Science, Service, Stewardship

Quota Markets in Multispecies IFQ Fisheries

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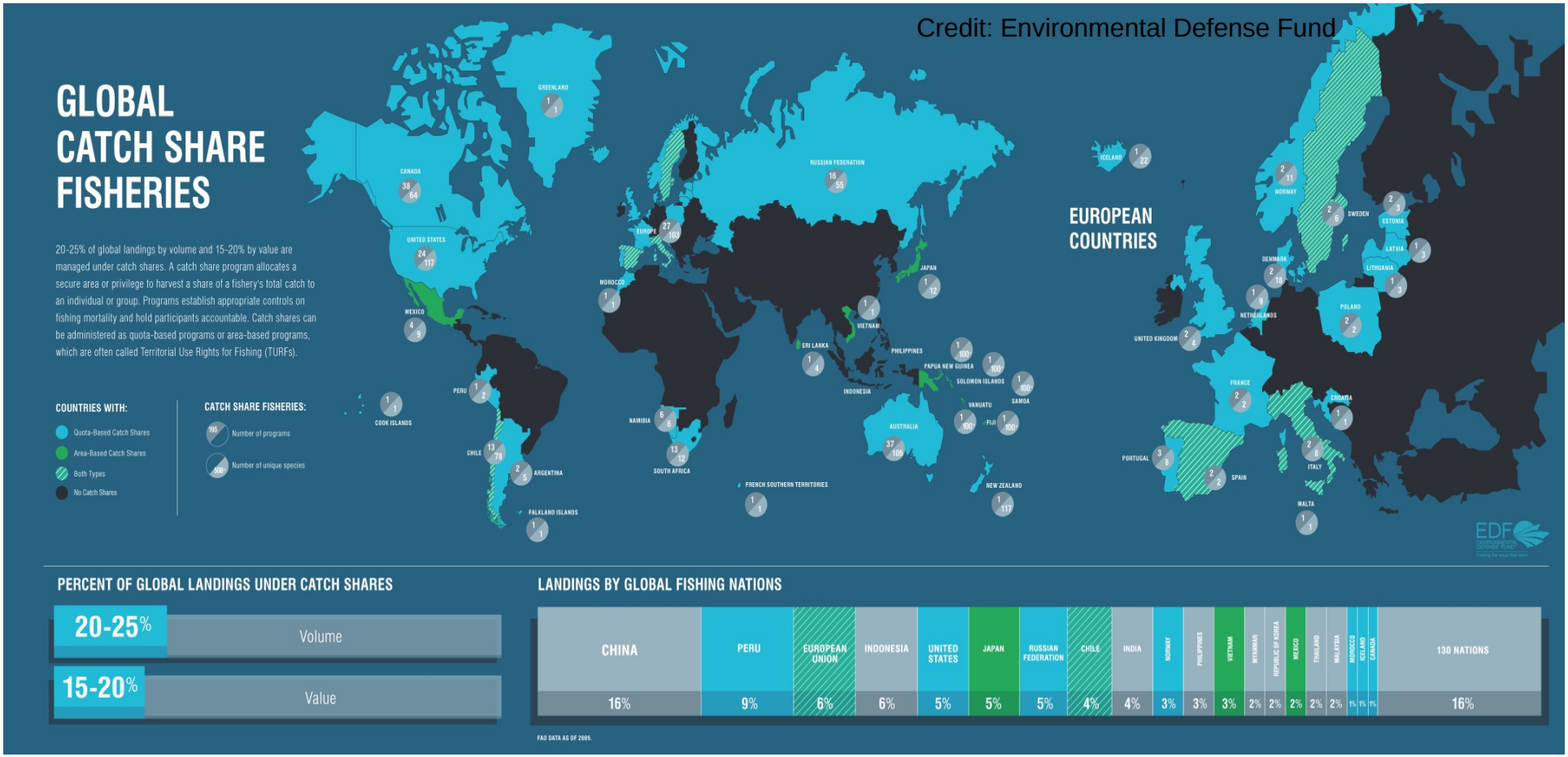
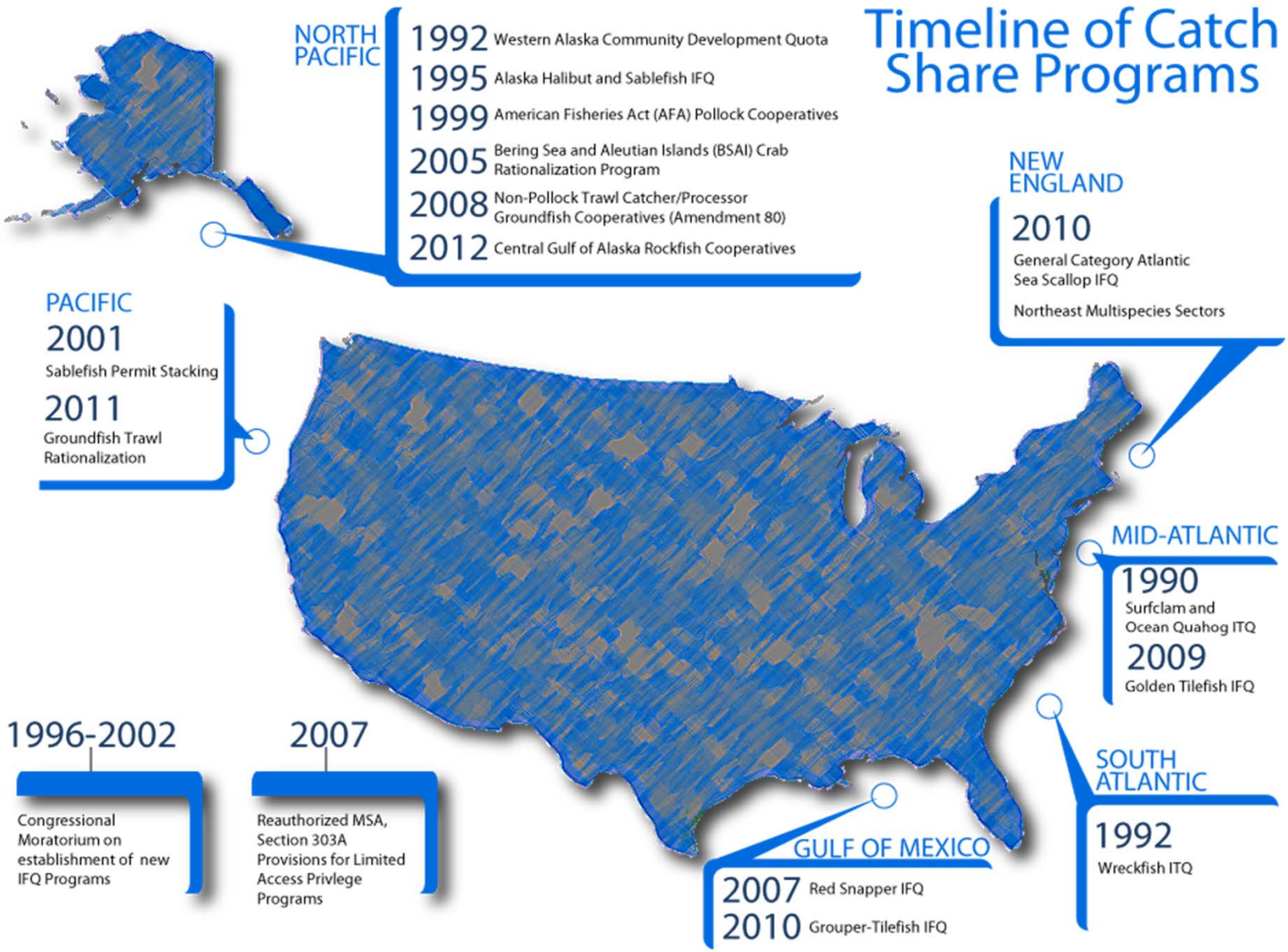
Outline

