NOAA FISHERIES

Prioritizing Fish Stock Assessments

Implementing the Process for NPFMC Stocks

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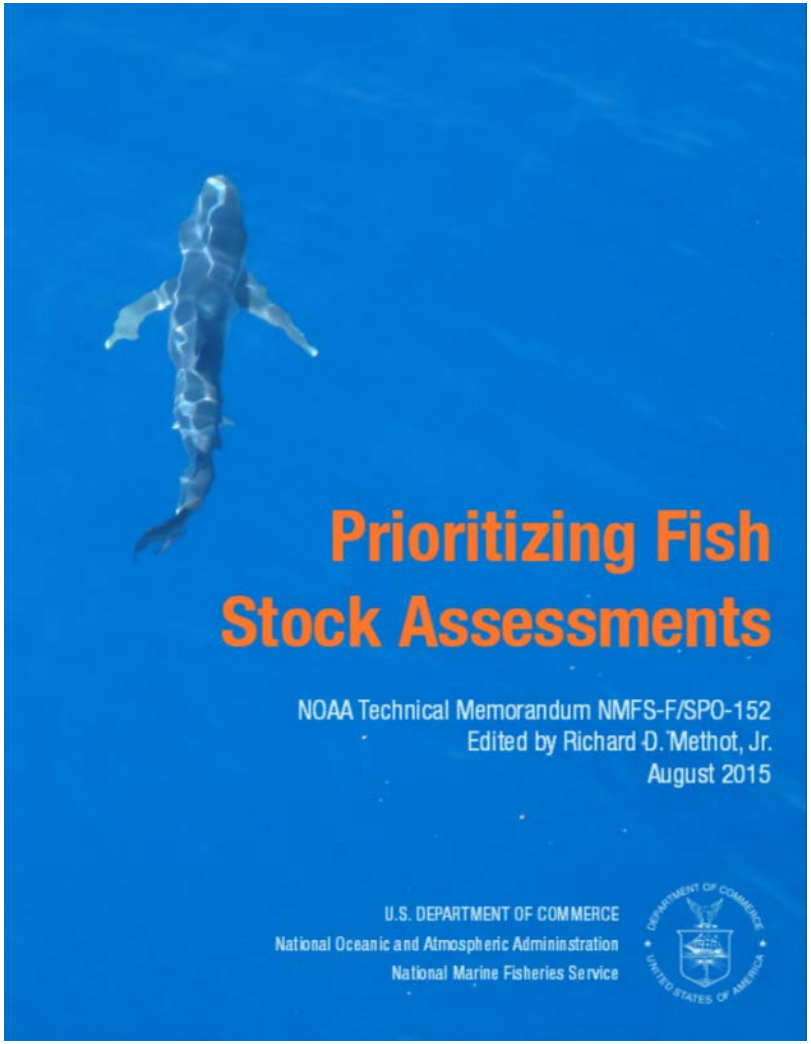
Overview

- History of prioritization
- Prioritization goals
- Process and factor overview
- Discuss roles and potential timeline
- Factor Details

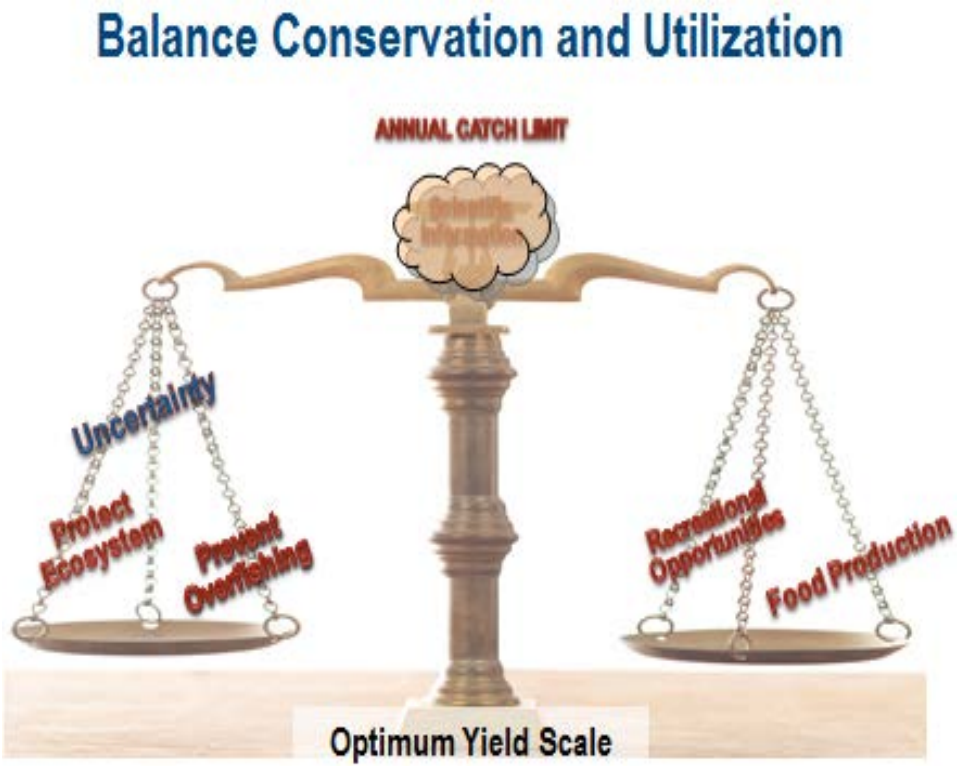


Prioritization History

2011	• Initiate development in response to budget inquiries
2013	• Needs discussed in proposed MSA reauthorization
Feb 2014	• Draft process presented to CCC and open for public comment
June 2014	• Public comments summarized for CCC
Sept 2014	• GAO report endorses draft plan
June 2015	• Process revised based on comments • Presented to CCC
Aug 2015	• Prioritization document released to public • Implementation initiated in cooperation with FMCs

