

# Considerations for Restructuring Groundfish Stock Complexes

Pacific Fishery Management Council  
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# National Standards and FMP Guidelines for Stock Complexes

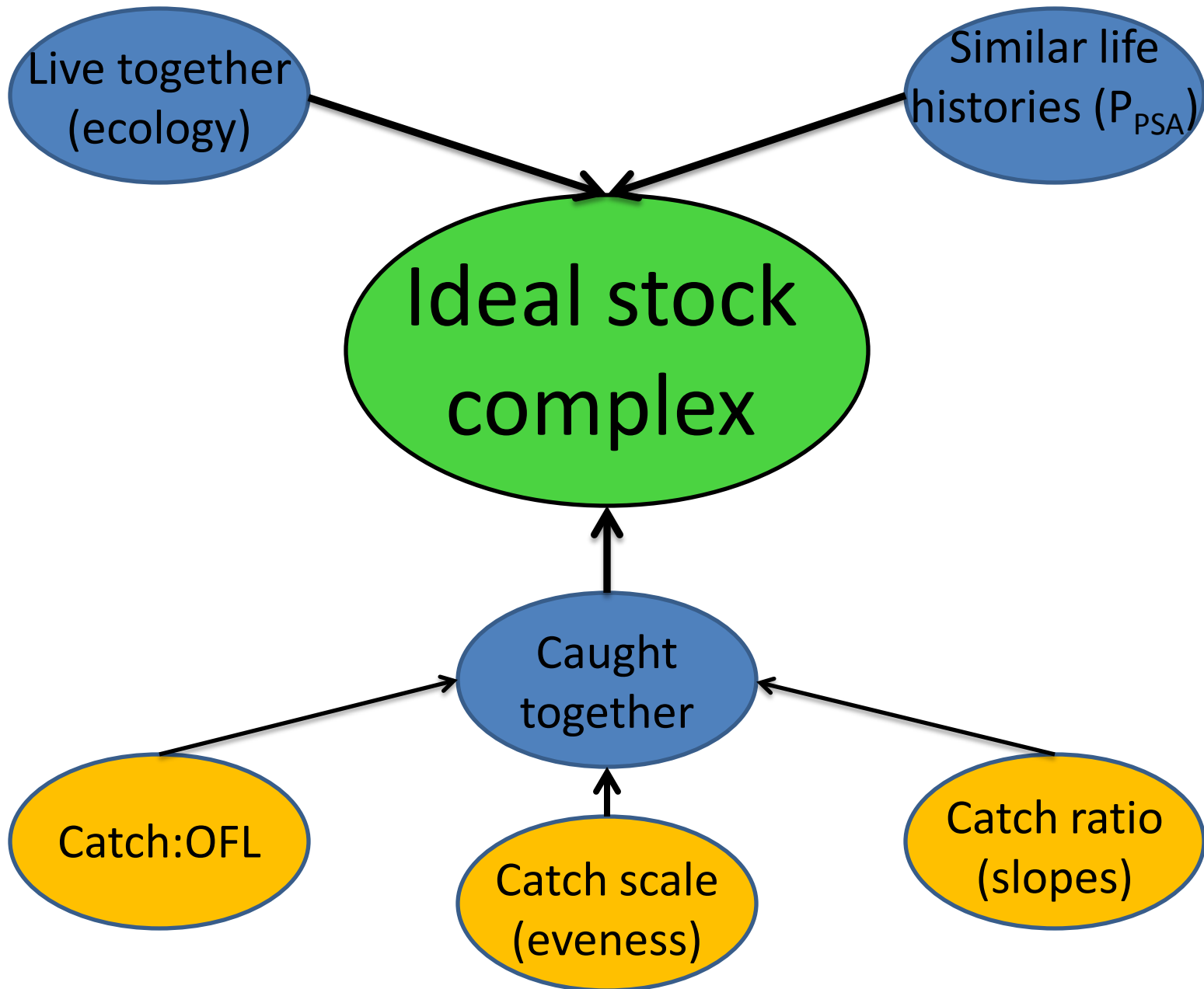
- Management impacts on stocks in a complex should be similar
- Stocks in a complex must be similar in geographic distribution, life history, and vulnerabilities to the fishery

