

# A descriptive example of applying vulnerability evaluation criteria to California nearshore species

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# Background

## 2006 Reauthorized MSFCMA

- Identify overfishing and overfished state
- Requires ACLs and accountability measures
- Need to assess all species in FMP
  - US West Coast Groundfish FMP
    - 80+ species; <30 assessed
  - California Nearshore FMP
    - 19 species; 5 assessed
- Conduct “vulnerability” analyses (NS1)

# Vulnerability Analysis

## Applicability

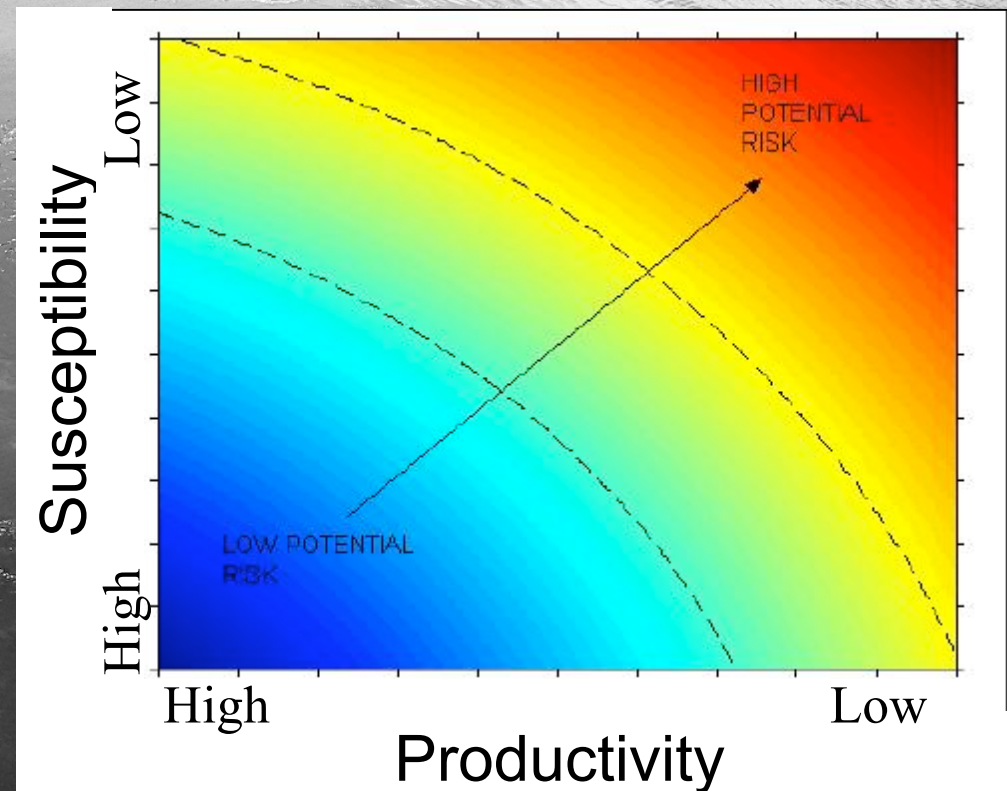
- “Fishery” & “Ecosystem” stocks
- Define stock complexes
- Create buffer between target and limit RPs

## “Vulnerability”

- Definition unclear
- Evaluated by working group (VEWG)

# Vulnerability = Productivity & Susceptibility

- Identifies vulnerability in 2-dimensions
- **Productivity** attributes reflect stock growth and recovery
- **Susceptibility** attributes reflect impacts of fishing on abundance and habitat
- Weighted average defines score
- Data quality also ranked