Supporting Sustainable Fisheries

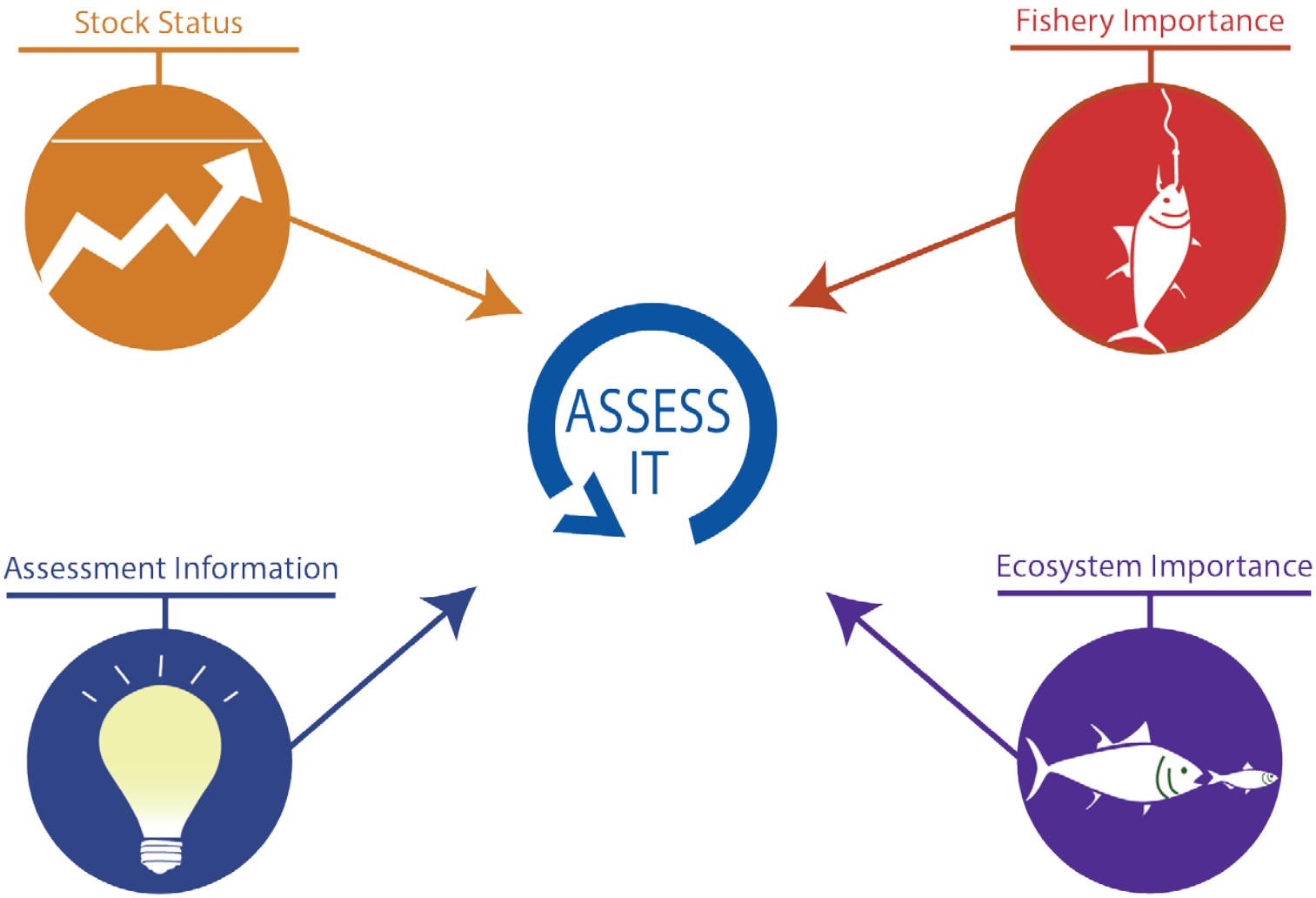
- Limited number & complexity of assessments that can be completed each year
- How complete/precise does an assessment need to be to provide good enough management advice?
- How frequently should assessments be updated to stay on track and improve?



Why Prioritize?

- All managed stocks need some level of assessment
- Some stocks need higher level or more frequent assessments
- Costs may exceed benefits for some low-value stocks
- Goal is a prioritized portfolio of right-sized assessments for each stock
- Achieved through facilitated and standardized regional prioritization processes
- Nationally, gaps in capability will be more visible and can be considered for future investments

Which Stocks Need Assessments?