- Are quota markets in multispecies IFQ fisheries efficient and effective at allocating quota ?
- Some reasons for successes and failures
- Some ideas about how to make quota markets work better
- Some problems with these solutions
- Relevance to water markets



- In 2013 The Environmental Defense Fund reports that: over 200 catch share programs and 900 stocks in 40 countries worldwide.
- In total EDF estimates they account for 20 to 25% of global fish landings and 15-20% of total value



Source: http://www.nmfs.noaa.gov/sfa/domes_fish/catchshare/catchshare_region.htm

Quota Shares & Quota Pounds

- ***Quota Shares****: An ongoing entitlement to a percentage of the total allowable catch of a specific fish stock*
- ***Quota Pounds****: An entitlement to catch a specific quantity of a particular fish stock over a single fishing year or season (analogous to quota lease or annual catch entitlement)*

The Role of Quota Markets in IFQ Systems

- Allocative Efficiency - allow catch rights to move to higher value users
- Facilitate catch balancing in multispecies fisheries and provides incentives to avoid constraining stocks
- Provide useful information
  - Prices should be indicator of current and future profits
  - QP and QS prices are important criterion for decisions to enter, exit, expand, or contract individual fishing activity (Newell, Pap and Sanchirico 2007).
  - Price information from prior sales facilitates price negotiation reducing transaction cost

Are ITQ Markets Efficient?