# Productivity (N=10)

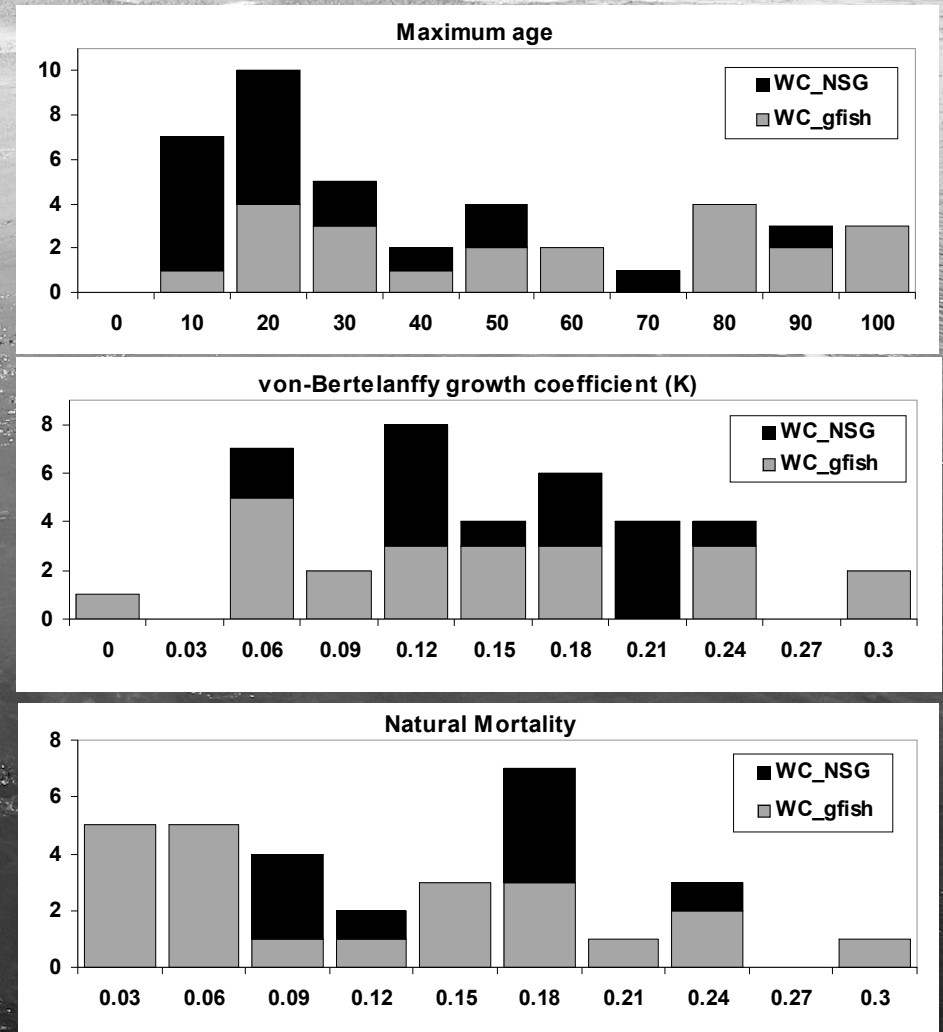
Attributes	High (3)	Moderate (2)	Low (1)
r (intrinsic increase)	>0.5	0.5-0.16 (mid-pint 0.10)	<0.16
Maximum age	< 20 years	20-40 years	> 40 years
Maximum size	< 40 cm	40-80 cm	> 80 cm
VonBert (k)	> 0.20	0.10 - 0.20	< 0.10
Natural mortality	> 0.20	0.10 - 0.20	< 0.10
Measured fecundity	> 10e4	10e2-10e3	< 10e2
Breeding strategy	0	between 1 and 3	≥4
Recruitment	highly frequent	moderately frequent	infrequent
Age at maturity	< 2 years	2-4 years (mid-point 3.0)	> 4 years
Mean trophic level	<2.5	2.5-3.5	>3.5

# Susceptibility (N=12)

Attributes	Low (1)	Moderate (2)	High (3)
Management strategy	Targeted stocks have catch limits and proactive accountability measures	Targeted stocks have catch limits and reactive accountability measures	Targeted stocks do not have catch limits or accountability measures
Areal overlap	< 25% of stock occurs in the area fished	Between 25% and 50% of the stock occurs in the area fished	> 50% of stock occurs in the area fished
Geographic concentration	stock is distributed in > 50% range	stock in 25% to 50% range	stock is < 25% of its total range
Vertical overlap	< 25% of stock occurs in the depths fished	Between 25% and 50% of the stock occurs in the depths fished	> 50% of stock occurs in the depths fished
Spawning stock biomass	B is > 40% of B <sub>0</sub>	B is between 25% and 40% of B <sub>0</sub>	B is < 25% of B <sub>0</sub>
Morphology Affecting Capture	low selectivity to the fishing gear.	moderate selectivity to the fishing gear.	high selectivity to the fishing gear.
Survival After Capture and Release	Probability of survival > 67%	33% < probability of survival < 67%	Probability of survival < 33%
Desirability/Value of the Fishery	stock is not highly valued	stock is moderately valued	stock is highly valued

# Defining Attribute Range

- Attribute ranges and bins
  - Consistent with life history theory
  - Common across all species
  - Assemblage specific
- Greater resolution increases contrast