Prioritization Process

1. Define stock list (~FMP)
2. Assemble data for 12 factor scores
3. Assign target level for each stock
4. Assign target frequency
5. Science experts assign scores, regional managers assign weights
6. Stock rank = sum(scores times weights)
7. Ranks are objective advice, not rigid prescription

Collaborative Roles in Prioritization Process

NMFS	Collates data from databases and past assessments
NMFS, Council Committees, Invited Experts	Provide scores for each stock for the other factors
NMFS, Councils	Assigns weights within ranges to each factor
NMFS Councils	Uses the proposed list, upcoming management cycle, data availability, and assessment capacity to determine set of assessments to do

Step 1: Organize Stocks for Prioritization

- Best to include all stocks in a region for which there are shared data sources, constituencies, assessment resources
- Separate prioritization groups where there are very distinct separations in one of the above
- Where there are species-rich complexes, consider where to include each potentially assessable stock in prioritization

Step 2: Get Values/Scores for each Factor

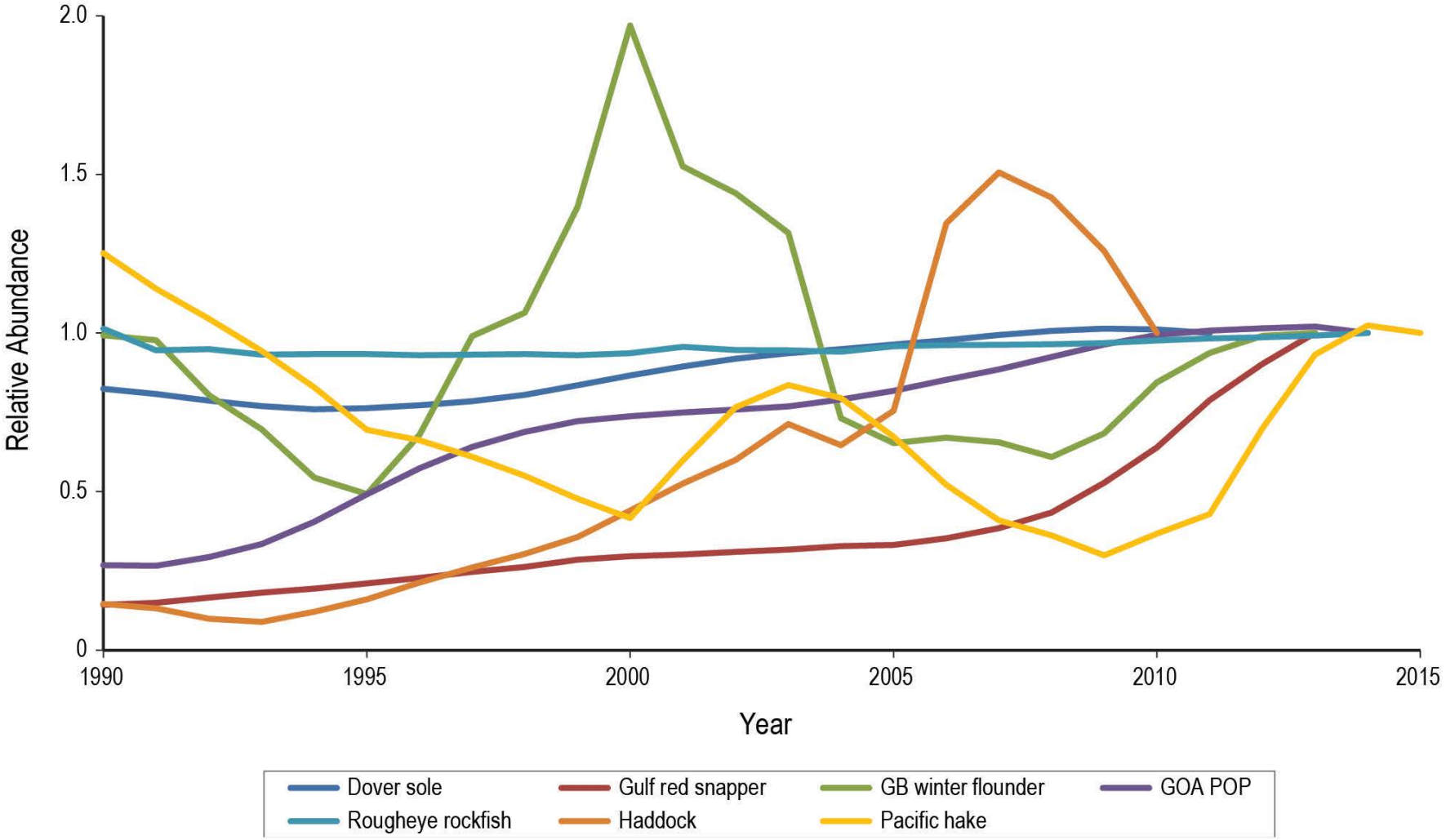
Category	Factor	Source	Raw Scores*
FISHERY	Commercial Fishery Importance - rescaled log(ex-vessel value)	SIS- ACL	0-5
	Recreational Fishery Importance - from regional input	Experts	0-5
	Importance to Subsistence	Experts	0-5
	Non-Catch Value	Experts	0-5
	Constituent Demand/Choke Stock	Experts	0-5
	Rebuilding Status	SIS	0-1
STOCK	Relative Stock Abundance	SIS	1-5
	Relative Fishing Mortality	SIS	1-5
ECO	Key Role in Ecosystem	Experts	1-5
ASMT	Unexpected Changes in Stock Indicators	Experts	0-5
	Relevant New Type of Information Available	Experts	0-5
	Years Assessment Overdue - relative to Target Frequency	SIS	0-10

