,
The difference in price coefficient between LARGE/XL and...*

Medium Grade: -\$1.13 to -\$0.60
Small Grade: -\$1.56 to -\$1.08
Extra Small: -\$2.19 to -\$1.71

*of landings with specified grade.

40% of landings of Sablefish have unspecified size listed on fish tickets
These are excluded from grade-level model only.

Key Results: Gear choice & grade

- Fish of same grade & sector, but different gear types also have significant prices differences.
 - EX: *Medium IFQ Line Sablefish* = \$2.67 > *Medium IFQ Pot* = \$2.47 > *Medium IFQ trawl* = \$1.87

Quality of fish caught with fixed gear → price premium over trawl

Grade	Trawl Coefficient	Difference Line - Trawl	Difference Pot - Trawl
XL/L	2.68	+0.71	+0.76
M	1.87	+0.80	+0.60
S	1.60	+0.42	+0.41
XS	0.59	+0.60	+0.68

Key Results:

Grade Composition of delivery matters

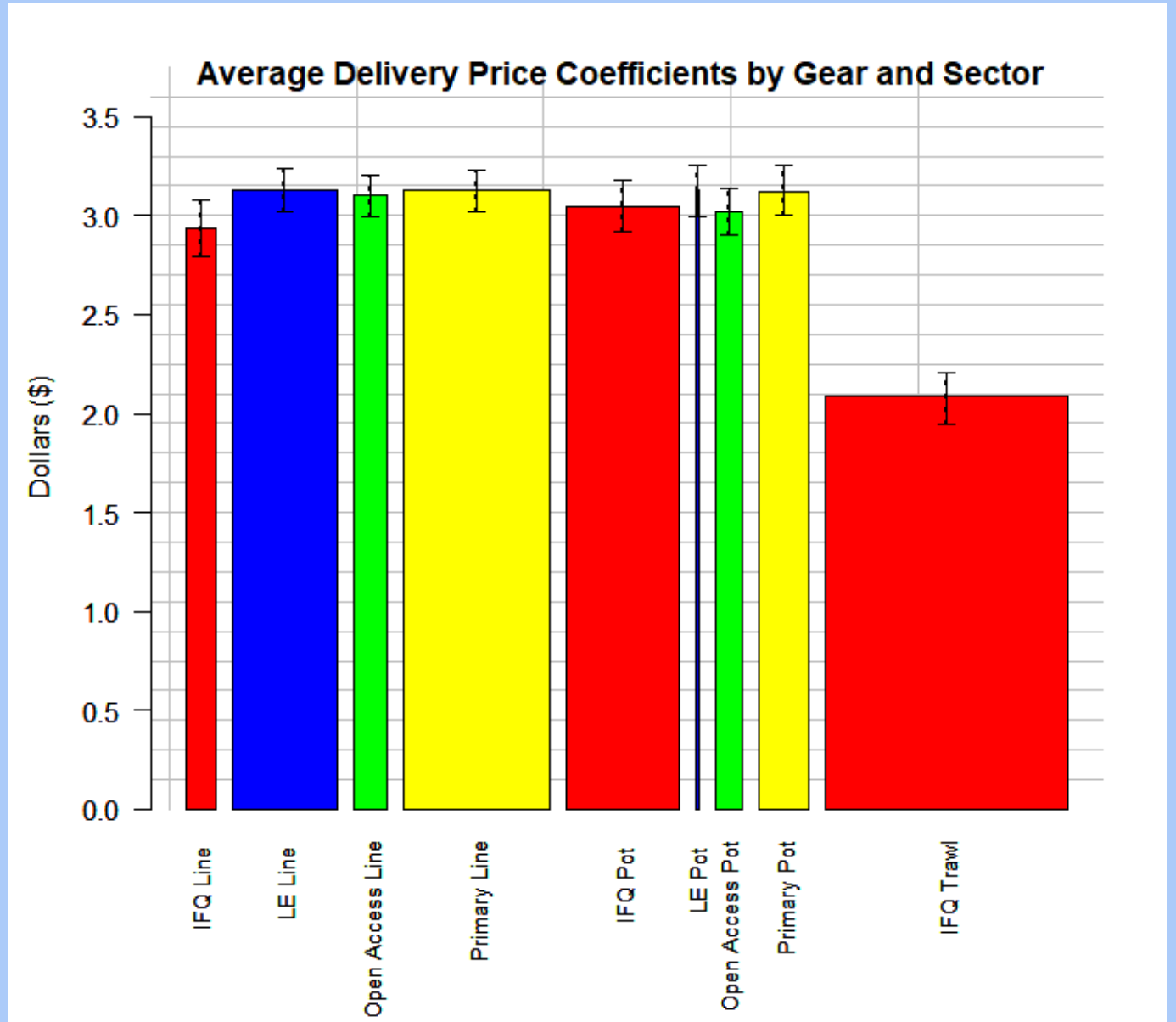
Trawl IFQ →

\$0.81 less than IFQ Line (Min)

\$1.08 less than L.E. Pot (Max)

AVG difference between fish of the same size in grade-model = \$0.66 less.

Not just lower price for fish of same size, but have more smaller or fewer large fish.