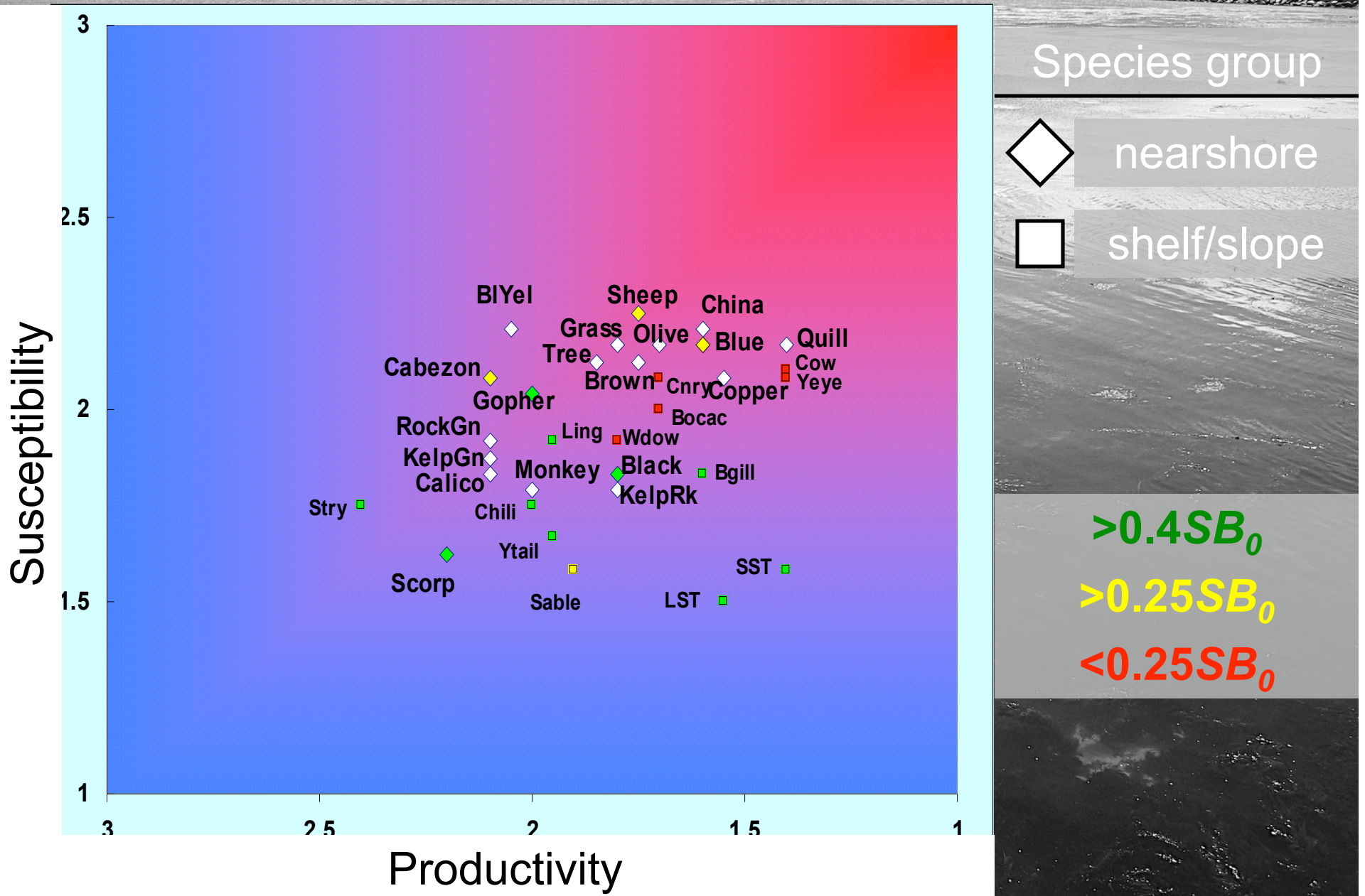
# California Nearshore Groundfish FMP

Black rockfish	<i>Sebastes melanops</i>
Black-and-yellow rockfish	<i>S. chrysomelas</i>
Blue rockfish	<i>S. mystinus</i>
Brown rockfish	<i>S. auriculatus</i>
Cabezon	<i>Scorpaenichthys marmoratus</i>
Calico rockfish	<i>Sebastes dallii</i>
California scorpionfish	<i>Scorpaena guttata</i>
California sheephead	<i>Semicossyphus pulcher</i>
China rockfish	<i>Sebastes nebulosus</i>
Copper rockfish	<i>S. caurinus</i>
Gopher rockfish	<i>S. carnatus</i>
Grass rockfish	<i>S. rastrelliger</i>
Kelp greenling	<i>Hexagrammos decagrammus</i>
Kelp rockfish	<i>S. atrovirens</i>
Monkeyface prickleback	<i>Cebidichthys violaceus</i>