**Scores are standardized (divided by total possible) as part of final calculations.*

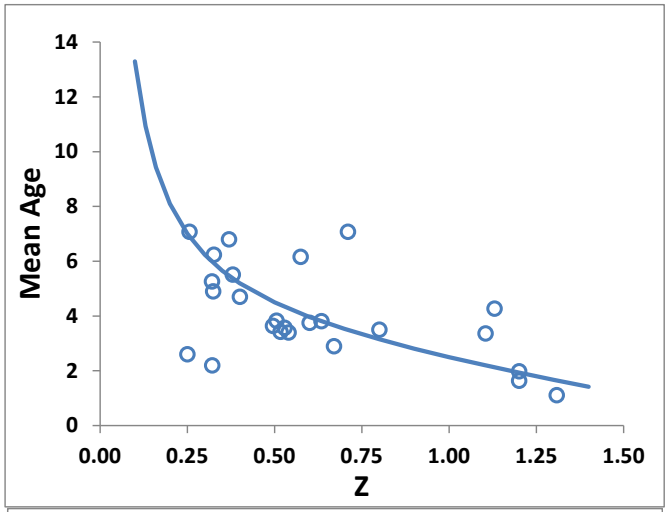
Step 3: Identify Target Levels

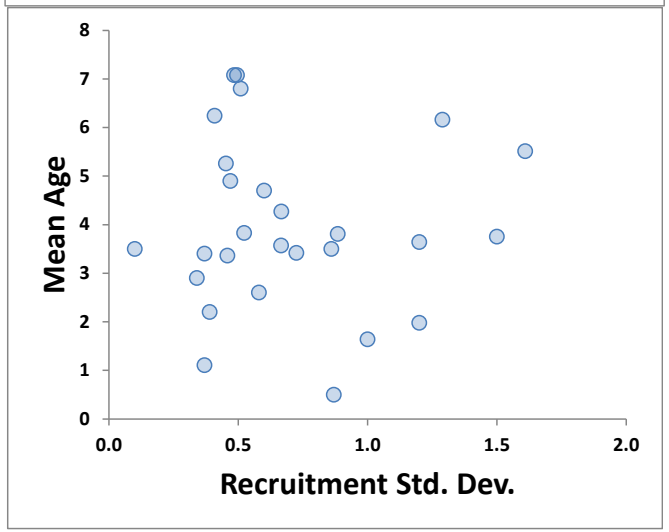
1. For now, we'll just assume that each stock needs a somewhat more data-rich and "better" assessment
2. In a year, the updated Stock Assessment Improvement Plan will describe an approach to identify gaps between current and species-specific target levels of assessment
3. Will consider where better surveys, age data, ecosystem-linkages, etc. are:
   - needed, feasible, good benefit/cost
   - pie-in-the-sky is not useful

Goal: Assess Variable Stocks More Frequently

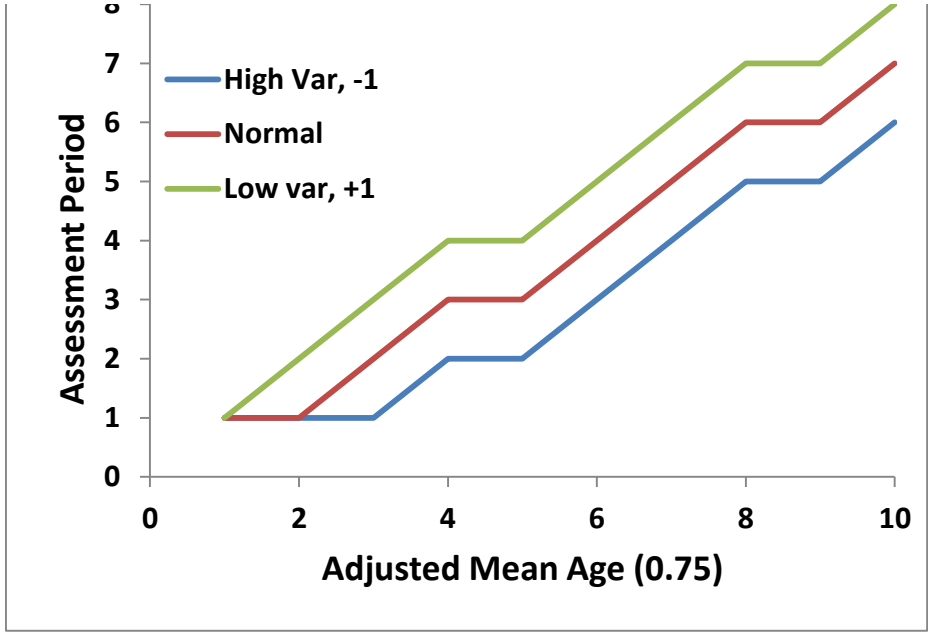


Step 4: Target Assessment Frequency





- Based on mean age x regional scaling factor
- Modify frequency using:
  - Stock variability (highly variable = more frequent)
  - Fishery importance (high importance = more frequent)
  - Ecosystem importance (high importance = more frequent)



Step 5: Assign Factor Weights

- Factor weights will be the same for all stocks in a prioritization group
- Intended to be developed by regional NMFS and Council leaders
- Allows for regional tailoring of the contribution of each factor to the overall score
- For example, the factor for subsistence is expected to be high for insular species
- Prototype factor weights will be provided

Step 6: Calculate and Rank Weighted Scores

Regional experts provide scores for stocks across each of the 12 prioritization factors

	Stock 1	Stock 2	…	Stock X
Factor 1				
Factor 2				
…				
Factor 12				

Regional managers weight each of the 12 prioritization factors

	Weight
Factor 1	
Factor 2	
…	
Factor 12	

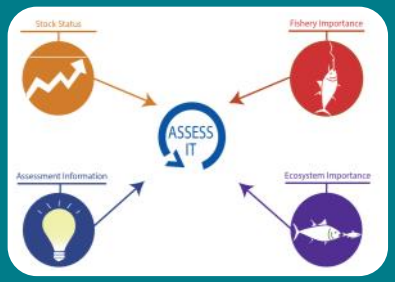
Product of relative scores and weights are summed across all 12 factors for each stock

Sorted list of results provides guidance on assessment priorities for upcoming cycle