# Problems with current stock complexes

- Disparate vulnerabilities
  - E.g., Slope Rockfish complexes
- Disparate distributions
  - E.g., Shelf Rockfish complexes
- Removals exceeding component OFLs
  - E.g., roughey in Slope Rockfish North
- Inflator stocks
  - E.g., greenstriped rockfish in Shelf Rockfish North complex
- No catch contribution
  - E.g., cabezon (WA) in Other Fish complex
- Disparate life histories
  - E.g., Other Fish (most poorly constructed complex)

# Strawman Alternatives

- Alternatives for 6 species groups
  - Nearshore RF, Shelf RF, Slope RF, Flatfish, Elasmobranchs, and Roundfish
  - Can be decided independently
- Addition of some non-FMP species
- Designation of EC stocks
- Removal of leopard shark from FMP



# Matching life histories

- PSA ( $P \ \& \ S = V$ )
- $V$  not stable ( $S$ )
- $P$  used
- 2 groups: high and low  $P$
- Cutoff = 1.4 for rockfish

## Nearshore rockfishes

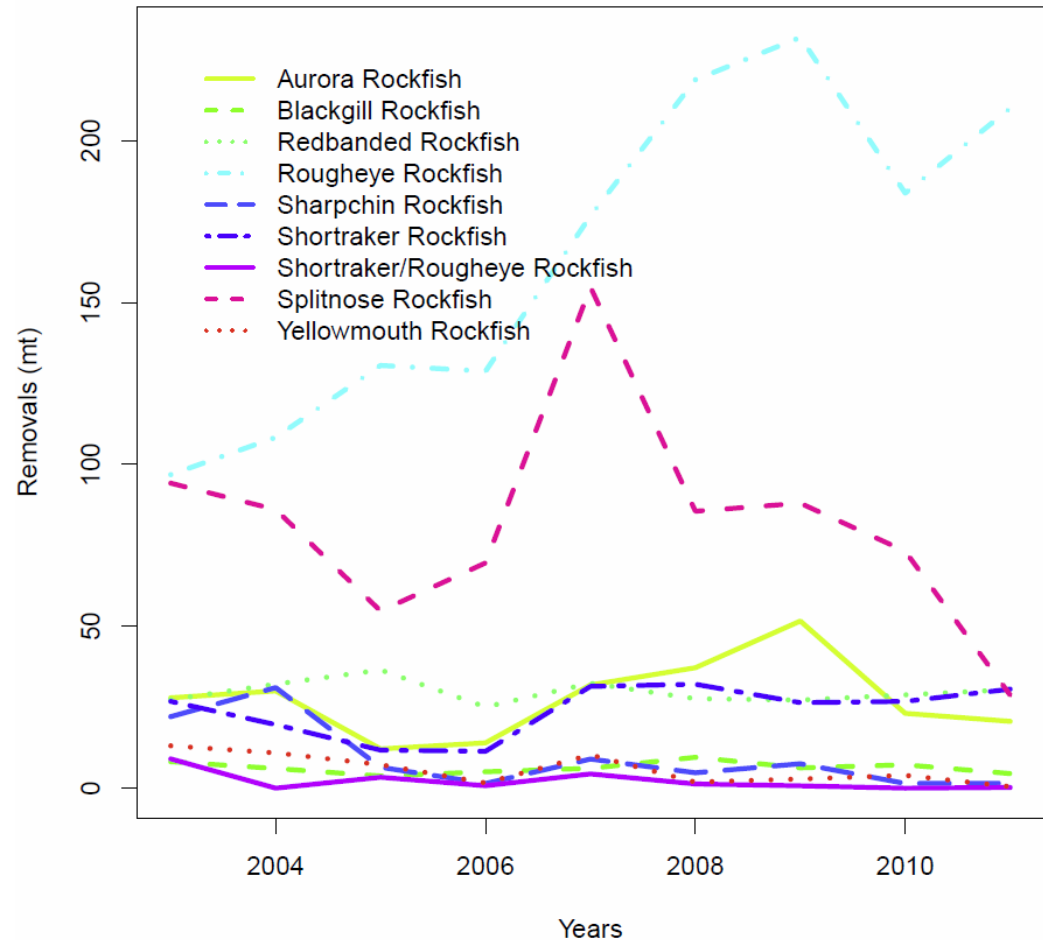
	P	V
Kelp rockfish	1.94	1.59
Black-and-yellow rockfish	1.89	1.7
Olive rockfish	1.69	1.87
Treefish rockfish	1.67	1.73
Brown rockfish	1.61	1.99
Grass rockfish	1.61	1.89
Gopher rockfish	1.56	1.76
Blue rockfish	1.39	2.01
Copper rockfish	1.36	2.27
Honeycomb rockfish	1.36	1.97
<b>Black rockfish</b>	1.33	1.94
<b>China rockfish</b>	1.33	2.23
<b>Quillback rockfish</b>	1.31	2.22