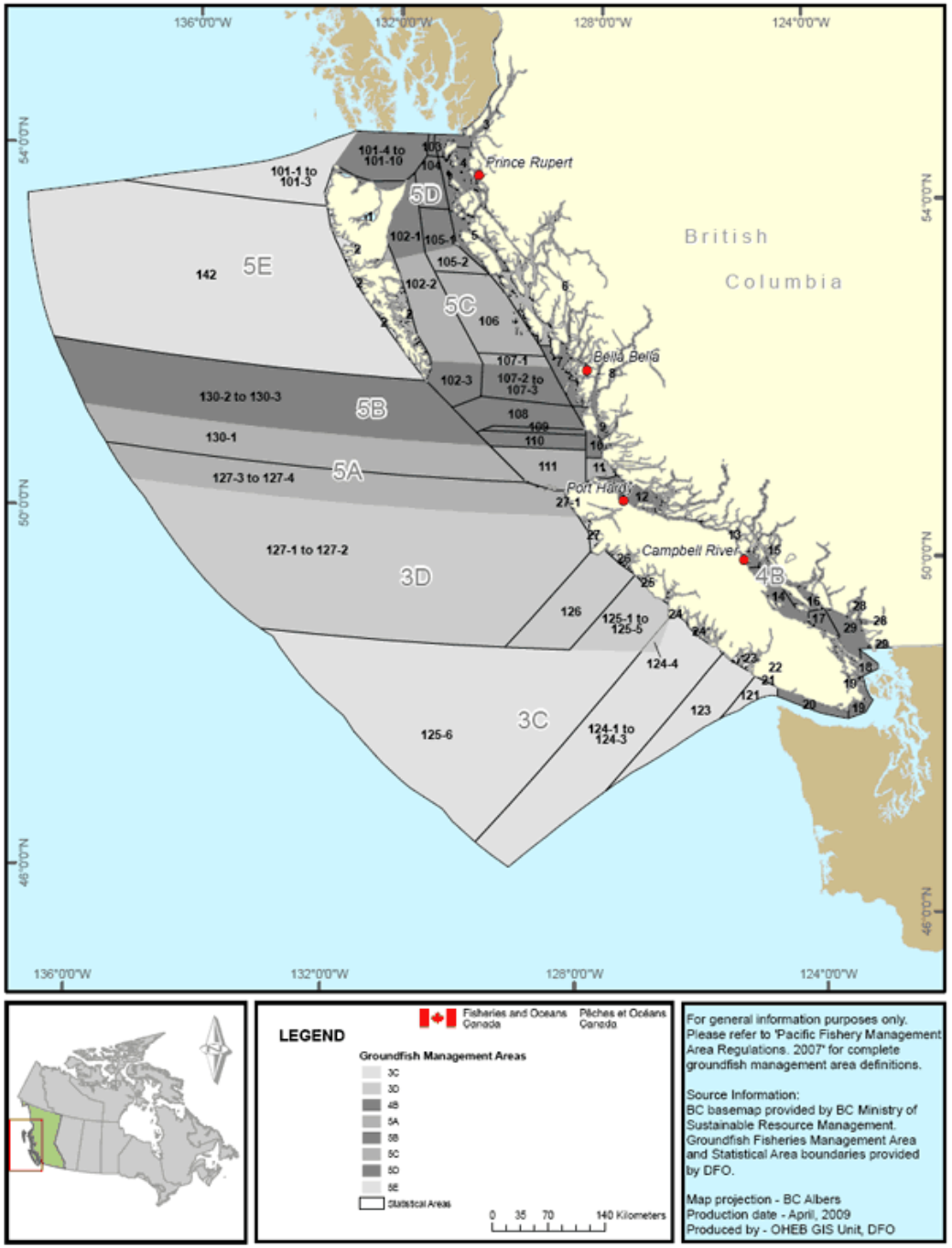
- Relatively little study of quota markets to date
  - New Zealand (Newell, Sanchirico and Kerr 2006)
  - British Columbia Groundfish IFQ (Holland 2013)
  - US Pacific Groundfish (Holland – 2016)
  - Alaska Halibut (Kroetz, Sanchirico, and Lew 2015)

New Zealand Quota Management System

- Introduced in 1986 for most species and extended to nearly all commercial fisheries by early 1990s.
- Newell, Sanchirico and Kerr 2006 "find evidence of economically rational behavior .....Overall, this suggests that these markets are operating reasonably well, implying that ITQs can be effective instruments for efficient fisheries management"
- Some key characteristics:
  - Flexible retrospective balancing regime – balance up to year end
  - Deemed values system creates dual price-quantity regime, sets ceiling on quota pound price, and limits price and supply risk
  - Highly concentrated ownership with processors owning most of the quota who distribute to fleets delivering to them
  - Most trade done bilaterally by company quota managers with clearinghouse at the end of the year to balance quota deficits

British Columbia Groundfish IFQ Market

- IFQ implemented in 1997
- Around 40 active vessels mostly fishing to 3 processors (at the time of my analysis)
- IFQ includes 33 species divided into over 75 distinct quota stocks
- Strict quotas with 100% observer coverage and constraining bycatch species



The golden rule of quota trading

"If someone demands a high price for quota of someone that is over a barrel, the word will get out and then some day when he needs quota he will be fair game for gouging. What's good for the goose is good for the gander."