Final Steps

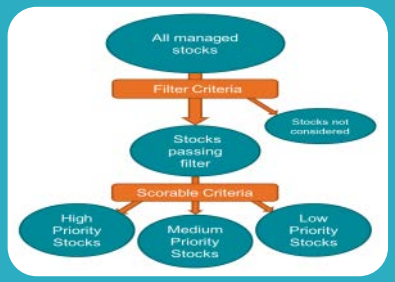
- The sorted list of ranks is intended as strong, objective guidance
- Final decisions can deviate from this list for various practical reasons
- Documentation of rationale for these final changes will provide transparent process and aid improving future process

Three Regional Science Activities



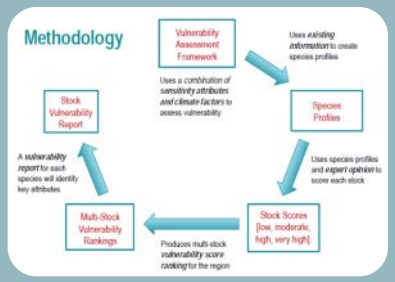
Stock Assessment Prioritization (http://goo.gl/8pQ898)

- Objective and transparent process to prioritize stocks for assessment
- Establishes target assessment level and frequency for each stock
- Cooperative process between NMFS, FMCs and other stakeholders



Habitat Assessment Prioritization (http://goo.gl/ZPNxbn)

- Process to develop regional habitat science priorities
- Uses criteria to score stocks appropriate to prioritizing habitat science
- Recently completed for West Coast stocks



Climate Vulnerability Assessment (http://goo.gl/0sARjR)

- Estimates relative vulnerability of fish stocks to potential climate change
- Based on existing information on species distributions and life history
- Results help managers identify ways to reduce risks/impacts to fisheries

Comparing Scoring Inputs

Stock Assessment Prioritization	Habitat Science Prioritization	Climate Vulnerability Assessment *excludes Exposure Variables
Commercial Fishery Importance	FSSI or FMC Priority	Habitat Specificity
Recreational Fishery Importance	Habitat Science Benefits SA?	Prey Specificity
Importance to Subsistence	Habitat Science Benefits EFH?	Sensitivity to Ocean Acidification
Non-Catch Value	Fishery Status	Sensitivity to Temperature
Constituent Demand	Habitat Disturbance/Vulnerability/Rarity	Stock Size/Status
Rebuilding Status	Habitat Dependence	Other Stressors
Relative Stock Abundance	Ecological Importance	Adult Mobility
Relative Fishing Mortality	Economic, Social, and Mgmt Value	Spawning Cycle
Key Role in Ecosystem		Complexity in Reproductive Strategy
Unexpected Changes in Indicators		ELH Survival/Settlement Requirements
New Type of Information		Population Growth Rate
Years Assessment Overdue		Dispersal of Early Life Stages

Next Steps for NPFMC

1. Timeline for implementation

   a. Briefed Plan Teams in Sept 2015

   b. Seek agreement from NPFMC to use info from this process

   c. Present results of process to Plan Teams at fall meetings; to include an analysis of the implications of increased uncertainty on reference points

2. Design collaborative process to assemble factor scores and weighting scheme; some scoring categories may need specific workshops to do a complete job

Future Directions

- Management Strategy Evaluations for select stocks can better inform setting of target assessment level and frequency
- Gaps between current and target assessment levels, and the number of overdue assessments, informs future investments in capacity
- The simple “factor score x weight” approach evolves to calculate a portfolio of assessments that achieve the greatest overall benefits

Questions?

then
Factor Score Details

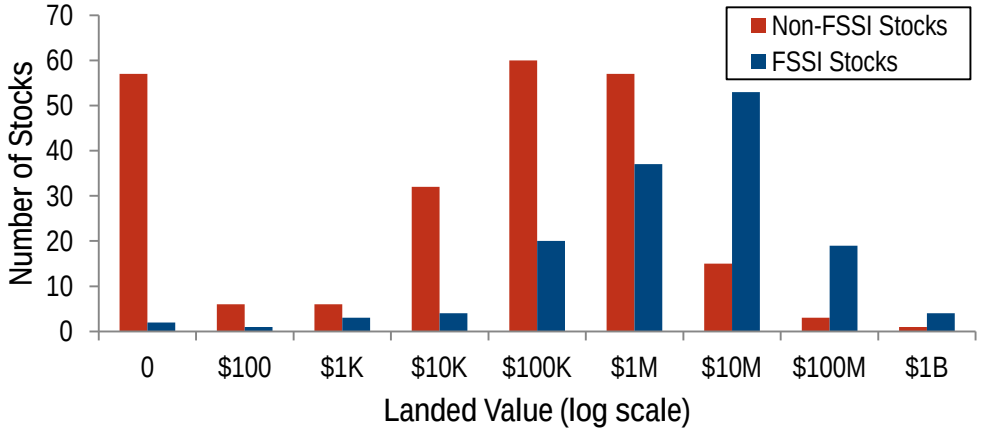
Fishery Importance – Commercial

Description: Non-linear ranking based on landed value of catch
Log-transformed to reduce range while preserving relative ranking
Scaled against most valuable *regional* stock

Data Sources: NMFS' Species Information System (SIS)
NMFS' Annual Commercial Landings Statistics
Regional landings statistics (as available)

Score Range: 0 to 5

Participants: NMFS staff
Council advisors



$$\text{Comm. Importance (stock x)} = 5 + \log_{10}(1+\text{landed value of stock x}) - \log_{10}(1+\text{landed value of most valuable regional stock})$$