High	Mod	High
Low	Low	X-hi

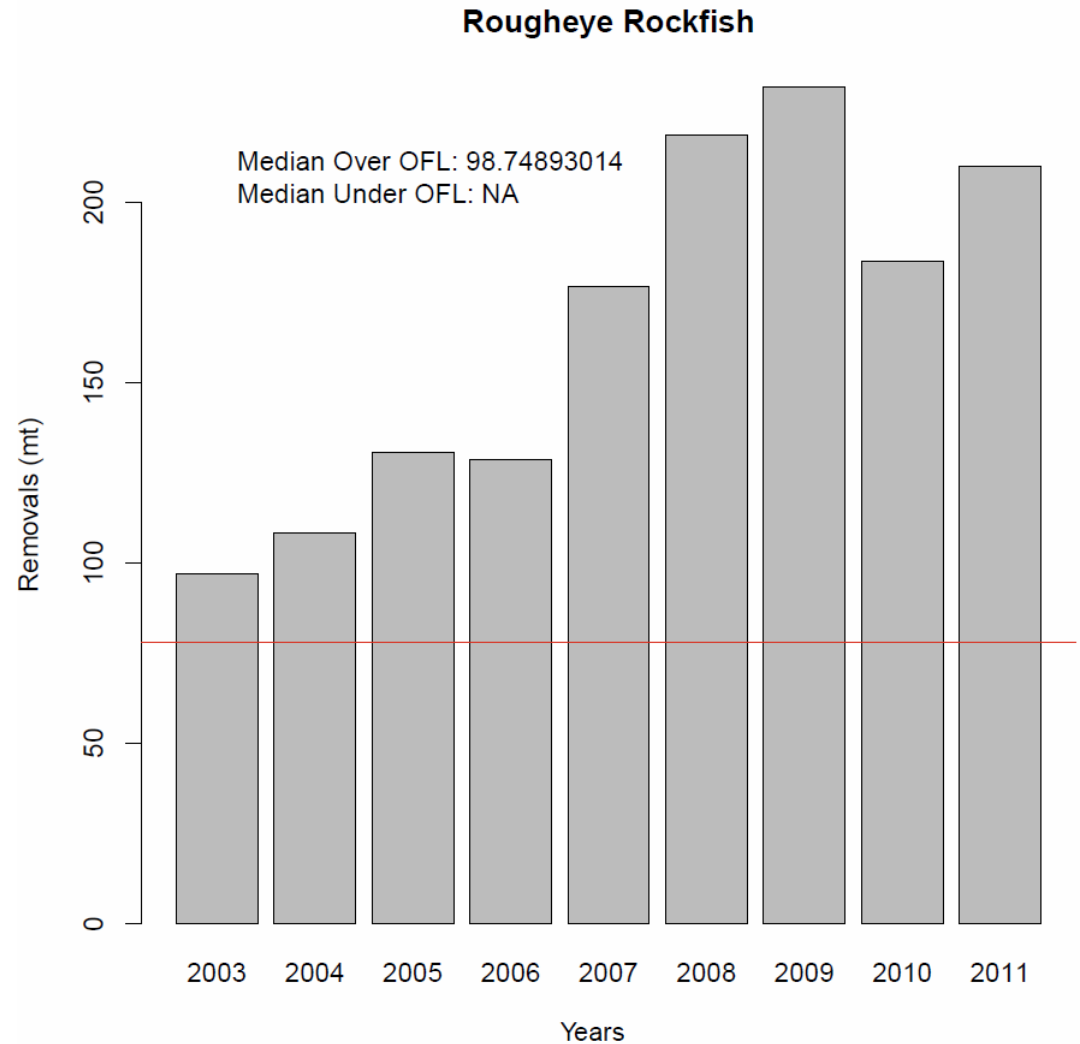
# Comparing removals

- Diff. cum catch from OFL
  - If  $\max > 0$ , OFL exceeded
  - If min large -#, inflator stock



