Science, Service, Stewardship

Stock Assessment Update
Council Coordinating Committee
May 2, 2012

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National Fish Stock Assessment Coordinator,
Office of Science & Technology

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Presentation Outline

Current Assessment Output

Next Generation Stock Assessments

—Fisheries And The Environment (FATE)

—Advanced Technology

Use of Best Available Science

Prioritizing Assessments

Allocating Resources to support Assessments

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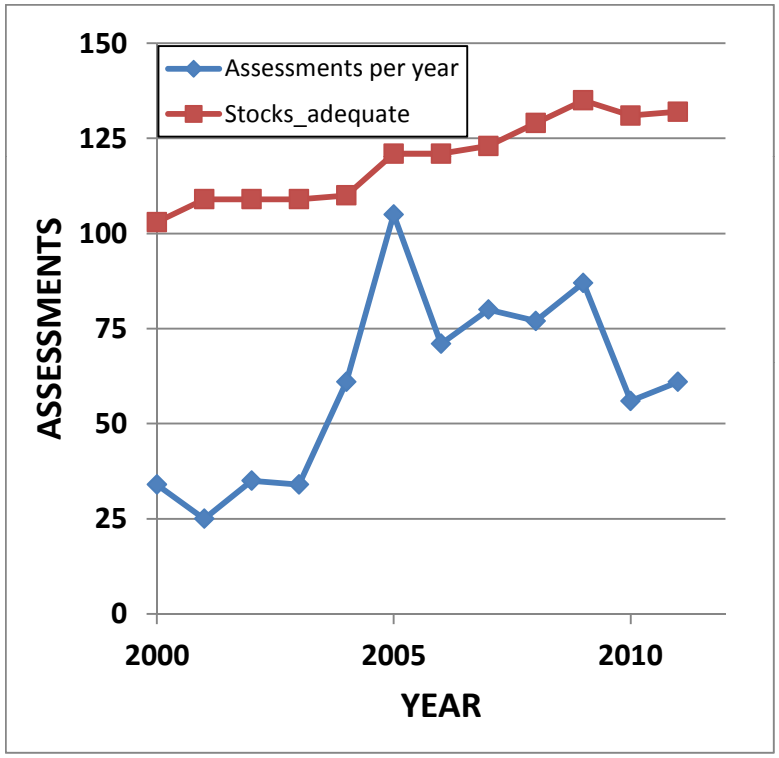
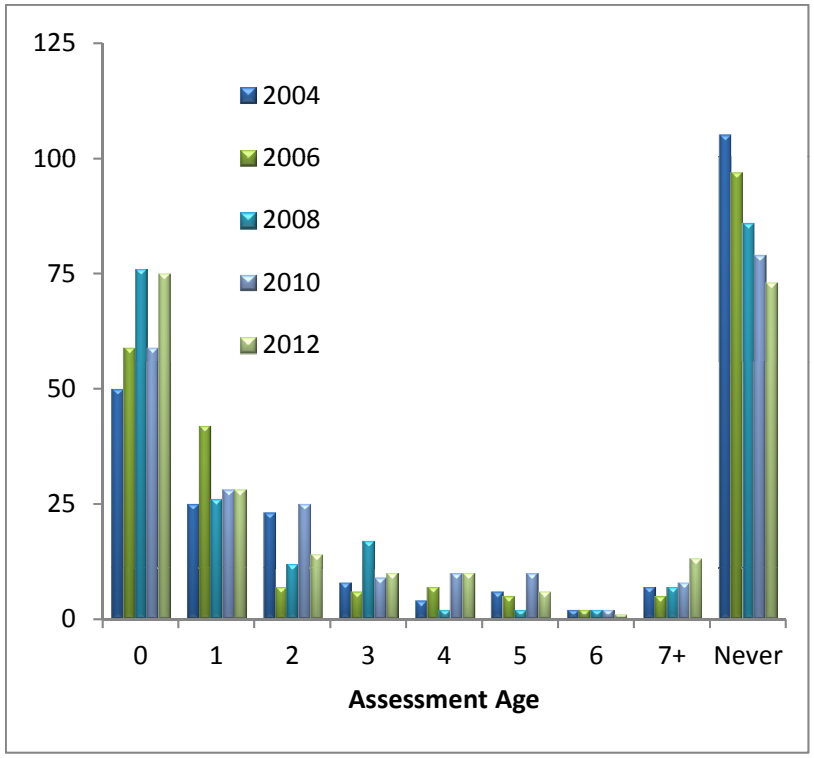
Assessment Activity for the 230 FSSI Stocks





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Regional Distribution

	ASSESSMENT AGE															
	0	1	2	3	4	5	6	7	8	10	11	12	15	17	none	All
Alaska	31														4	35
Cal. Current	5	9		4	1	6		7						1	12	45
Caribbean															8	8
Gulf of Mexico	6	5	1	1	2							1			7	23
International - Atl	2	2	4													8
International - Pac	5	5		1	1										6	18
Northeast	18	2	6	2											20	48
Pacific Islands	2	1													4	7
Southeast	6	4	3	2	6		1		1	1	1		1		12	38
Grand Total	75	28	14	10	10	6	1	7	1	1	1	1	1	1	73	230