Key Results: Catch Region

Relative to catch between 36N and 40N

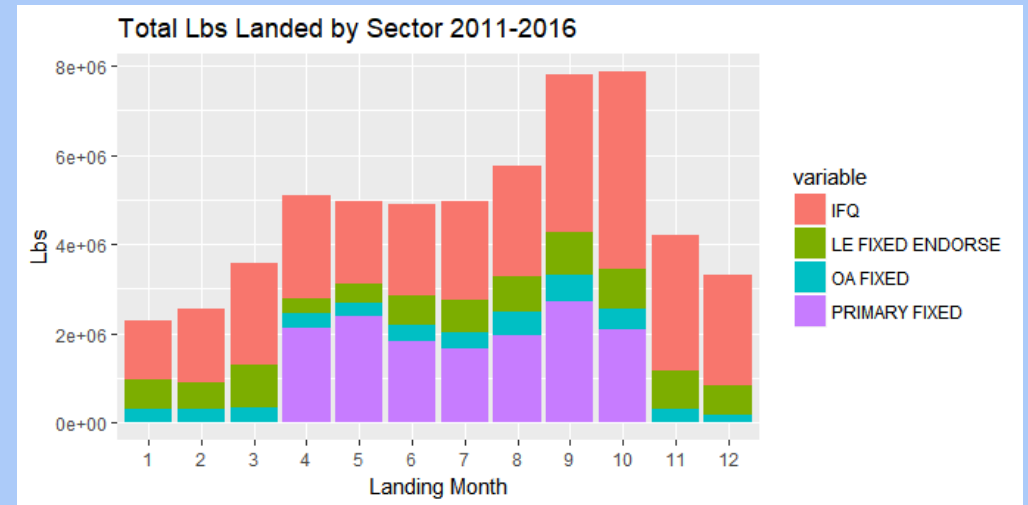
Catch Region	Grade-Level Coefficients (\$)	Grade-Level Confidence Interval (\$)	Delivery-Level Coefficients (\$)	Delivery-Level Confidence Interval (\$)
North of 40'30	+-0.14 *	(0.03, 0.27)	+0.24 *	(0.13, 0.34)
South of 36N	-0.05 **	(-0.12, -0.01)	-0.28 **	(-0.36, -0.21)

Difference between grade-level and delivery-level may reflect the grade-composition shift towards smaller fish in Southern waters.

Interaction with condition significant ***:
Dressed*South36 = -0.73 (-0.82, -0.64)

Key Results: Timing

- **Hypothesis:** Sectoral timing would influence price – Primary season only April to October, less available outside these months
- **Results:** Month jointly significant but differences very small.
- **Possible explanation:** Majority of the product is frozen H&G rather than a fresh



Landing Month	Grade-level model coefficient (\$)	Landing Month	Grade-level model coefficient (\$)
JAN	0.0016	JUL (in season)	0.0053
FEB	0.0093	AUG (in season)	-0.0020
MAR	-0.0005	SEP (in season)	Reference Group
APR (in season)	-0.0221	OCT (in season)	0.0197
MAY (in season)	0.0318	NOV	0.0380
JUN (in season)	-0.0157	DEC	0.0372