Model Structure

- Determine average value ratios that solve this equation where quantities traded by one arbitrarily chosen party to each trade are given a negative sign

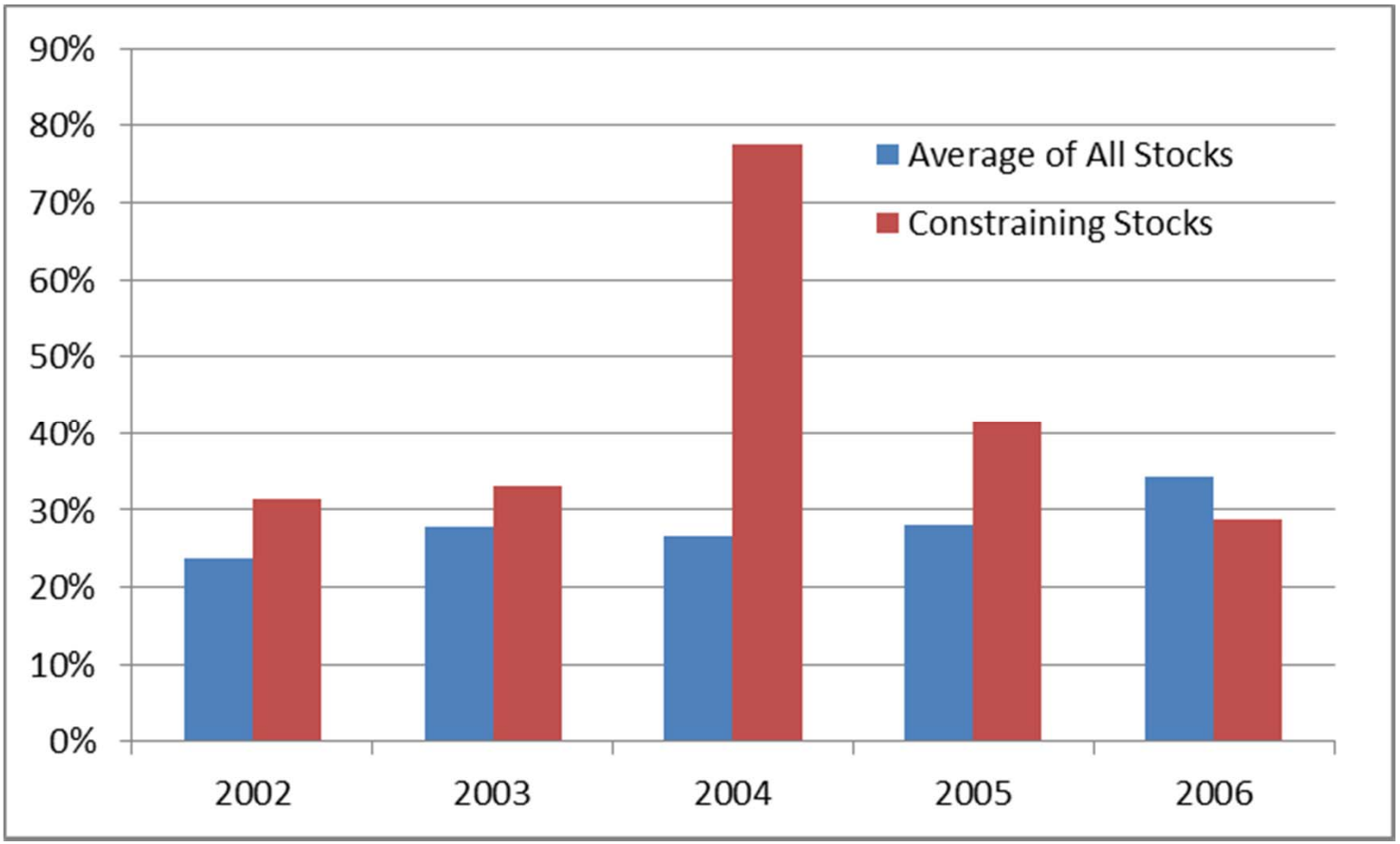
(1) $$-P_a X_a + P_b X_b - P_c X_c + \ldots + P_n X_n = 0$$

- Estimate (1) by choosing a numeraire species and moving it to the left hand side

(2) $$X_a = \frac{P_b}{P_a} X_b - \frac{P_c}{P_a} * X_c + \ldots + \frac{P_n}{P_a} * X_n + \varepsilon$$

Holland, D.S. 2013. Making Cents Out of Barter Data from the British Columbia Groundfish ITQ Market. In Press Marine Resource Economics 28(4).