As of April 2012; Includes assessments at level 3 or higher

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Level of Assessment Complexity

0. Data-poor: based on historical catch
1. Index: tracks some index over time, but cannot establish absolute levels
2. Equilibrium: Snapshot of mortality rates, but no abundance information or trends
3. Aggregate Model: Sufficient information to estimate time series of abundance and mortality; "adequate"; supports status determinations
4. Age/Size Structured: adds age and size data for better mortality estimates, better tracking and forecasting of fluctuations
5. Environmental/ecosystem linkages to get at "why", not just "what"

Level	1	2	3	4	5
Not FSSI	11	2	20	37	3
FSSI	27	0	16	108	2

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Next Generation Assessments

Prioritized

- Each has established target level and frequency
- Objective prioritization criteria

Timely and Efficient

- Streamlined data systems
- Standardized models
- Focused reviews
- Communication focus

Ecosystem Linked

- Assessment draws upon ecosystem, habitat, climate factors
- Assessment supports Integrated Ecosystem Assessments and Marine Spatial Planning

Utilize Advanced Technology

- Data collection is accurate, timely, and precise
- Strive for absolute, not relative, measurements

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Fisheries And The Environment

- Primary mission:
  - Describe ecosystem response to environmental change
  - Develop indicators to detect and track change
  - Create new forecasting tools to predict change

- Implements EBFM with tight tie to stock assessments, linkages to FMCs
- Designed to use expertise of NMFS PIs to lead projects and FATE Representatives at each center to staff cross-regional analysis and rapid transfer of results, indicators, and models across NMFS Science Centers
- FATE publishes an annual request for proposals
- 2001: Program begins; 2002: N. Pacific focus; 2006: focus broadened to Atlantic, Pacific, Gulf of Mexico
- Partnership between all six NMFS Science Centers

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FATE Projects

- Since 2006: 60 projects funded, 36 completed / 24 active
- Most projects advance science and develop products at the intersection of biological oceanography and fisheries science
- Topically:
  - Biological response to climate change: ~23%
  - Plankton, lower trophic level changes and impacts on fisheries: ~15%
  - Biological response to physical (currents, etc.) forcing: ~33%
  - Projects to transition research results into indicators, models: ~28%
- Regionally:
  - Pacific: ~57%
  - Atlantic: ~29%
  - Gulf of Mexico: ~15%

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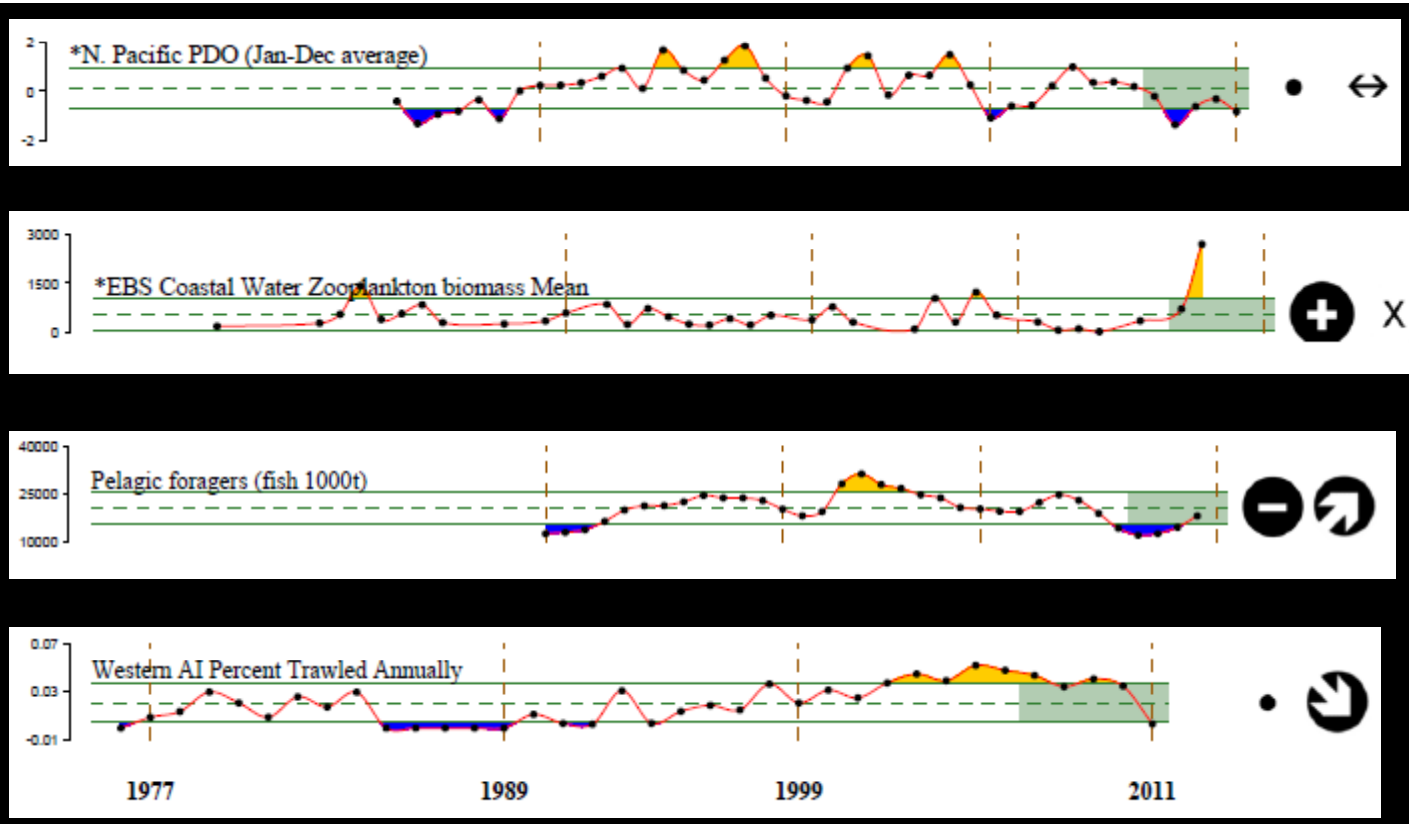
FATE Projects