Key Results: Dealer-vessel Relationships

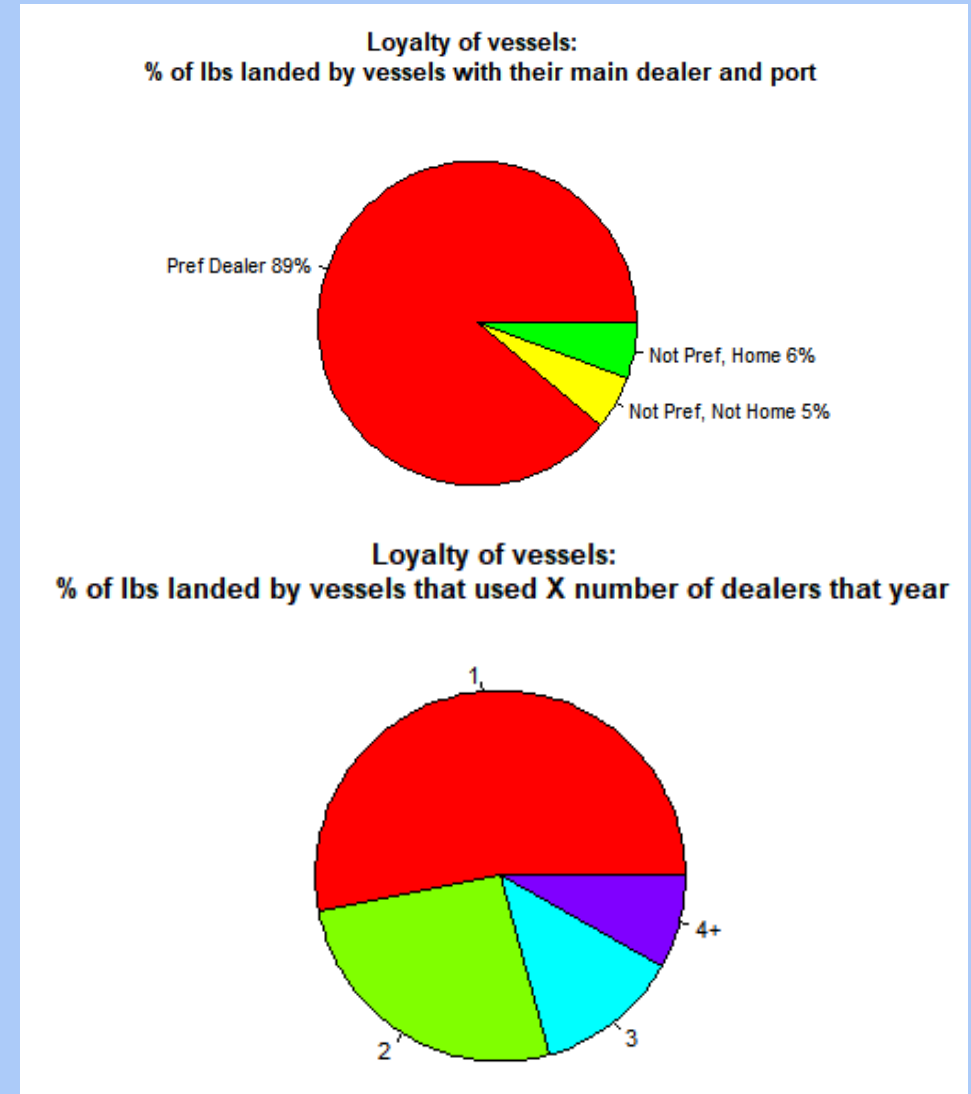
COMPARED TO USING MAIN DEALER

If in home port & not at your main dealer:

+\$0.13, [\$0.10, \$0.16]

Possible explanation:

- Trying to attract loyalty
- Need to meet a contract or supply need for some particular reason



Key Results: Dealer's Operations

- Dealers that do not buy 500 pounds of either Dover sole or Thornyheads that year:

+\$0.12 (0.07, 0.16) **

- Dealers that do not buy at least 500 pounds of Sablefish that year:

-\$0.36 (-0.61, -0.11) *

Key Results: Dealer-vessel Relationships

Dealers have own preferences, but also pay vessels differently

Calculated range/IQR within each dealer of random dealer-vessel effect coefficients:

Excluding the 113 dealers who work with just 1 vessel.

Average IQR is **\$0.324**

Average range is **\$0.861**



Thoughts & Next Steps

- Need cost model to appropriately examine profitability
 - *Variable cost model – technical efficiency & selectivity*
 - *Quota and permit costs*
- Long term utilization and age-composition of catch implications
- Species composition/ selectivity of catch
 - *DTS profits vs. Fixed gear sable profits depends on relative abundance*
- Economically-sophisticated Management Strategy Evaluation
 - *Incorporates size*
 - *Explores the flexibility provision and quota trading rules*
 - *Geographic division*

Acknowledgements

Thanks for advice and insight:

Economic & Social Science Research Team: Erin Steiner
University of Washington: Chris Anderson & Anderson Lab
Dan Holland

Thanks for my employment that makes this possible:

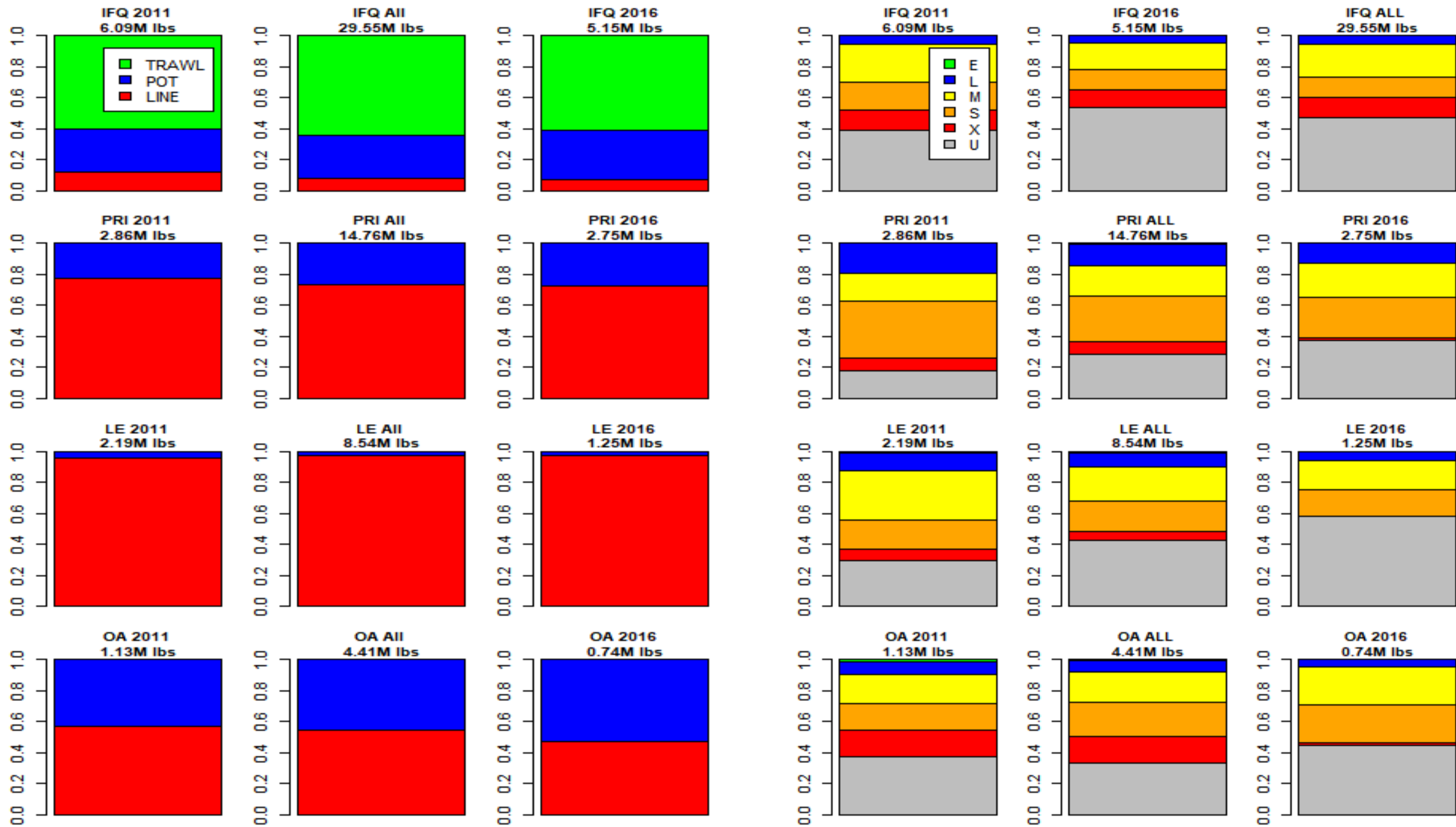
NOAA, NWFSC, FRAM
Lynker Technologies

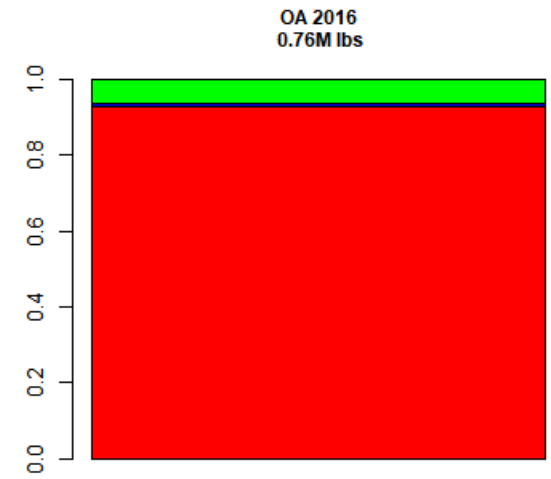
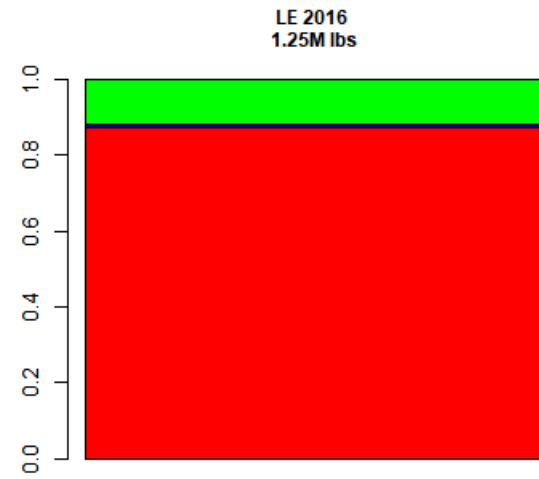
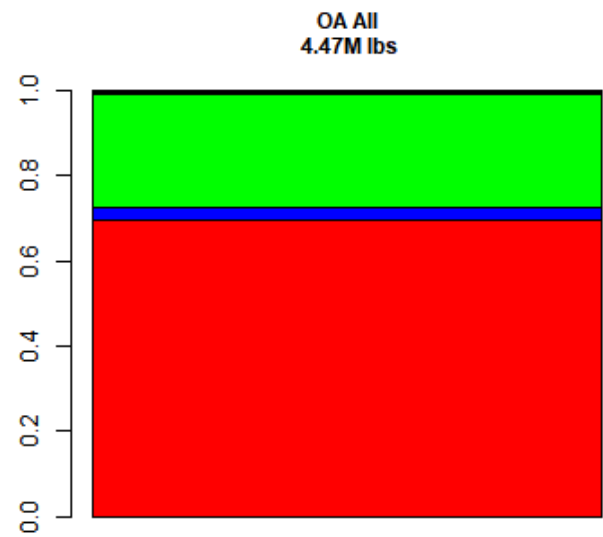