Fishery Importance – Recreational

Description: Data limited to develop quantitative, species-specific rec scores
Experts provide scores based on marginal values where available
Overall significance of rec vs. comm addressed via weighting

Score Range: 0 to 5

Data Sources: Experts; state data

Participants: NMFS staff
Council advisors

Fishery Importance – Subsistence

Description: Measures stock's contributions to subsistence fisheries
Full range of scores does not need to be utilized

Score Range: 0 to 5

Data Sources: Regional experts

Participants: NMFS staff
Council advisors

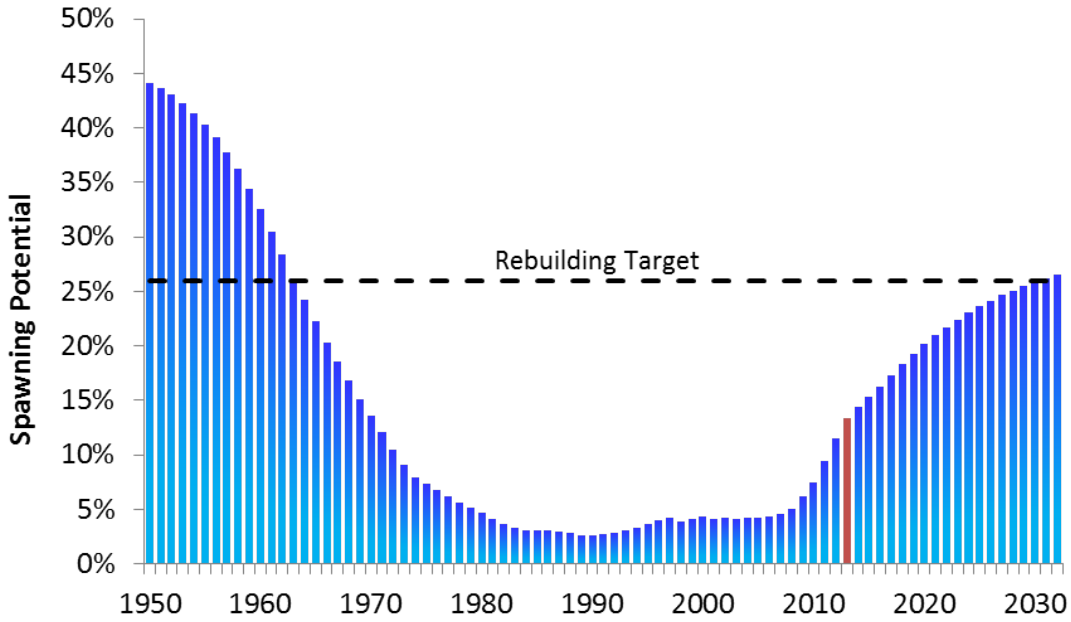
Fishery Importance – Rebuilding Status

Description: Considers stocks on rebuilding plans or listed under ESA
Catch is reduced and may occur mainly as discarded bycatch

Score Range: 0 or 1

Data Sources: NMFS' Species Information System (SIS)
NMFS ESA Species Lists

Participants: NMFS staff



Fishery Importance – Constituent Demand

Description: Some stocks have high demand for assessment excellence
Includes catch share programs, choke stocks, controversial assessments, and high sociocultural importance
Full range of scores need not be utilized

Score Range: 0 to 5

Data Sources: Regional experts

Participants: NMFS staff
Council advisors

Fishery Importance – Non-Catch Value

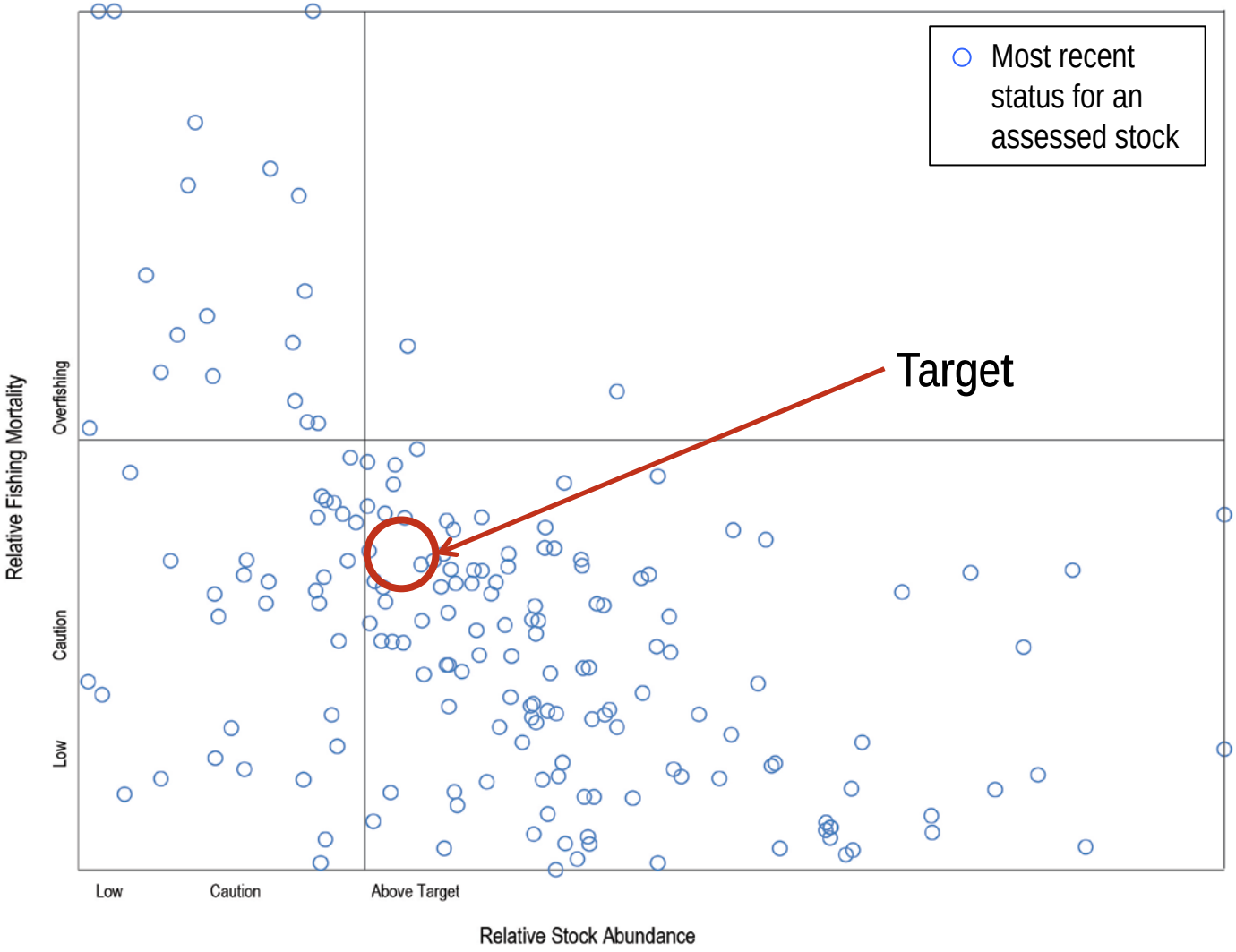
Description: Value not associated with any harvest
Based on relatively undisturbed existence in ecosystem
Examples – viewing of reef fish, public sentiment for protection
Full range of scores need not be utilized