- Ecosystem Considerations for 2012 – Alaska (Zador et al., AFSC)
- Acquire, Maintain, Synthesize Ecosystem indicators for Alaska
- Publishes annual *Ecosystem Considerations Report* for the North Pacific Fisheries Management Council



climate/ physics

plankton

fish

fishing fleet

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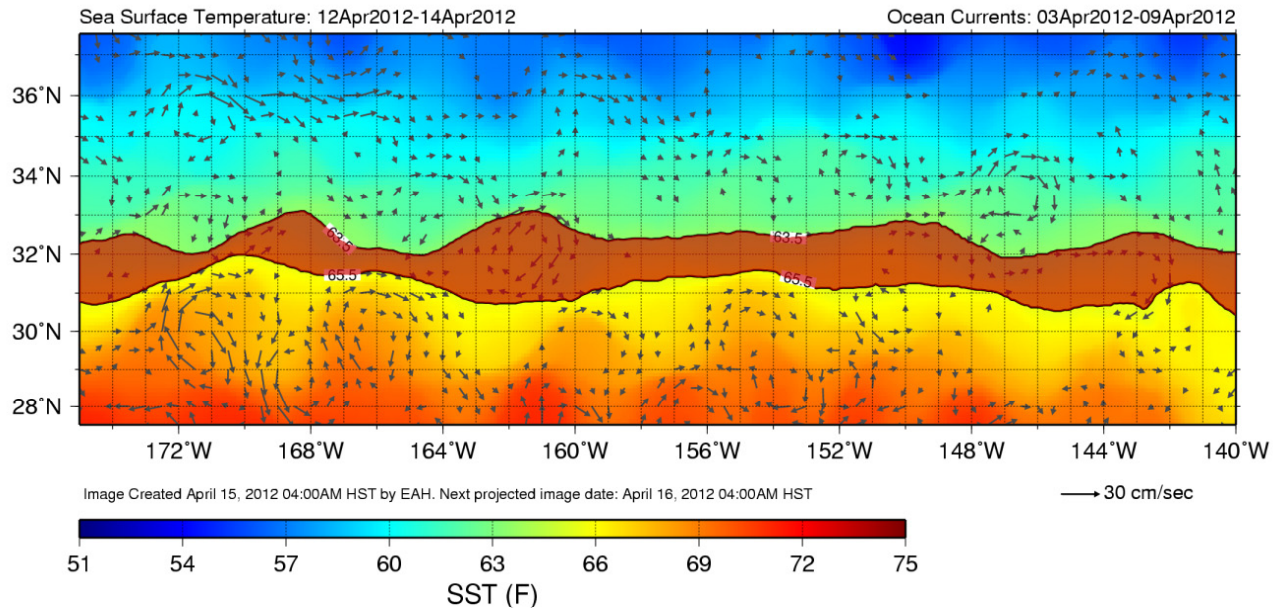
EXPERIMENTAL PRODUCT

avoid fishing between solid black 63.5°F and 65.5°F lines
to help reduce loggerhead sea turtle interactions

- Turtle Watch (Howell et al., PIFSC)
- Satellite derived SST describes dynamic habitat for turtles
- Developed for Western Pacific Fisheries Management Council to inform longline fishers
- Daily updates
- Also distributed to fishers and public via GeoEye
- Available in English, Vietnamese, and Korean



PACIFIC ISLANDS FISHERIES SCIENCE CENTER
ECOSYSTEMS AND OCEANOGRAPHY DIVISION
2570 Dole Street, Honolulu, HI 96822
http://www.pifsc.noaa.gov/eod/turtlewatch.php
contact: Evan.Howell@noaa.gov

Data provided by Central Pacific CoastWatch node

TURTLEWATCH

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FATE – Future Projects

- Long-term climatic forcing and pelagic nekton in NCC
- Humboldt squid and climate-driven interactions in the CA current
- Stratification and circulation model for stock and ecosystem assessments
- Modeling for the California Current IEA
- Atlantic bluefin tuna abundance indices: Gulf of Mexico
- Climate change and river herring
- El Nino and salmon over the past 50 years
- Hypoxia and the GoMex menhaden fishery
- North Pacific Current and north Pacific albacore tuna in the Northeast Pacific Ocean
- Environmental effects and haddock productivity: Georges Bank

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Advanced Technology Innovations

Innovative science under development or recently implemented in NOAA Fisheries that enhances our capabilities for improving the scientific information needed for fisheries management in the 21st century.