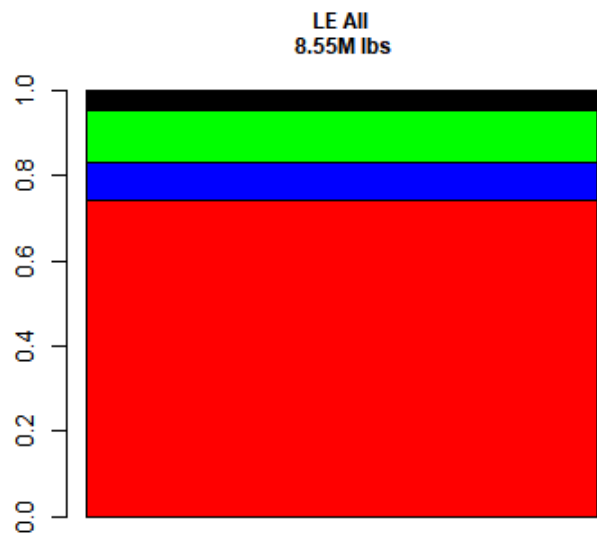
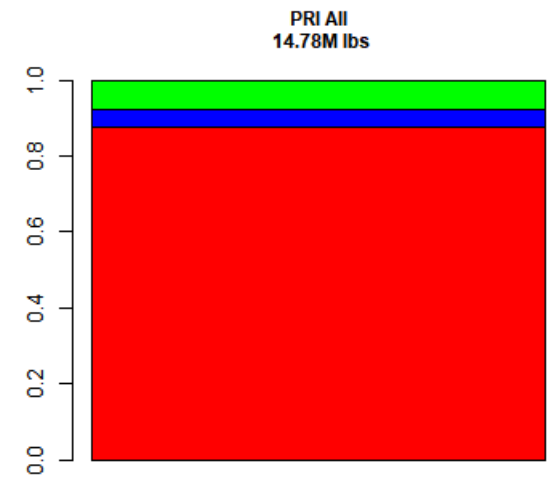
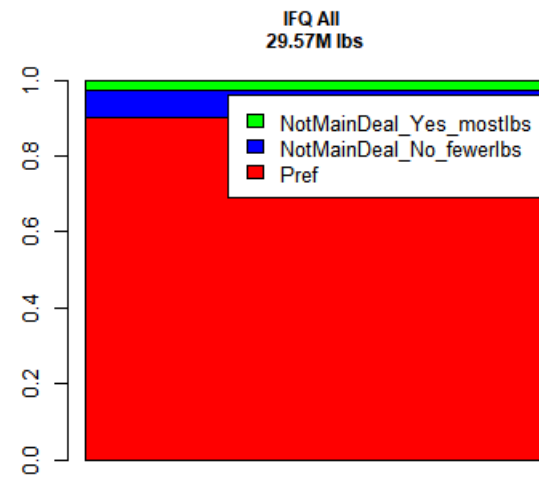
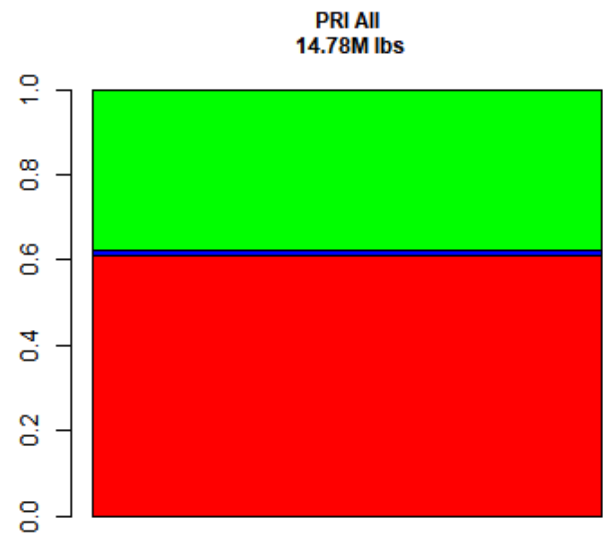
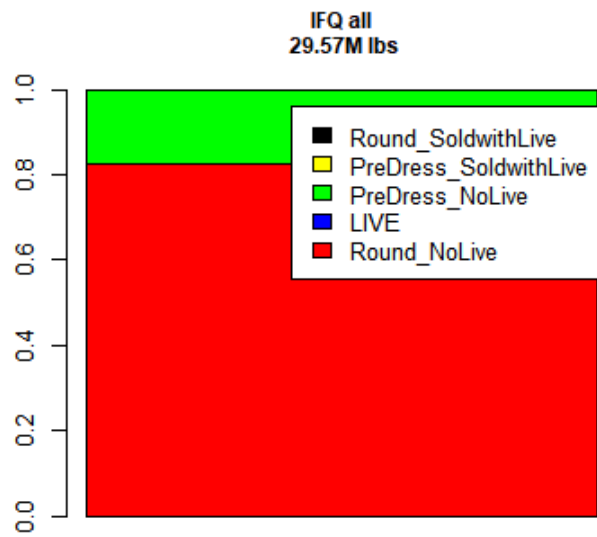
Thanks for coordinating: IIFET 2018