Average of Implicit Quota Lease Prices as Percent of Ex-vessel Price from Hedonic Analysis of Barter Data



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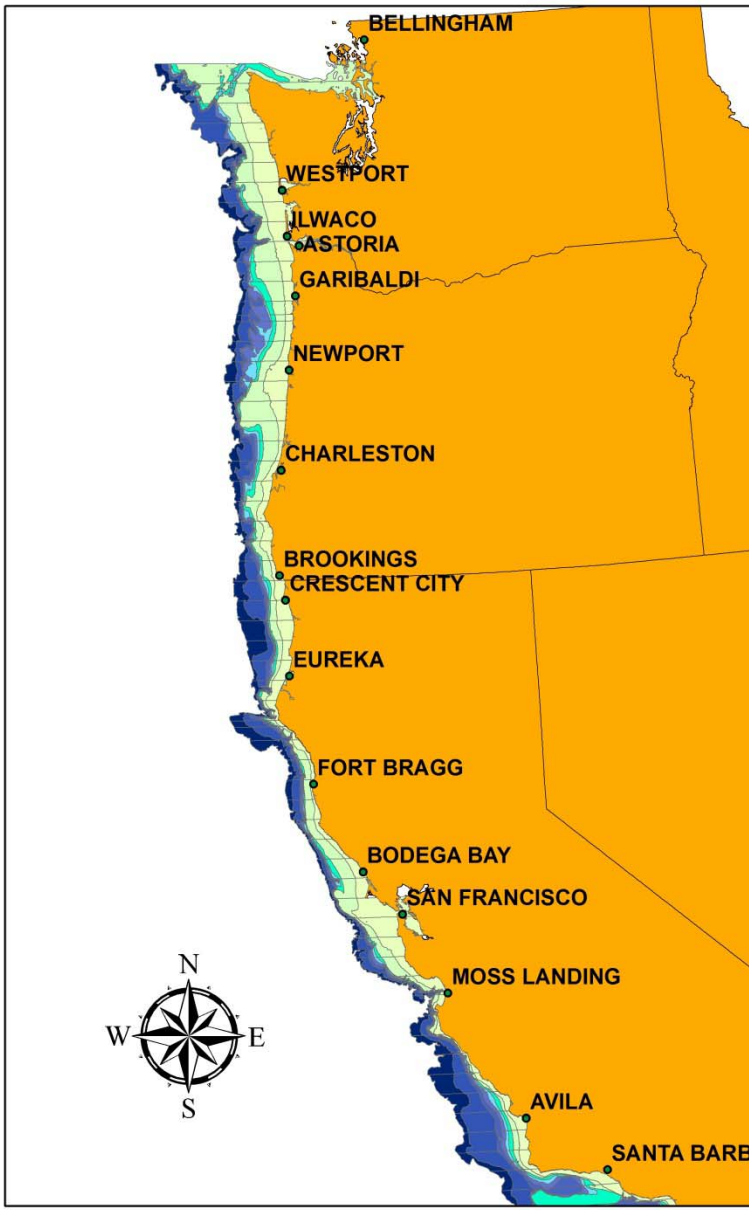
More Questions than Answers

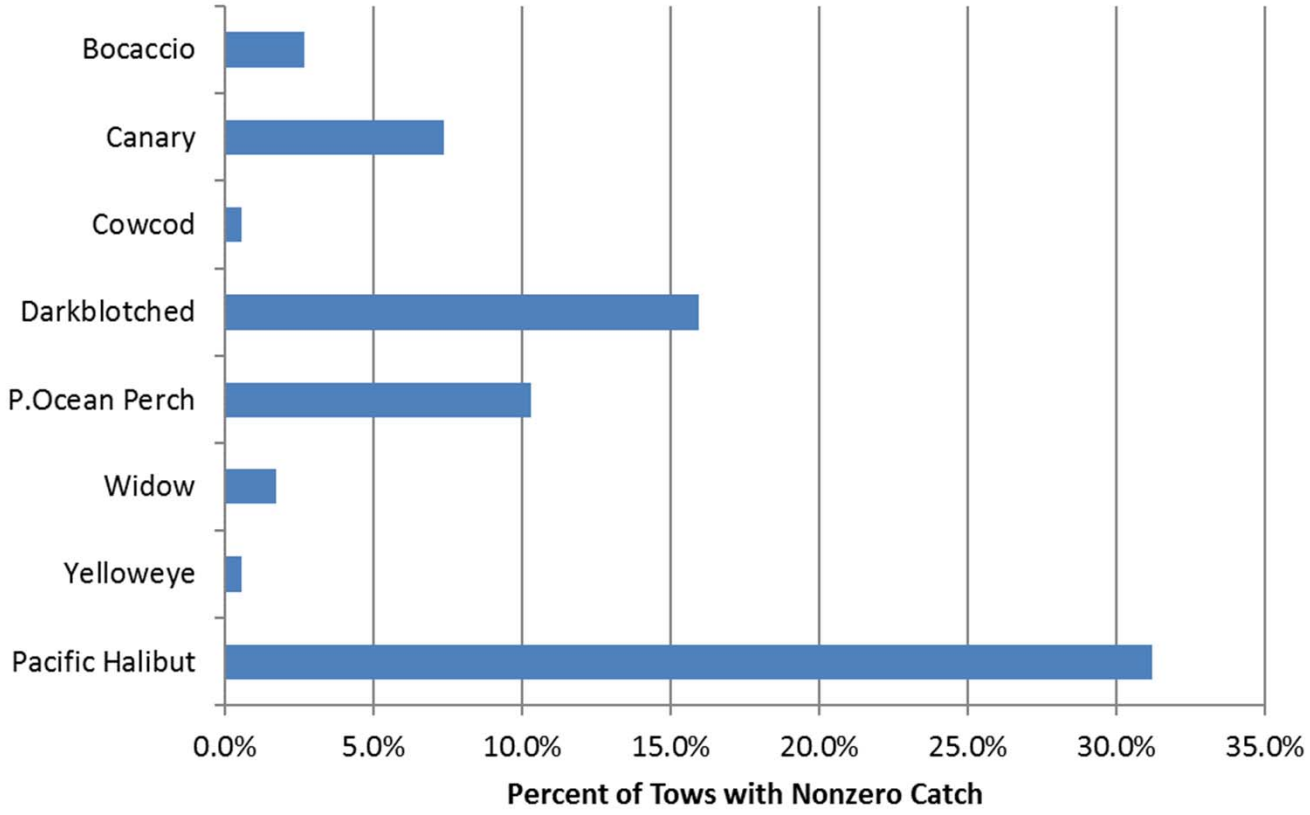
- Why is barter used instead of cash?
  - Is barter also a risk-reduction strategy, perhaps driven by loss aversion since no cash outlays are required, or is it a symptom of liquidity (cash) constraints
- Why are most trades for packages rather than single-species sales with transparent pricing?
- Are cooperative approaches to bycatch avoidance and allocation of constraining quota as, or perhaps, more effective than efficient quota pricing?