Priority to improve the accuracy, efficiency, and timeliness of information for assessing fisheries and protected species stocks, habitats, and ecosystems, even under flat budgets. Our science innovations include:

- Technology (sensors and platforms)
- Efficiency (integrated survey operations and data processing)
- Information (modeling and enterprise data management)

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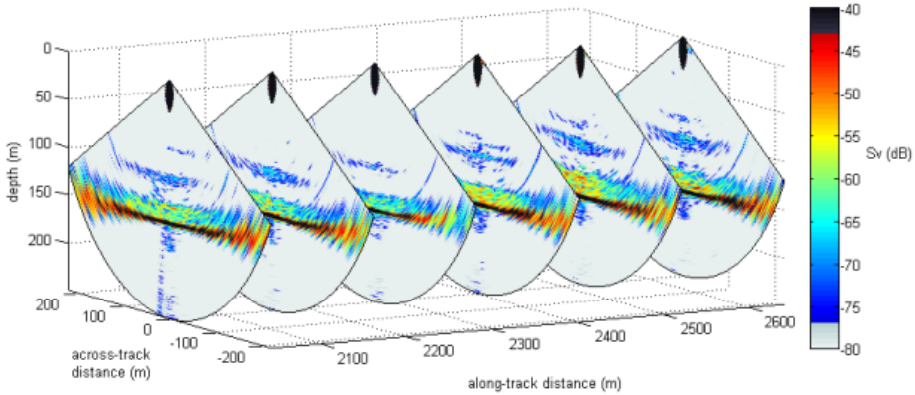
Technology: Acoustic Sensors

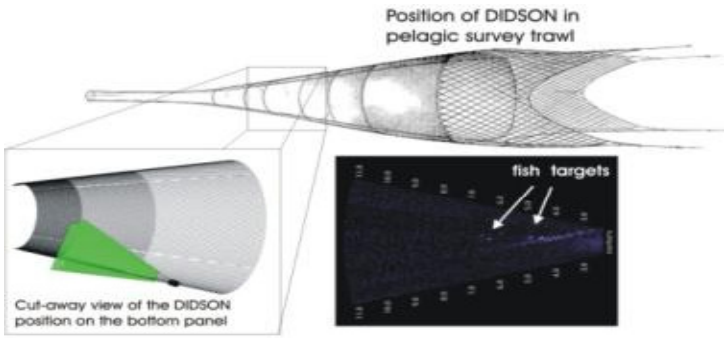
- Remote sensing for improved estimates from higher spatial and temporal resolution in measures with nonintrusive sampling.

- Improved processing efficiencies and cost-effective deployment capabilities including alternative platforms for species-specific abundance estimates, sampling gear performance, and calibration.

ME70 Multibeam Sonar



DIDSON Acoustic Camera



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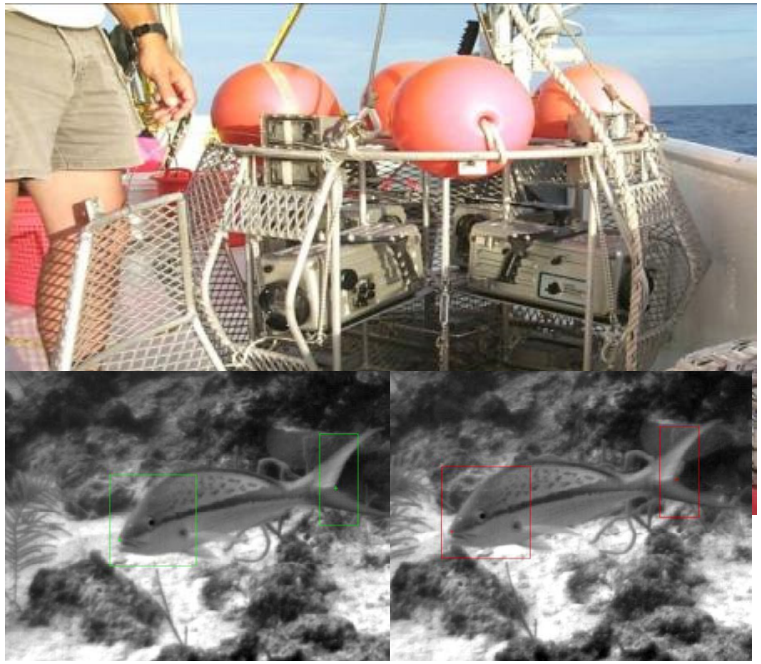
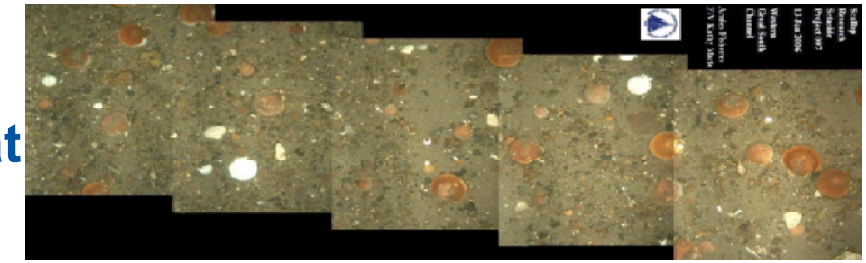
Technology: Optical Sensors