# Removals relative to OFL

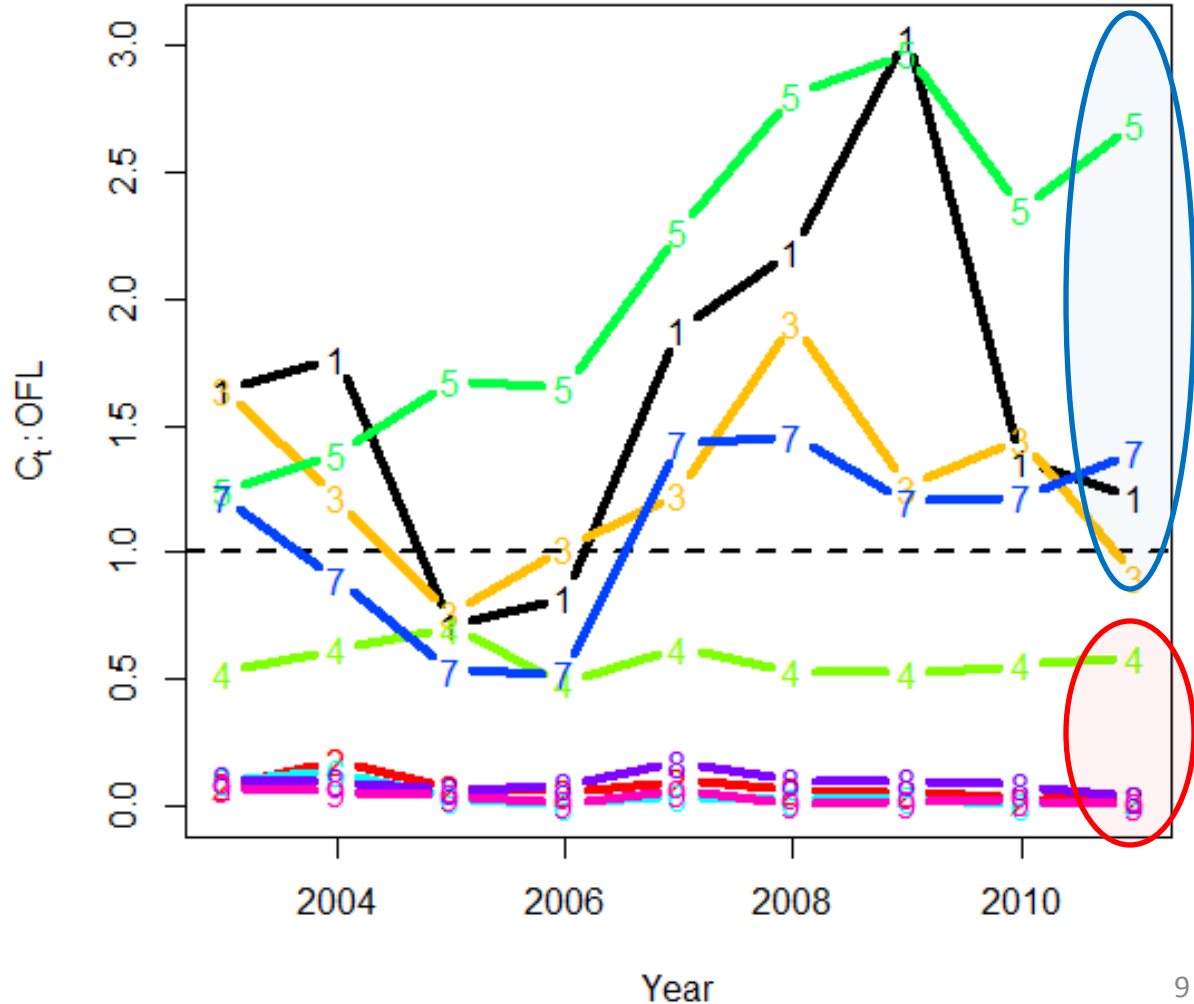