Thanks for the data: Pacific States Marine Fisheries Commission

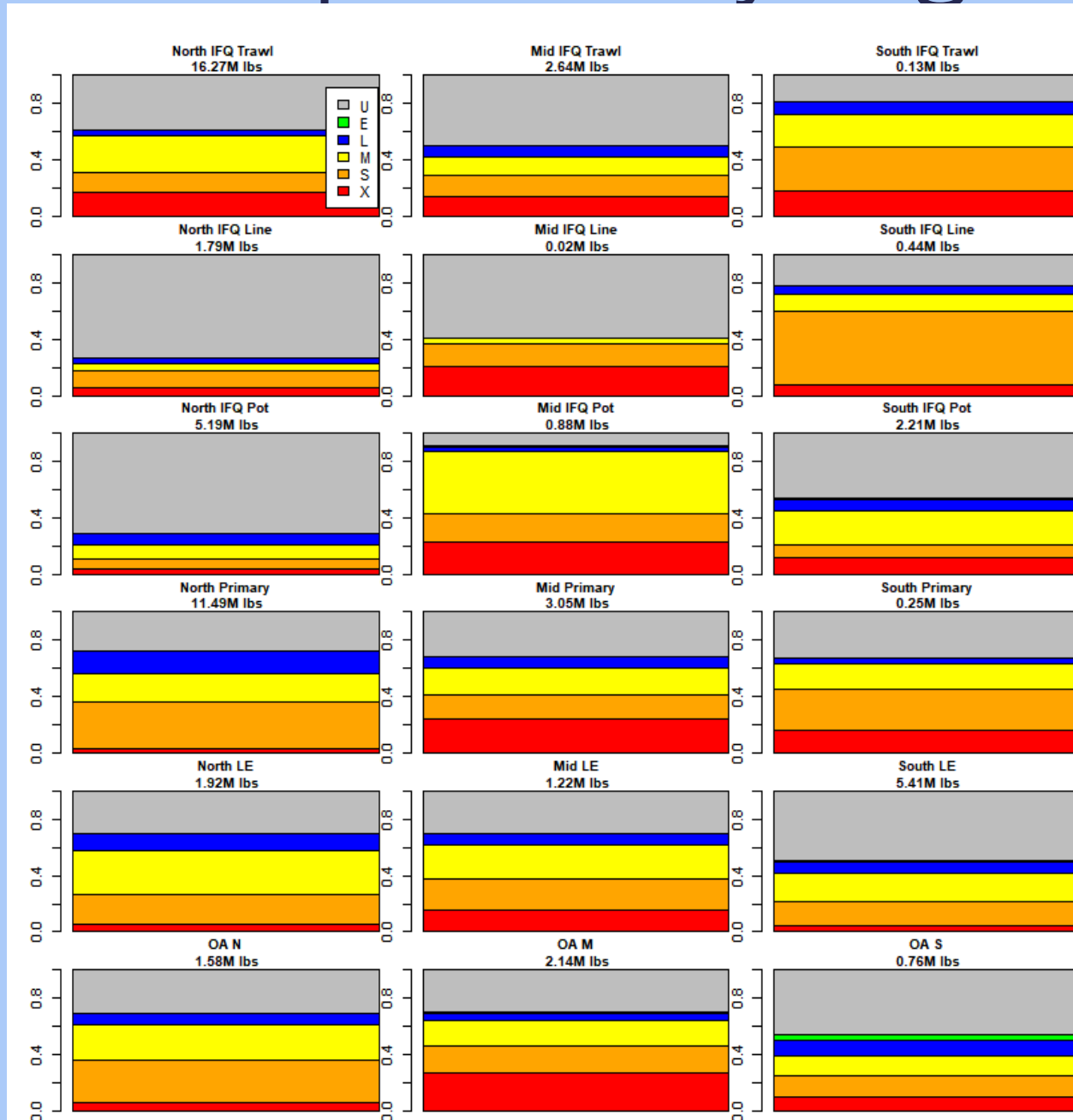
Come find me if you want to chat about Sablefish! 😊