- Optical technology for improved abundance, habitat classification, verification of remote sensing, calibration, and gear efficiency.

- Optical 3D imagery for improved measurements with automated image processing to reduce processing time.

- Optical mosaics for absolute abundance estimates and habitat classification.





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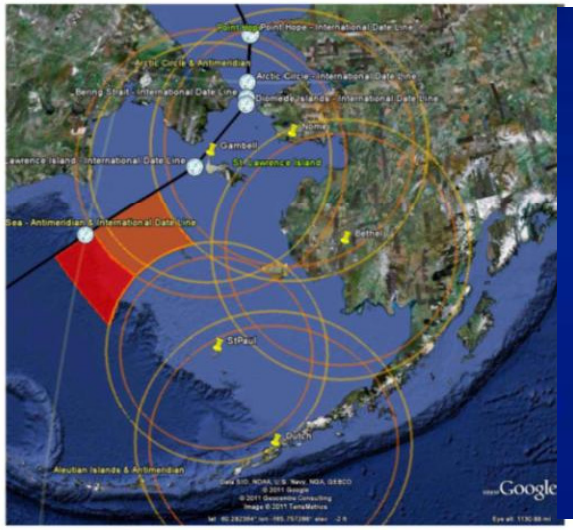
Technology: Platforms

Modernizing interface between sensors and environment with alternative platforms as cost-effective approach to improve the spatial and temporal survey coverage.

Unmanned Aircraft Systems (UAS)



Gliders for marine mammal surveys

AUV operations for fish abundance & habitat characterization

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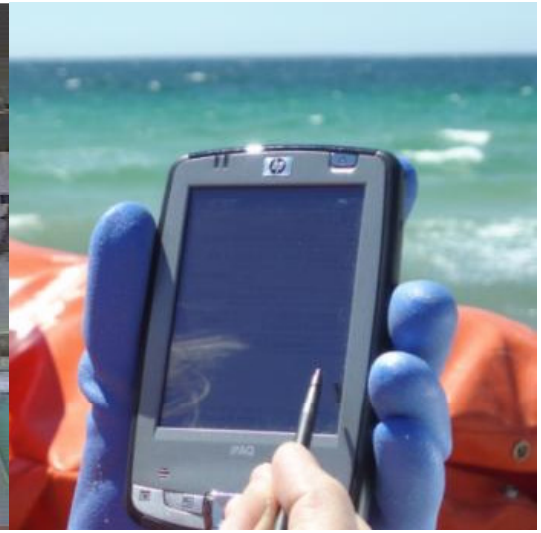
Technology: Electronic monitoring

Electronic monitoring and data entry systems aboard commercial and research vessels improve the quality and timeliness of information for stock assessment scientists and in-season quota monitoring for managers.

Fisheries scientific computing system

Electronic monitoring on commercial vessels

Data entry with Ipaq touchscreen



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Best Science Information Available

- Updated definition and clarification will be in NS2 Guidelines; now in internal clearance
- Major NS2 Topics
  - BSIA definition
  - Role of the SSC in BSIA
  - Complementary relationship between SSC and Peer Review process
  - Updated expectations for Stock Assessment and Fishery Evaluation (SAFE) documents

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Best Science Information Available

Aside from NS2, some observations from NS1 implementation

- Science information is never perfect
- All assessment results have uncertainty, which should be taken into account when the SSC recommends the Acceptable Biological Catch relative to the uncertainly estimated Overfishing Level
- Rejecting a more complex assessment because it is “too uncertainty to provide management advice” should always be accompanied by a fallback simpler method
- Simpler methods are no panacea; they work because they use more assumptions, so are less reliant on data