Pacific Groundfish Limited Entry Trawl Fishery

- Implemented in 2011
- WA, OR and CA
- <100 active vessels in IFQ
- 30 separate IFQ stocks
- 100% observer coverage ensures all catch counted against quota



Rockfish and Halibut Catch in Observed Tows Between 2002-2009



Market Infrastructure

- NMFS IFQ Website
  - https://www.webapps.nwfsc.noaa.gov/ifq/

- Jefferson trading
  - http://jeffersonstatetradingco.com/cgi-bin/auction/auction.pl

Transfer Activity

Transfer	2011		2012		2013		2014		2015	
Type	Single	Multi	Single	Multi	Single	Multi	Single	Multi	Single	Multi
Cash Sale	281	96	340	67	384	63	411	62	473	87
Barter	221	64	275	48	262	35	191	37	206	53
Cash and Barter	22	11	37	11	48	12	31	9	39	11
Other	395	196	606	260	663	400	596	360	419	341
Self-Trade	410	394	512	308	641	327	528	326	599	467
Total	2090		2464		2835		2551		2695	

Catches Vs. Total IFQ Quota Pound Allocations	2011	2012	2013	2014	2014 Sector Quota Pounds
Arrowtooth flounder (TAC dropped 60% in 2013)	20%	26%	63%	50%	7,643,603
Bocaccio rockfish South of 40°10' N.	**9%**	**15%**	**17%**	**11%**	**174,165**
Canary rockfish	**14%**	**28%**	**26%**	**26%**	**90,610**
Chilipepper rockfish South of 40°10' N.	21%	22%	36%	29%	2,352,883
Cowcod South of 40°10' N.	**1%**	**5%**	**22%**	**20%**	**2,205**
Darkblotched rockfish	**36%**	**36%**	**44%**	**35%**	**613,789**
Dover sole	35%	33%	36%	29%	49,018,682
English sole	1%	2%	3%	5%	11,598,189
Lingcod (combined North and South of 40°10' N.)	16%	21%	21%	11%	3,592,323
Longspine thornyheads North of 34°27' N.	49%	48%	59%	50%	3,993,453
Minor shelf rockfish North of 40°10' N.	3%	8%	6%	7%	1,119,948
Minor shelf rockfish South of 40°10' N.	3%	15%	25%	12%	178,574
Minor slope rockfish North of 40°10' N.	17%	27%	25%	23%	1,740,285
Minor slope rockfish South of 40°10' N.	14%	33%	31%	26%	834,736
Other flatfish	17%	16%	19%	20%	9,245,746
Pacific cod	22%	35%	14%	15%	2,483,309
Pacific halibut (IBQ) North of 40°10' N.	**28%**	**43%**	**31%**	**25%**	**236,660**
Pacific ocean perch North of 40°10' N.	**39%**	**45%**	**45%**	**36%**	**247,535**
Pacific whiting	**98%**	**96%**	**99%**	**83%**	**263,309,103**
Petrale sole	**93%**	**100%**	**92%**	**97%**	**5,242,593**
Sablefish North of 36° N.	**94%**	**91%**	**100%**	**95%**	**4,382,790**
Sablefish South of 36° N.	86%	44%	15%	32%	1,439,839
Shortspine thornyheads North of 34°27' N.	50%	50%	60%	50%	3,025,822
Shortspine thornyheads South of 34°27' N.	17%	1%	7%	5%	110,231
Splitnose rockfish South of 40°10' N.	3%	4%	3%	4%	3,472,501
Starry flounder	2%	1%	0%	2%	1,665,592
Widow rockfish	**40%**	**45%**	**41%**	**66%**	**2,191,020**
Yelloweye rockfish	**10%**	**6%**	**6%**	**6%**	**2,205**
Yellowtail rockfish North of 40°10' N.	24%	32%	27%	40%	6,479,055