Extra

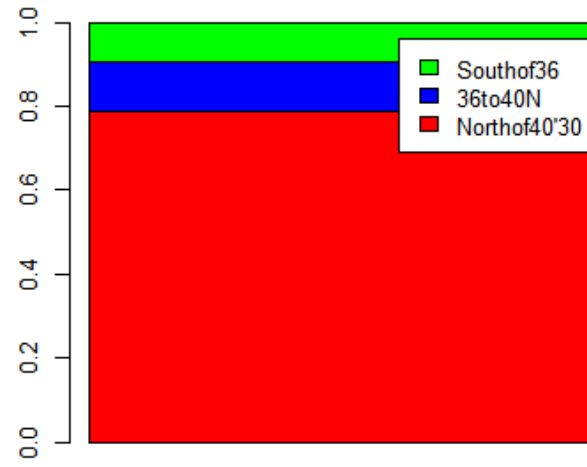




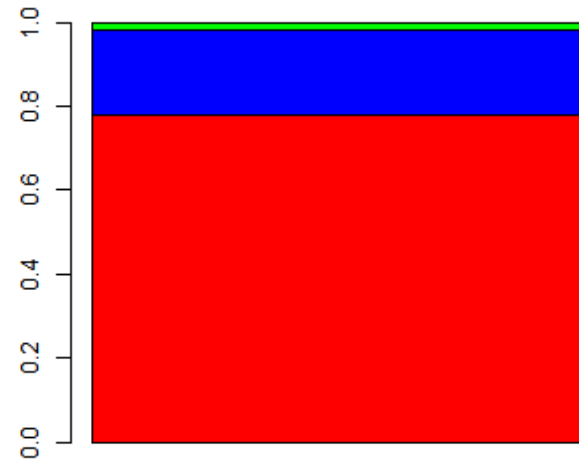
Grade Composition By Region & Sector



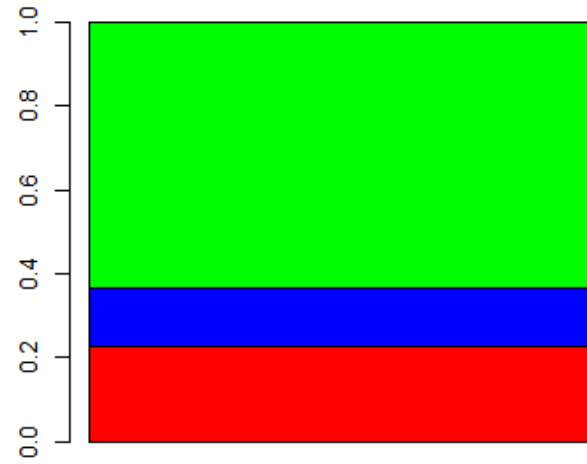
IFQ all
29.57M lbs



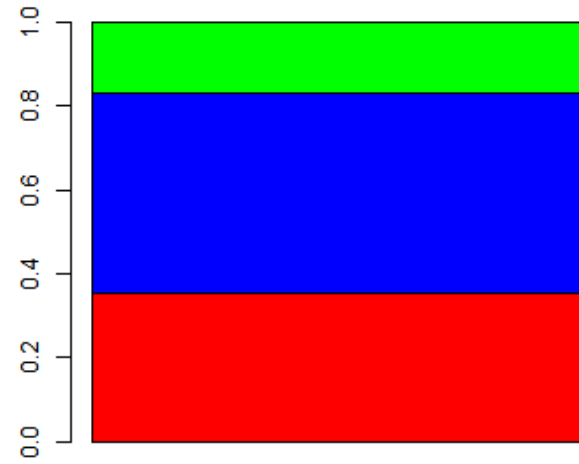
PRI All
14.78M lbs

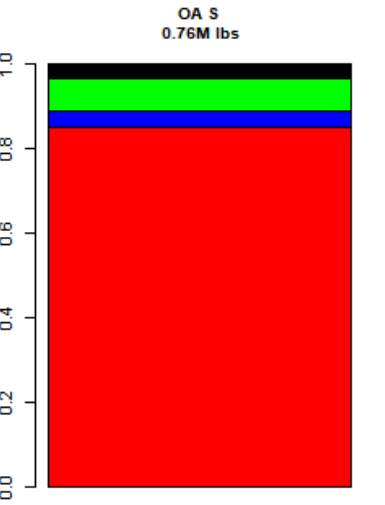
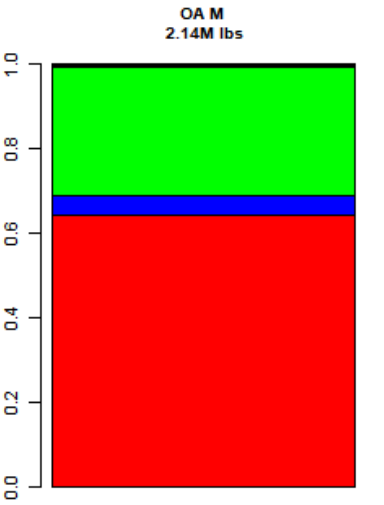
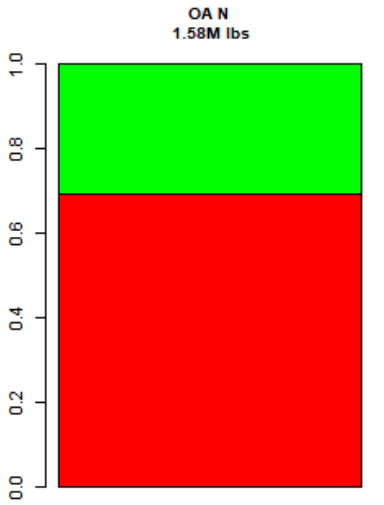
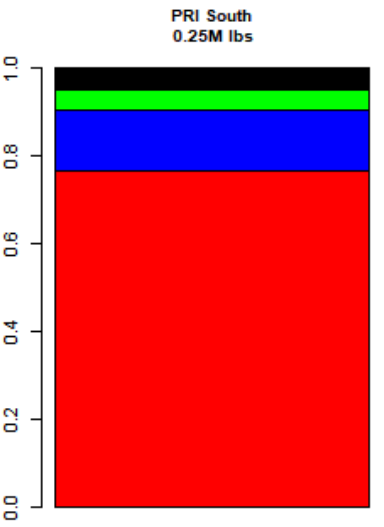
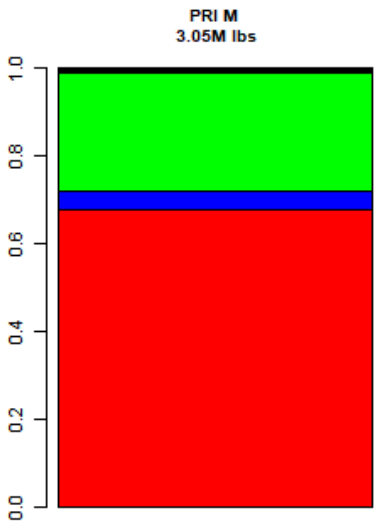
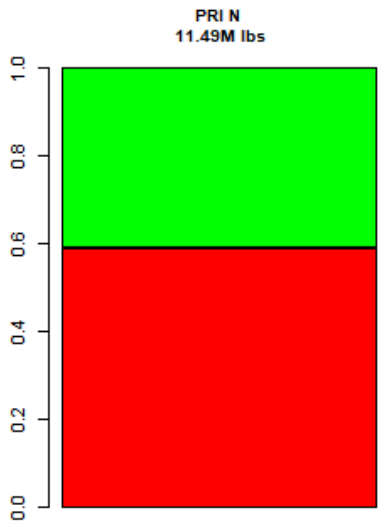
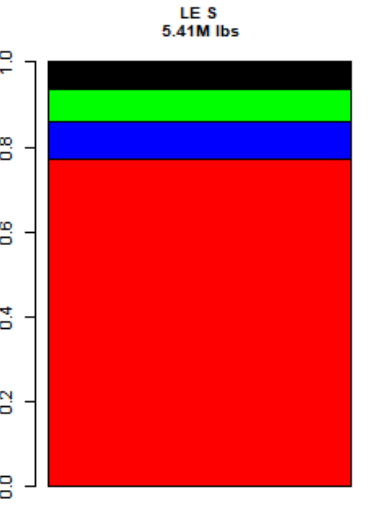
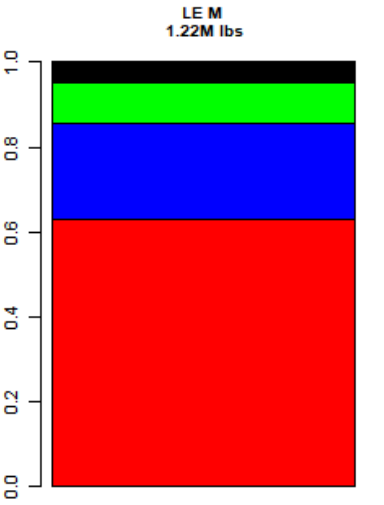
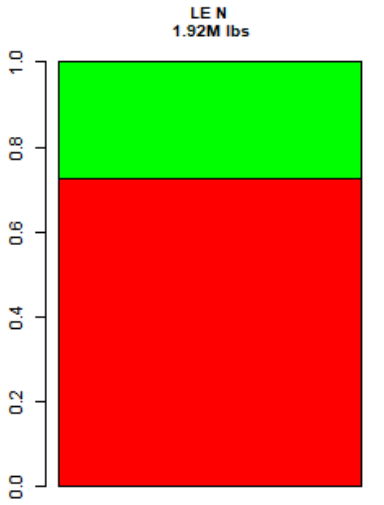
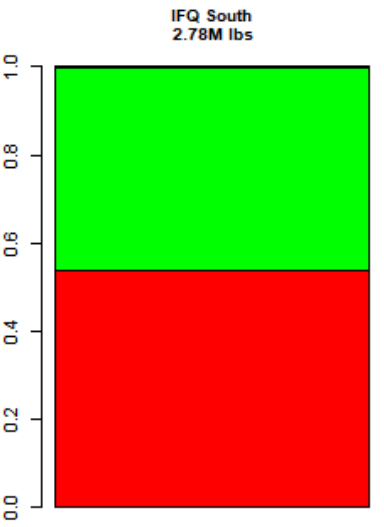
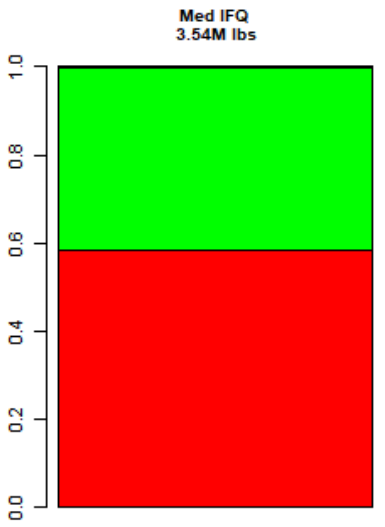
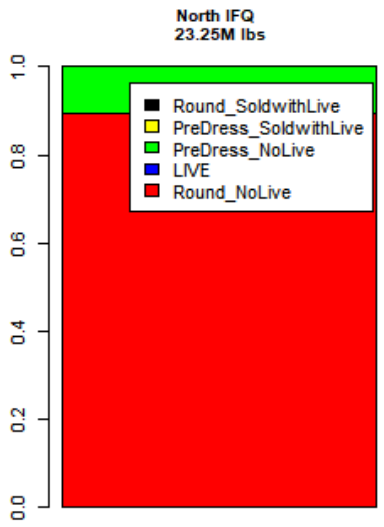