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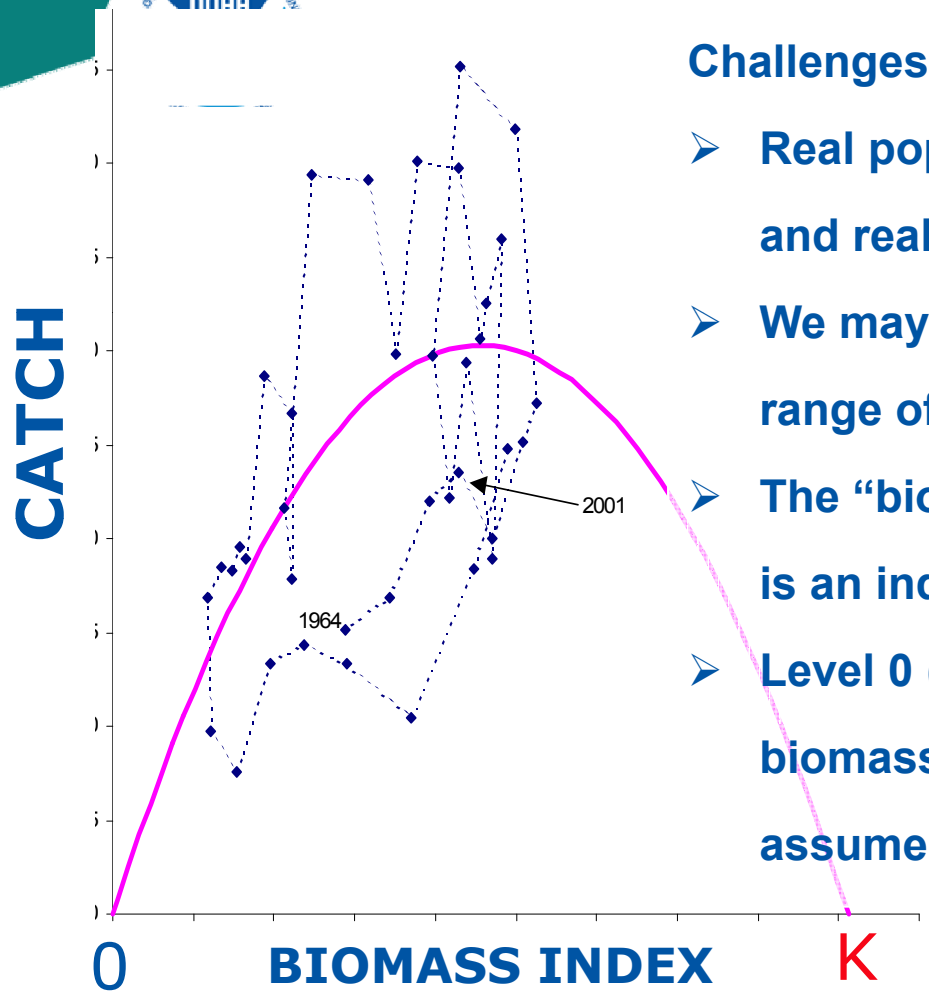
Production Model – Level 3



Challenges:

- Real populations show much natural fluctuation and real data have sampling error
- We may not have observed stock over the full range of biomass levels
- The "biomass" is not actually biomass, instead it is an index assumed proportional to biomass
- Level 0 (Catch-only) models assert current biomass level relative to K, or more simply assume that historical catch has been sustainable

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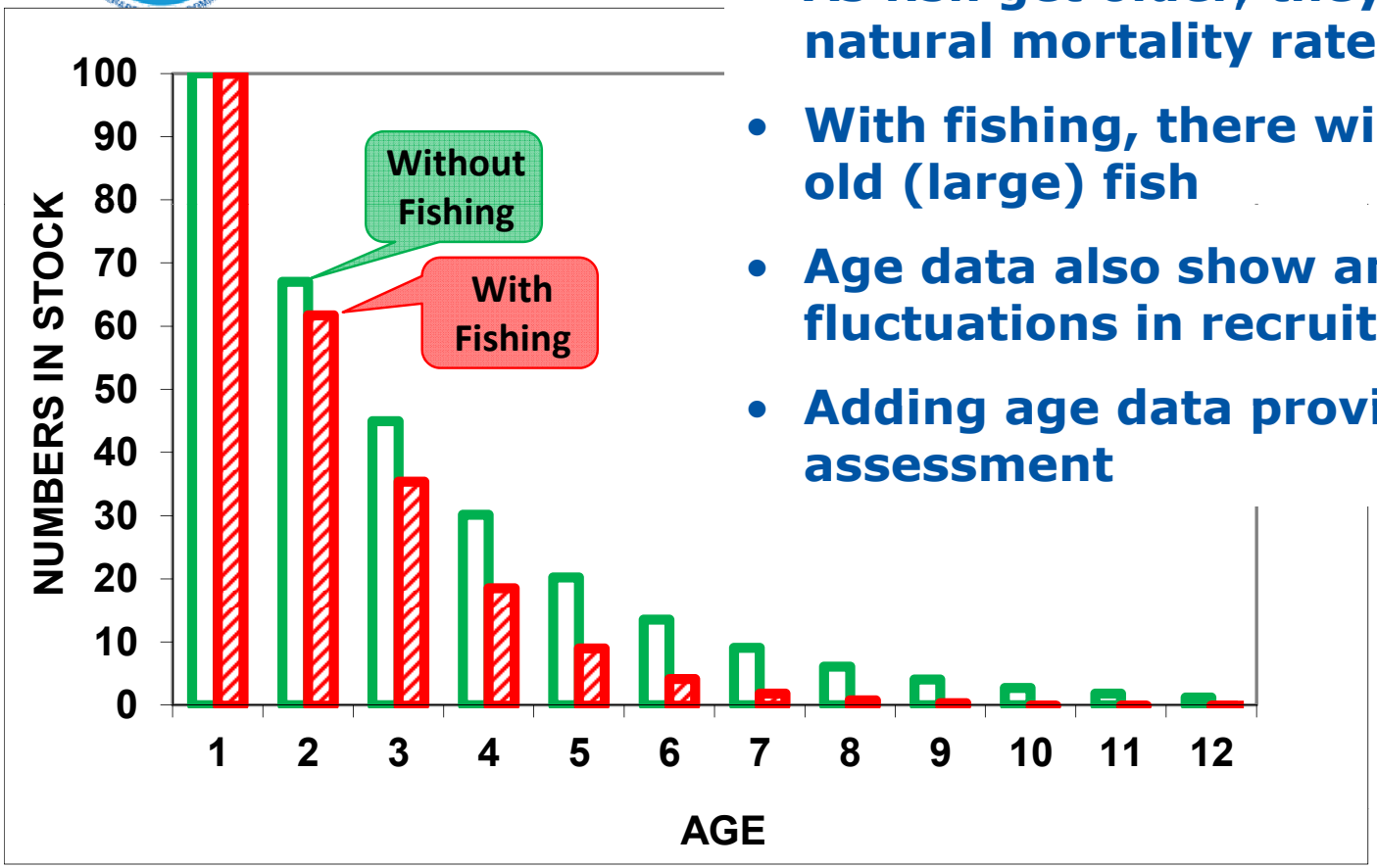
Age Data More Directly Measures Fishing Mortality