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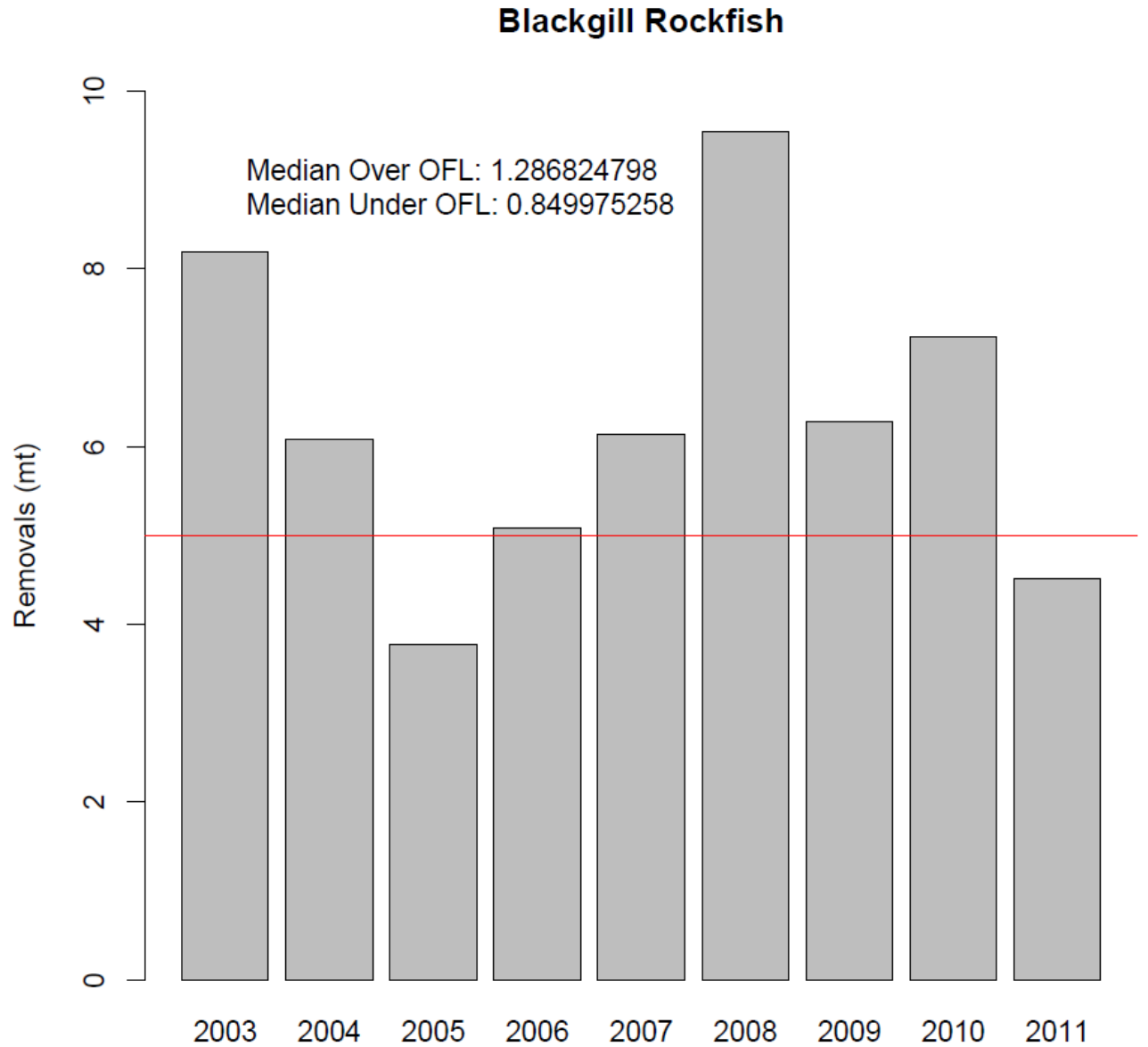