Score Range: 0 to 5

Data Sources: Regional experts (e.g. NGOs, regional economists, The Natural Capital Project)

Participants: NMFS staff

Status: Which Stocks are Pushing Limits?



Stock Status – Relative Stock Abundance

Description: Based on spawning biomass, targets, and limits (or proxies)
Data from most recent stock assessment and management data
Data-limited stocks can use PSA or ORCS to assign scores, or assign as "unknown"

Score Range: 1 to 5

Data Sources: NMFS' Species Information System (SIS)

Participants: NMFS staff
SSC

1 point = stock biomass above target ($SB_C > 1.25*SB_{MSY}$)
2 points = stock biomass is near target ($MSST < SB_C \leq 1.25*SB_{MSY}$)
3 points = caution – SB_C or MSST is unknown and status cannot be determined
4 points = stock is overfished ($SB_C \leq MSST$)
5 points = stock is overfished and shows signs of decline

Stock Status – Relative Fishing Mortality

Description: Based on current fishing mortality rates and limits (or proxies)
Data from most recent stock assessment and management data
Data-limited stocks can use PSA or ORCS to assign scores, or assign as "unknown"

Score Range: 1 to 5

Data Sources: NMFS' Species Information System (SIS)

Participants: NMFS staff
SSC

1 point = low fisheries impact on stock ($F_C \leq 0.25*F_L$)
2 points = moderate fisheries impact on stock ($0.25*C < F_C \leq 0.9*F_L$)
3 points = caution – F_C or F_L is unknown and status cannot be determined
4 points = high impact of fisheries on stock ($F_C > 0.9*F_L$)
5 points = stock has been determined to be experiencing overfishing

Ecosystem Importance – Key Role in Ecosystem

Description: Measures top-down and bottom-up contributions (max of either)
Ability to quantitatively define ecosystem importance is difficult
Identify components that likely have substantive impacts

Score Range: 1 to 5

Data Sources: Regional experts, aided by food habits data, basic ecological information, and model exploration (where available)

Participants: NMFS staff
SSC

Top-Down Component: Predator/Ecosystem Interaction

1 point = minor/unmeasurable impacts on other stocks (e.g. splitnose rockfish)

2-4 points = notable changes in the predation mortality, recruitment, or other vital rates of other stocks (e.g. lingcod)

5 points = substantive changes in the vital rates of other stocks (e.g. arrowtooth flounder)

Bottom-Up Component: Forage or Habitat

1 point = minor dietary component or habitat provider (e.g. Pacific grenadier)

2-4 points = moderate dietary or habitat component (e.g. Pacific sardine)

5 points = major dietary or habitat component, or critical to an endangered or otherwise protected stock (e.g. krill)

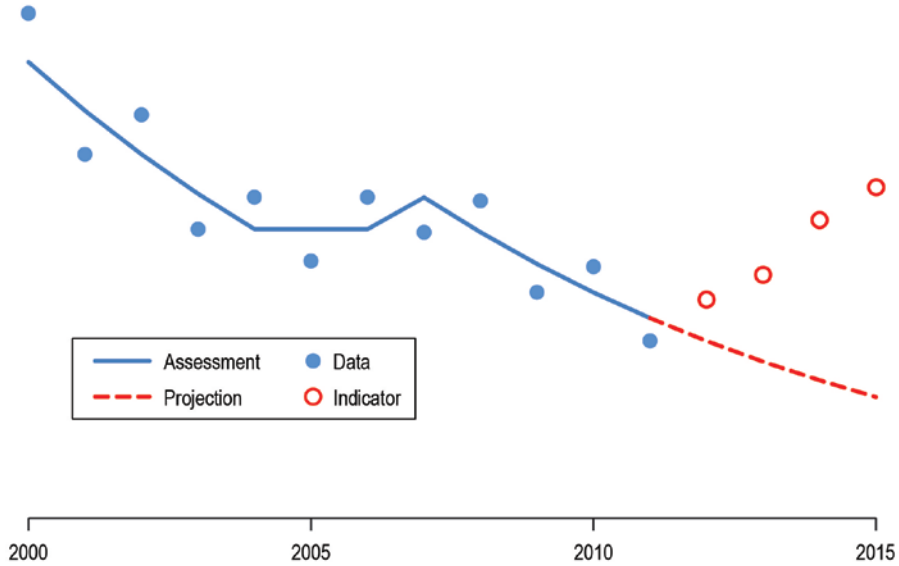
Assessment – Changes in Stock Indicators