- As fish get older, they die off at a natural mortality rate
- With fishing, there will be fewer old (large) fish
- Age data also show annual fluctuations in recruitment
- Adding age data provides "level 4" assessment

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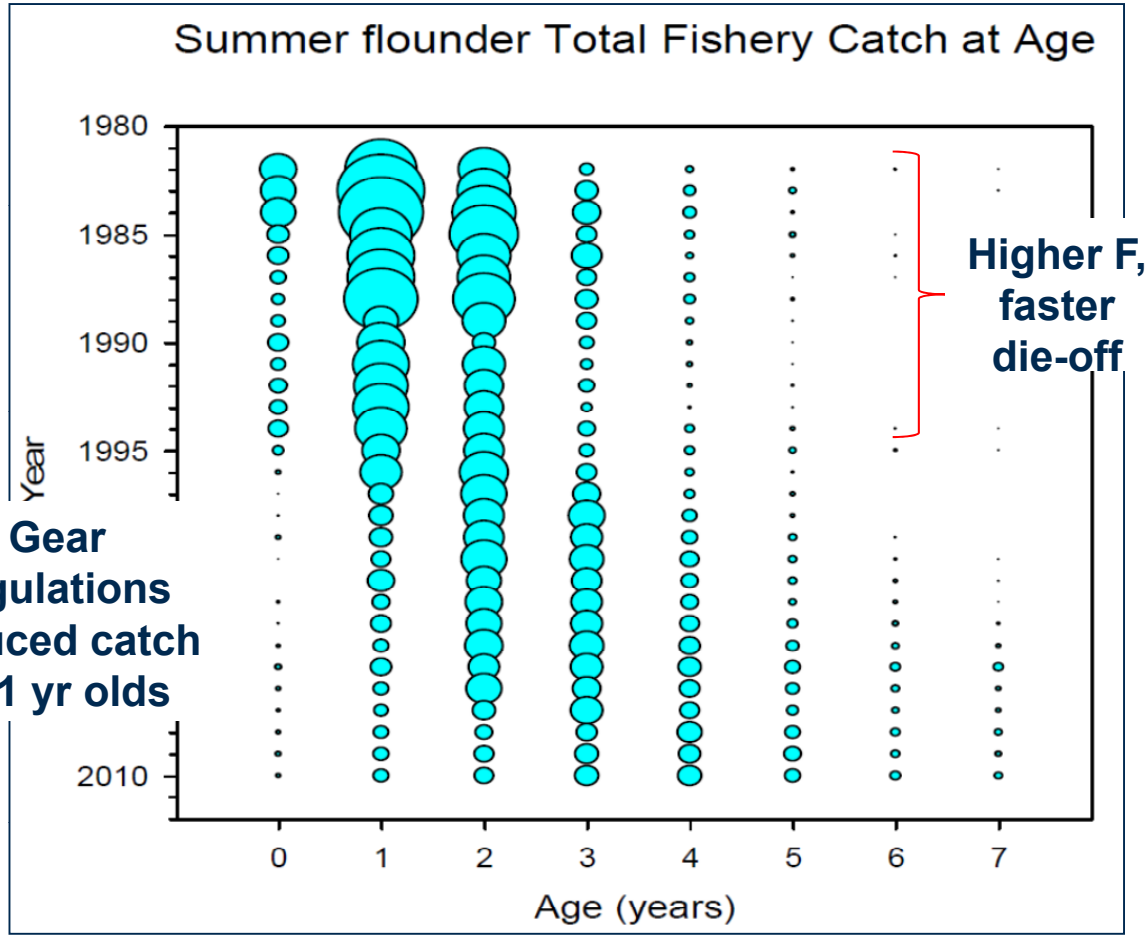
Age-Structured Data Provide More Information

NOTES!