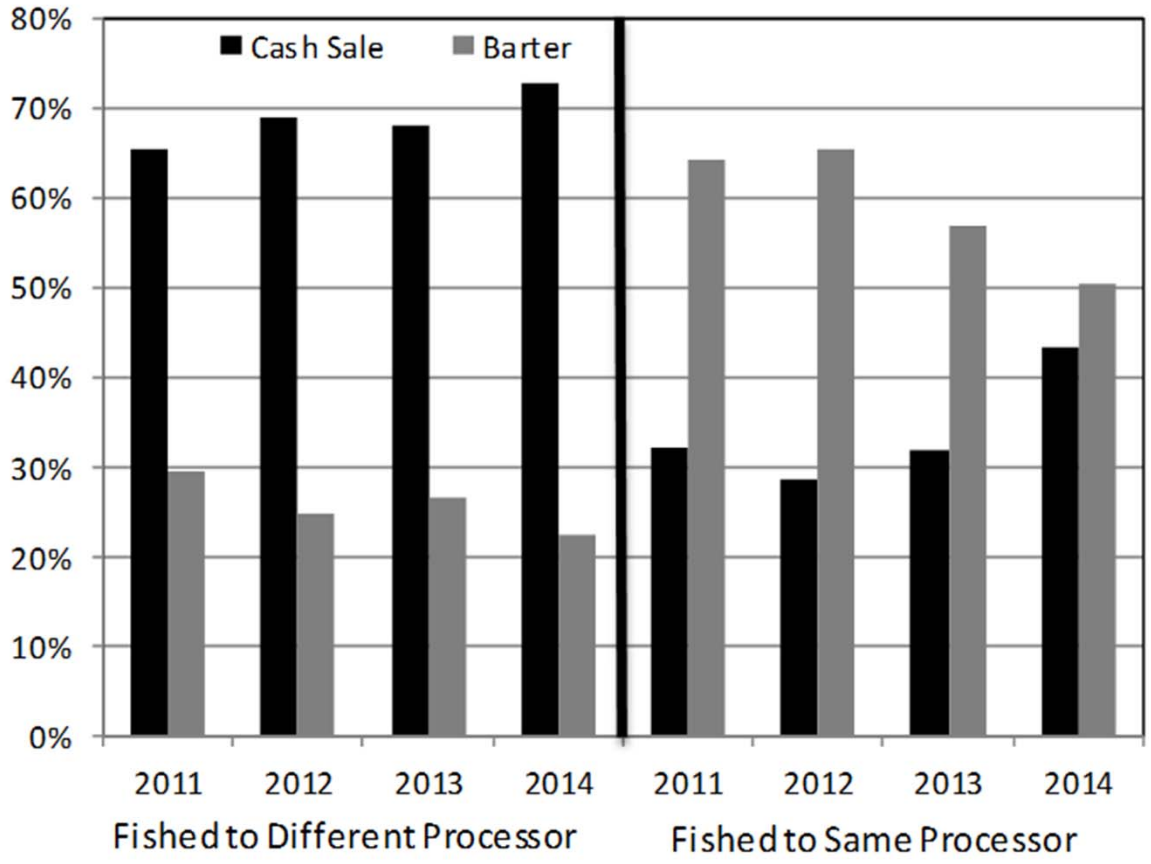
Prices, Price Dispersion and Counts for Cash Sales of Quota Pounds

	2011			2012			2013			2014			Average Pounds
OPTIMAL_YIELD_CATEGORY	Price	C.V.	Count	Price	C.V.	Count	Price	C.V.	Count	Price	C.V.	Count	Tranferred
Bocaccio rockfish South of 40°10' N.		42%	3		0%	1	$ 0.20	17%	4		15%	7	1,449
Canary rockfish		18%	4	$ 1.49	57%	15	$ 3.09	26%	12	$2.12	35%	17	300
Cowcod South of 40°10' N.		10%	2		101%	2		54%	4		35%	2	13
Darkblotched rockfish	$ 0.40	119%	4	$ 0.22	49%	6	$ 0.53	51%	10	$1.08	22%	10	1,947
Pacific halibut (IBQ) North of 40°10' N.	$ 1.31	45%	5	$ 1.19	19%	10	$ 1.76	51%	21	$0.58	64%	15	1,007
Pacific ocean perch North of 40°10' N.		69%	3		56%	3	$ 0.75	45%	14	$0.98	44%	15	1,073
Widow rockfish	$ 0.44	62%	6	$ 0.34	57%	9	$ 0.53	45%	10	$0.23	45%	34	6,933
Yelloweye rockfish		105%	4	$ 21.76	33%	9	$ 29.58	53%	11	$27.07	10%	12	10
Pacific whiting	$ 0.02	70%	29	$ 0.04	31%	65	$ 0.04	43%	54	$0.03	47%	29	179,150
Petrale sole	$ 0.34	29%	38	$ 0.40	12%	20	$ 0.25	32%	50	$0.28	16%	58	10,448
Sablefish North of 36° N.	$ 1.06	41%	58	$ 1.04	36%	47	$ 0.88	17%	66	$1.00	26%	62	10,303
Sablefish South of 36° N.	$ 0.76	54%	62	$ 1.05	9%	31	$ 0.26	31%	8	$0.16	37%	22	6,922