# Clustering Catch:OFL ratios: Ex: Slope Minor Rockfish North

1. Aurora
2. Bank
3. Blackgill
4. Redbanded
5. Rougheyeye
6. Sharpchin
7. Shortraker
8. Splitnose
9. Yellowmouth



# Why scale matters



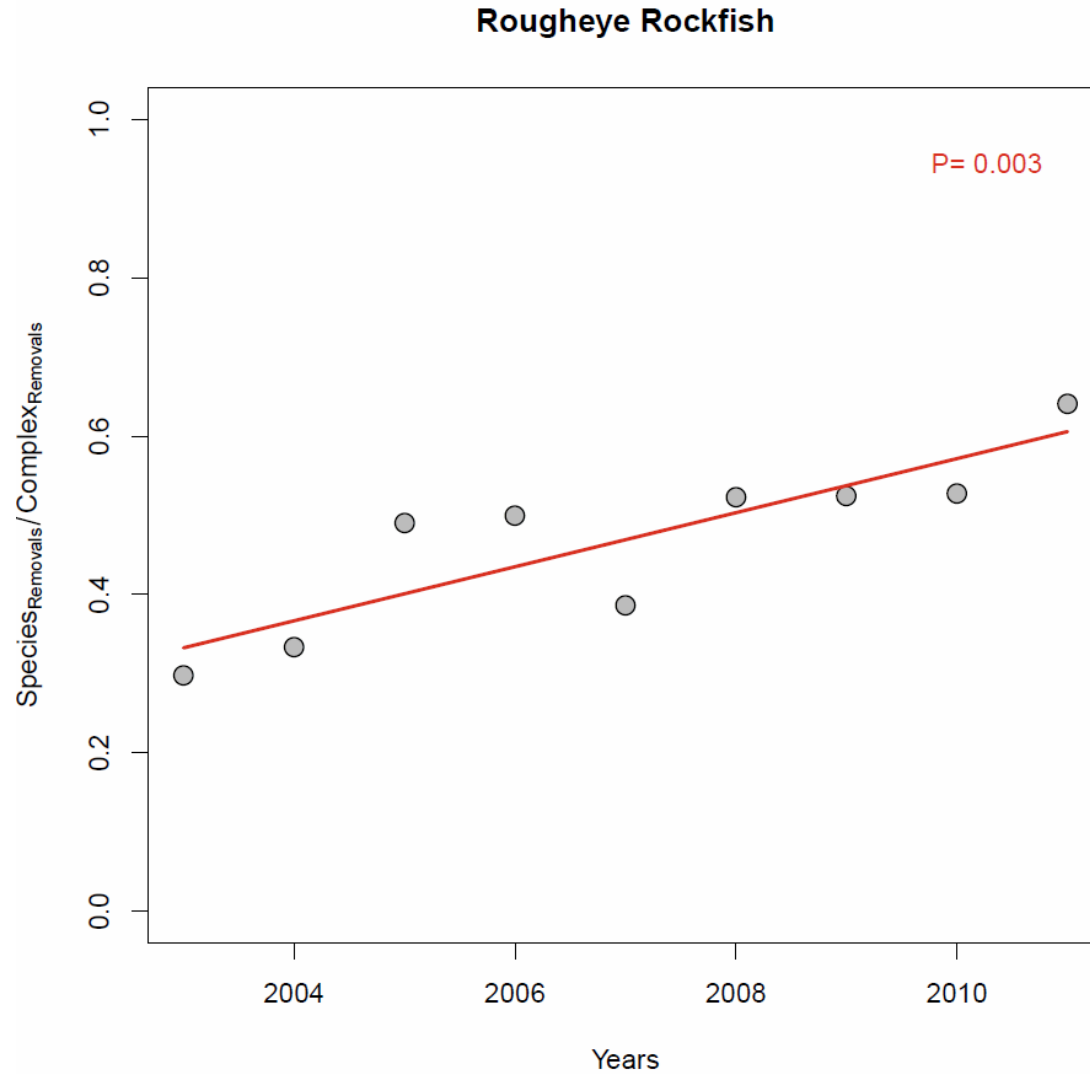
# Matching catch scales

- Similar contributions to stock complex OFLs and removals
- “Evenness” (0-1: least to most even)