Bubble size is amount of catch at age (column), year (row)

Catch of youngest fish is lower because they are too small to be selected by fishery



Gear regulations reduced catch of 1 yr olds

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Background to Prioritization

- Goal is to provide scientific information needed to prevent overfishing (through forecast of annual catch limits), rebuild overfished stocks and achieve optimum yield
- How good does each stock's assessment need to be to achieve this goal?
- Stock-specific assessment objectives allow us to consider priorities among stocks to achieve these objectives and the overall goal of the assessment enterprise

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Setting Assessment Goals

- What is target level for a stock's assessment?
  - We cannot afford level 4, or even 3, for all stocks
- How good should the data be for that level?
  - Fishery-dependent index of stock abundance, or fishery-independent survey?
  - Size data only, or age data?
- How frequently should it be updated?
  - High recruitment variability causes fluctuations
  - Young age at selection shortens time to react to the fluctuation
  - But, long-lived stocks have more age groups so more inertia to change

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Prioritization Process

- Prioritization is region-specific under a national umbrella. Each region has a process involving the NMFS Science Center and the regional Fishery Management Council
- OMB request: "NMFS provide OMB with an evaluation system (e.g. based on points) that will be used to prioritize funding for FY 2012 fisheries stock assessments"
- NMFS created a Stock Assessment Prioritization Working Group
  - Balanced national and regional (FMC scale) prioritization is needed to achieve best benefits to the nation and each fishing community

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Starting Point for Each Stock

A baseline evaluation of each stock can guide unassessed stocks into:

- those OK with just baseline monitoring
- Those with priority for first-time assessments

Using factors such as:

- Fishery importance
- Vulnerability to overfishing (from stock biology and exposure to fishing pressure)
- Ballpark estimate of stock status (local knowledge / expert judgment)
- Ecosystem importance

After first-time assessment, then consider long-term targets

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Long-Term Assessment Targets: Level, Frequency

Higher assessment **LEVEL** drives need for new data collection programs to collect age data and conduct high quality surveys

—new programs generally provide data for multiple co-occurring stocks

High assessment **FREQUENCY** drives need for more staff and streamlined process to quickly move from raw data to assessment result

—More updates, fewer benchmarks

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Factors to Consider

- Fishery importance – value at the national and regional scale
- Ecosystem importance – role of stock in regional ecosystem
- Stock status –degree of fishery impact on the stock
- Stock biology – scale of expected fluctuations
- Assessment history – is upgrade or update needed?

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Target Assessment Level

- Level 1 (trend monitoring) for stocks with low fishery importance and low vulnerability to overfishing
- Level 3 (non-age structured, e.g. biomass only) for moderately important stocks with low natural fluctuation
- Level 4 (age structured) for high fishery importance demanding closer tracking of fluctuations

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Stock Biology Factors

- Inertia to change due to the accumulation of age groups in the stock. Measure as mean generation time at recent F level, or proxy
- Tendency to change due to annual fluctuations in recruitment and other natural factors
- Age at recruitment to fishery which determines time lag to react to the recruitment fluctuation

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Target Assessment Frequency

- Start with fraction of generation time of stock at recent F (inertia to change)
- Adjust shorter/longer according to degree of recruitment fluctuation
- Adjust shorter for high fishery importance and management need
- Adjust shorter for stock status (high F, low biomass)

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Possible Stock Status Factor Levels

Fishing Rate	Stock Abundance
1 <75% of limit	1 Abundant
2 Just below limit	2 Near target
3 Unknown	3 Below target or unknown
4 Over limit (overfishing)	4 Overfished
	+1 On rebuilding plan

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Assessment History

Issue: assessment update vs. time-demanding benchmark assessment

Factors include:

- New data type or research finding requires benchmark investigation to get reviewed and incorporated into assessment
- Previous assessment noted an issue needing fuller investigation, especially if new data or analysis has promise to resolve the issue
- Several updates have been conducted and accumulated small issues warrant benchmark

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Assessment Priority

Previously assessed?

NO

PRIORITY FACTORS

- Stock vulnerability to overfishing
- Fishery importance
- Ecosystem importance
- Approx. stock status

YES

PRIORITY FACTORS

- Fishery importance
- Due rel. target frequency
- New information to resolve past uncertainty

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Using Assessment Priorities

Prioritization of the stock assessment and survey capability requirements provides an important framework for directing NOAA's scientific innovations.

Annual Catch Limit Mandates

↓

Stock Assessment Priorities

↓

Survey Capability Requirements
- precision and accuracy
- calibration
- survey coverage

←

Advanced Sampling Technologies
- research & development
- transition into survey operations

Regional and national workshops underway to develop strategic plan for cost-effective investments to improve survey capabilities with innovative technologies.

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Goal for 2012

- Draft prioritization report and priority factors database
- Circulate approved draft to Councils for comment
- Complete report
- Distribute report and database access to Science Centers and Councils to inform and guide their within-region stock assessment prioritization
- Use results to inform allocation of new/existing/reduced funds among regional programs

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Questions