Ratios of QP Prices to Ex-vessel Prices

Quota Stock	2011	2012	2013	2014
Bocaccio rockfish S. of 40°10' N.			0.27	
Canary rockfish		**3.57**	**6.87**	**4.21**
Cowcod S. of 40°10' N.				
Darkblotched rockfish	0.75	0.90	**1.55**	**2.62**
Pacific ocean perch N. of 40°10' N.			**1.88**	**2.66**
Widow rockfish	**1.06**	**1.02**	**1.56**	0.60
Yelloweye rockfish		**40.08**	**57.73**	**35.02**
Pacific whiting	0.18	0.28	0.33	0.37
Petrale sole	0.24	0.27	0.22	0.26
Sablefish N. of 36° N.	0.39	0.48	0.49	0.48

Percent of Annual Cash and/or Barter Transfers that were Cash Sales vs. Barter Depending on Whether the Parties Involved Landed Fish to the Same Processor or Not



Risk Pools

- At least three risk pools operated in 2011 and four in 2012
- There appear to be some other informal risk pools operated by processors
- Risk pools provide members quota to cover bycatch
- Defined best practices for minimizing bycatch risk (e.g. require short test tows, delineate areas to avoid fishing) to address moral hazard
- Created system to share real-time information to avoid bycatch
- Generally avoid monetizing bycatch quota – no price for quota withdrawals and no deductibles

Conclusions on Pacific Groundfish Quota Market

- The quota pounds market is thin but is still developing
- Most transactions are barter, package sales or other trading mechanisms making price discovery difficult
- Barter is more common than cash trades when individuals fish to the same processor
- Brokers, risk pools, and processors play critical roles as middlemen
- Efficient market? Not yet is seems.

Challenges to Efficient Markets

- Joint production - interrelated values
- Dispersed bycatch quota but concentrated catch and highly uncertain needs and individual level
- Heterogeneous value and asymmetric information
- Lack of information for price discovery
- Constraints on quota accumulation limits role of processors to serve as clearinghouse

Mitigating Market Failures

- Catch Balancing Mechanisms
  - Deemed Value (New Zealand)
  - Species Quota Conversions (Iceland)
  - Forfeiture (Iceland)
  - 30% carry forward/carry back (BC Groundfish)
- Multi-year quotas
- Risk pools and cooperatives
- Consolidation of quota by multi-vessel firms and processors

Problems with Solutions

- Deemed value, quota transformation, multiyear quotas, etc., illegal in US if they have potential to allow TACs to be exceeded.
- Would deemed values undermine cooperative approaches to bycatch reduction? (e.g. Israeli daycare example)
- Would consolidation of quota to large firms and processors have negative social impacts and possibly present market power issues.

Some Observation that may be relevant to Rationalization of Water Use

- Multispecies quota markets have many of the same characteristics: thin markets, heterogeneous values, joint values, incomplete and asymmetric information issues
- Conventional spot markets don't function well or are avoided by many potential market participants
- Dynamic considerations that appear to be important in trades (relationships, reciprocity, competition, grudges) are not consistent with anonymous spot market
- **Risk and uncertainty** about quota needs are the main problem but can be mitigated with alternative supply at a fixed price (even a high price) that limits risk.

Some Observation that may be relevant to Rationalization of Water Use

- Individuals catalyze solutions and profit motive may not be the driver
- There are likely to be conflicts between efficiency and social objectives. Social constraints may project real benefits/value.
- Access to capital may impeded socially desirable and maybe efficient allocation

Related Publications

- Holland, D.S. 2016. Development of the Pacific Groundfish Trawl IFQ Market. Marine Resource Economics. Forthcoming in Marine Resource Economics 31(3)
- Holland, D.S. 2013. Making Cents Out of Barter Data from the British Columbia Groundfish ITQ Market. In Press Marine Resource Economics 28(4).
- Holland, D.S. and J.E. Jannot 2012. Bycatch Risk Pools for the US West Coast Groundfish Fishery. Ecological Economics 78:132-47.
- Holland, D.S.2010. Markets, Pooling and Insurance for Managing Bycatch in Fisheries. Ecological Economics. 70(1):121-133.
- Sanchirico, J., D.S. Holland, K. Quigley and M. Fina 2006. Catch-Quota Balancing in Multispecies Individual Fishing Quotas. Marine Policy 30(6):767-785.