Stock complex OFL = 100				
Species	Uneven		Even	
	OFL	Removal	OFL	Removal
A	90	5	25	24
B	2	70	25	22
C	3	10	25	20
D	5	5	25	24

Evenness	0.309	0.549	1.000	0.998
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# Constant catch ratios



# Steps in analyzing SQ & alternatives

- Analyze Status Quo:
  - Productivity grouping (+: common Ps; -: mixed Ps)
  - Calculate min.-max. cumulative catches
- Analyze alternatives relative to Status Quo:
  - Productivity grouping
  - Evenness (catch and OFLs)
  - % Removal ratios

			Measures to evaluate Status Quo		Measures to evaluate alternatives relative to Status Quo		
Complex	Alternative	P	Cumulative removal difference (mt)		Evenness		Ratios
			Maximum	Minimum	Removals <sub>median</sub>	OFL	%Slope = 0
Slope North	SQ	-	784	-7338	0.63	0.57	0.40
	SQ - EC spp.	-	784	-7338	0.65	0.57	0.44
	Alt. 1	-			<b>0.74</b>	0.64	0.40
	Alt 1 V	+			0.37	0.50	0.50
	Alt. 2	+			0.60	<b>0.70</b>	0.50
	Alt 2 V	+			0.51	0.62	<b>0.60</b>

# Steps in analyzing alternatives

- Develop alternative (based on ecology, P, etc.)
- Calculate min.-max. cumulative catches
- Evenness (catch and OFLs)
- Removal ratios

# Analytical Methods

- Core ecological distribution from PACOOS and published species ranges
- Productivity from PSA
- Catch analysis using PacFIN, RecFIN, NorPAC, and WCGOP databases
  - Scale of catches (Pielou's evenness measure)
  - Slope of catch ratios

# Considerations for Nearshore Rockfish

- Should vulnerable stocks (China, copper, and quillback) be managed in their own complexes?
  - China and copper data-moderate assessments this year – could be indicator stocks or managed as single species
- Should species (black and yellow, gopher, and kelp in north) be removed from complex?
- Should honeycomb and calico be designated EC stocks in the south?



# Considerations for Shelf Rockfish

- Should complexes be stratified into Shallow and Deep Shelf complexes?
- Should species (e.g., freckled) be removed from complexes due to low or no presence?
- Should species (e.g., harlequin) be designated as EC species?

# Considerations for Slope Rockfish

- Should vulnerable stocks (aurora, blackgill, roughey, and shortraker) be managed in their own complexes?
  - Aurora and roughey assessments this year; blackgill assessment in 2011 – could be indicator stocks or managed as single species
- Should species (e.g., POP in the south) be removed from complex?

# Considerations for Flatfish

- Should non-FMP species (deepsea sole and slender sole) be added to complex?
  - In the fishery (caught in same amounts as some FMP species)
  - More accurate OFL estimates for some species
  - Alt. 1 & 2
- Should complex be stratified into Shallow and Deep Flatfish complexes?
  - Alt. 2

# Considerations for Elasmobranchs

- Should skates be managed separately from other elasmobranchs?
  - Different productivities and vulnerabilities
  - Different distributions
  - Alt. 1 & 2
- Should complex be stratified by depth distributions of species?
  - Alt. 2 for skates; alt. 4 for all elasmobranchs

# Considerations for Roundfish

- Should grenadiers be managed separately from other roundfish?
  - Different productivities and vulnerabilities
  - Different distributions
  - Alt. 1
- Should complex be stratified by depth distributions of species?
  - Alt. 2