LE All
8.55M lbs



OA All
4.47M lbs





Gear	Lbs (10,000s)	Percent	Sector	Lbs(10,000s)	Percent	Grade (Percent)		
Trawl	1904.2	33.2	IFQ	1904.2	100	L/XL (5.1) M (24.0), S (14.0), XS (16.9), U (40.0)		
Line	2386.2	41.6	IFQ	224.4	9.4	L/XL (4.8), M (6.0), S (19.8), XS (0.6), U (63.2)		
			LE	830.9	34.8	L/XL (9.7), M (22.0), S (18.8), XS (6.2), U (43.1)		
			Primary	1086.2	45.5	L/XL (14.5), M (19.3), S (35.3), XS (5.9), U (24.8)		
			Open Access	244.6	10.3	L/XL (10.6), M (22.7), S (22.8), XS (6.8), U (37.1)		
			TOTAL	2386.2	100			
Pot	1447.3	25.5	IFQ	828.3	57.2	L/XL (8.1), M (16.8), S (9.5), XS (7.8), U (57.8)		
			LE	24.1	1.7	L/XL (4.9), M (45.3), S (18.9), XS (7.2), U (23.7)		
			Primary	202.8	14.0	L/XL (12.1), M (20.7), S (13.6), XS (13.6), U (39.9)		
			Open Access	392.1	27.1	L/XL (4.4), M (16.0), S (22.0), XS (29.2), U (28.2)		
			TOTAL	1447.3	100			
TOTAL	5737.8	100						

Condition & Region		Month		Year		Dealer	
Dress & Catch Region	Percent	Month	Percent	Year	Percent	Preferred Dealer	Percent
Northof40'30_Round_NoLive	49.5	1	3.93	2016	14.82	Pref	91.26
Northof40'30_LIVE	0.13	2	4.45	2011	24.44	NotPrefDeal_NotPort	4.46
Northof40'30_PreDress_NoLive	16.74	3	6.38	2012	17.1	NotPrefDeal_HomePort	4.29
36to40N_Round_NoLive	13.17	4	8.97	2013	13.66		
36to40N_Round_SoldwithLive	0.26	5	9.15	2014	13.5		
36to40N_LIVE	0.9	6	9.27	2015	16.48		
36to40N_PreDress_NoLive	4.81	7	8.01				
36to40N_PreDress_SoldwithLive	0.01	8	10.72				
Southof36_Round_NoLive	11.09	9	13.88				
Southof36_Round_SoldwithLive	0.74	10	13.37				
Southof36_LIVE	0.95	11	5.89				
Southof36_PreDress_NoLive	1.69	12	5.97				
Southof36_PreDress_SoldwithLiv	0.01						