Olive rockfish	<i>S. serranoides</i>
Quillback rockfish	<i>S. maliger</i>
Rock greenling	<i>H. lagocephalus</i>
Treefish	<i>S. serriceps</i>





# CA Groundfish Vulnerability



# Vulnerability Analysis

## What it is

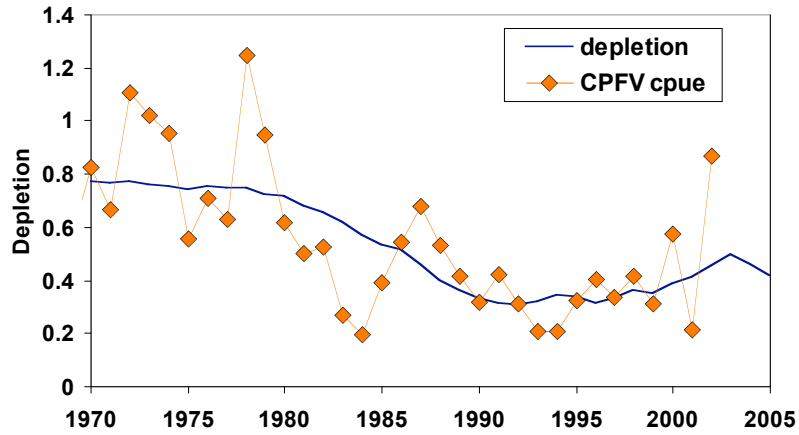
- A way to group or identify “vulnerable” species
  - Focus management attention
  - Develop ACLs
  - Direct data collection

## What it is not

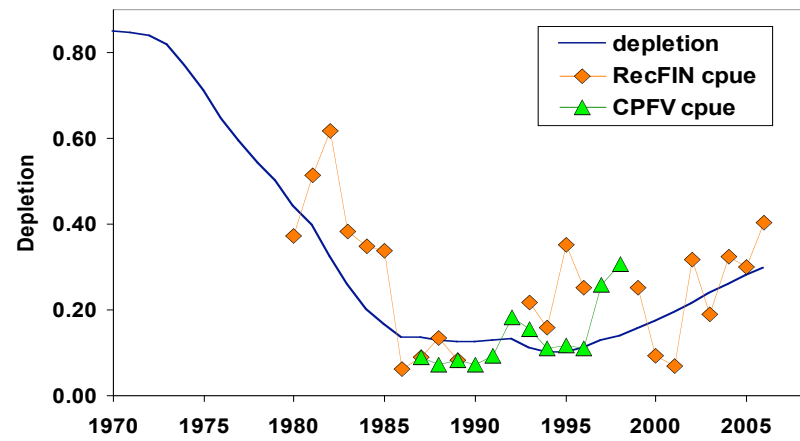
- An assessment method



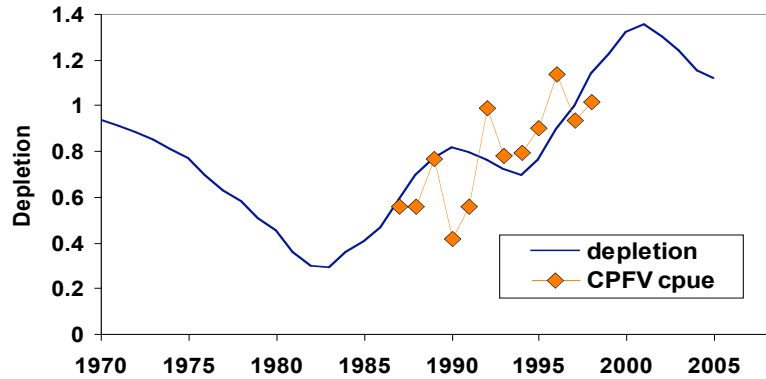
N. Cabezon rockfish depletion and CPUE Indices



Blue rockfish depletion and CPUE Indices



Gopher rockfish depletion and CPUE Indices



S. black rockfish depletion and CPUE Indices