Description: Quick evaluation of new information between assessment updates
Does new data match forecasts from previous assessment?
Adjust assessment priority up or down based on match

Score Range: 0 to 5

Data Sources: Regional experts

Participants: NMFS staff
SSC



0 points = new data are as expected from previous assessment forecasts
3 points = new data indicate moderate deviations from past projections
5 points = new data indicate strong deviations from past projections

Assessment – New Type of Information

Description: Significant new data sources expected to resolve uncertainties from previous assessments or upgrade assessment level
Data now available for first time assessment
Examples: New type of survey; new biological research result

Score Range: 0 to 5

Data Sources: Regional experts

Participants: NMFS staff
SSC

0 points = no significant new types of information are available
3 points = new information is available that could have a modest impact on the assessment
5 points = newly available information is expected to have a major impact on the assessment

Target Frequency – Mean Age in Catch

Description:

Used to calculate Years Assessment Overdue

Serves as a measure of inertia to change in the population

Should be measured as an average over several years to smooth out effect of recruitment fluctuations

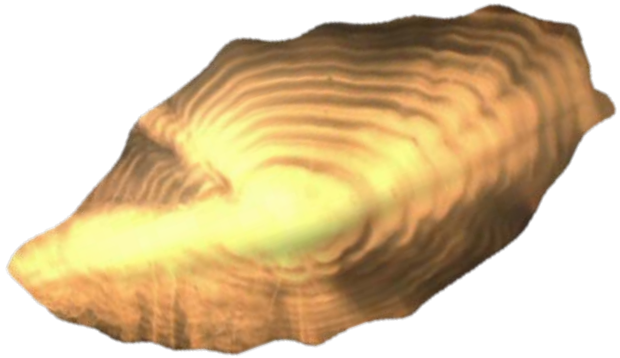
If direct measures not available, estimate in assessment model using total mortality and selectivity, or approximate based on total or natural mortality

Not required for data-limited/unassessed stocks

Score Range: Value

Data Sources: Assessment results, experts

Participants: NMFS staff
SSC



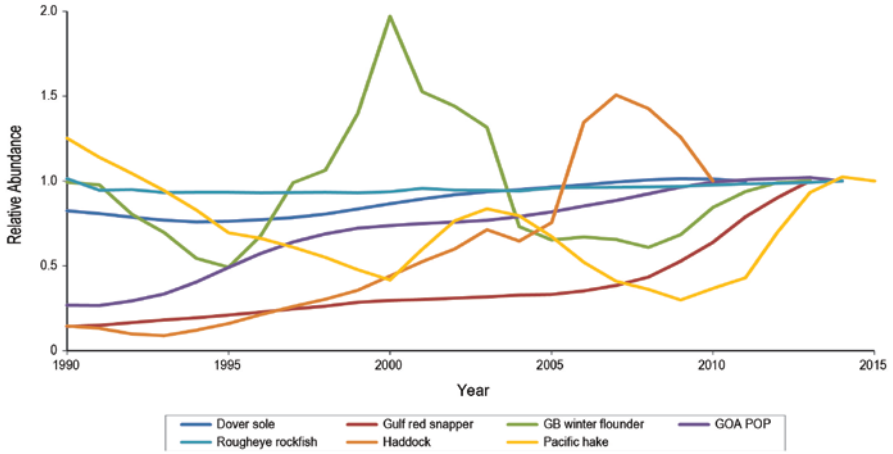
Target Frequency – Stock Variability

Description: Used to calculate Years Assessment Overdue
Changes due to annual recruitment, but also resulting from changes in growth, natural mortality, and fishing mortality
Recruitment fluctuations an important driver of abundance changes
Not required for data-limited/unassessed stocks

Score Range: 0 to 5

Data Sources: Regional experts

Participants: NMFS staff
SSC



+1 points for low recruitment variability (CV < 0.3; assess less frequently)
0 points for moderate recruitment variability (0.3 < CV < 0.9)
-1 point for high recruitment variability (CV > 0.9; assess more often)

Target Frequency Details

1. Mean age in Catch (or proxy), multiplied by regional scaling factor (adjust targets to match available capacity)
2. Adjust up for low Stock Variability, down for high Stock Variability (e.g. assess more frequently)
3. Adjust up for low Fishery Importance, down for high Fishery Importance (e.g. assess more frequently)
4. Adjust up for low Ecosystem Importance, down for high Ecosystem Importance (e.g. assess more frequently)

Results will be between 1 and a maximum of ~10 years

Assessment – Years Assessment Overdue

Description: Years (if any) an assessment is overdue for a stock relative to the target frequency
Initially set at a moderate level (e.g. 5) for unassessed stocks, then increases annually until an assessment is completed

Score Range: 0 to ~10

Data Sources: NMFS' Species Information System (SIS)
Target Assessment Frequency

Participants: NMFS staff
SSC

Prioritization Process