Data needs for stock assessment

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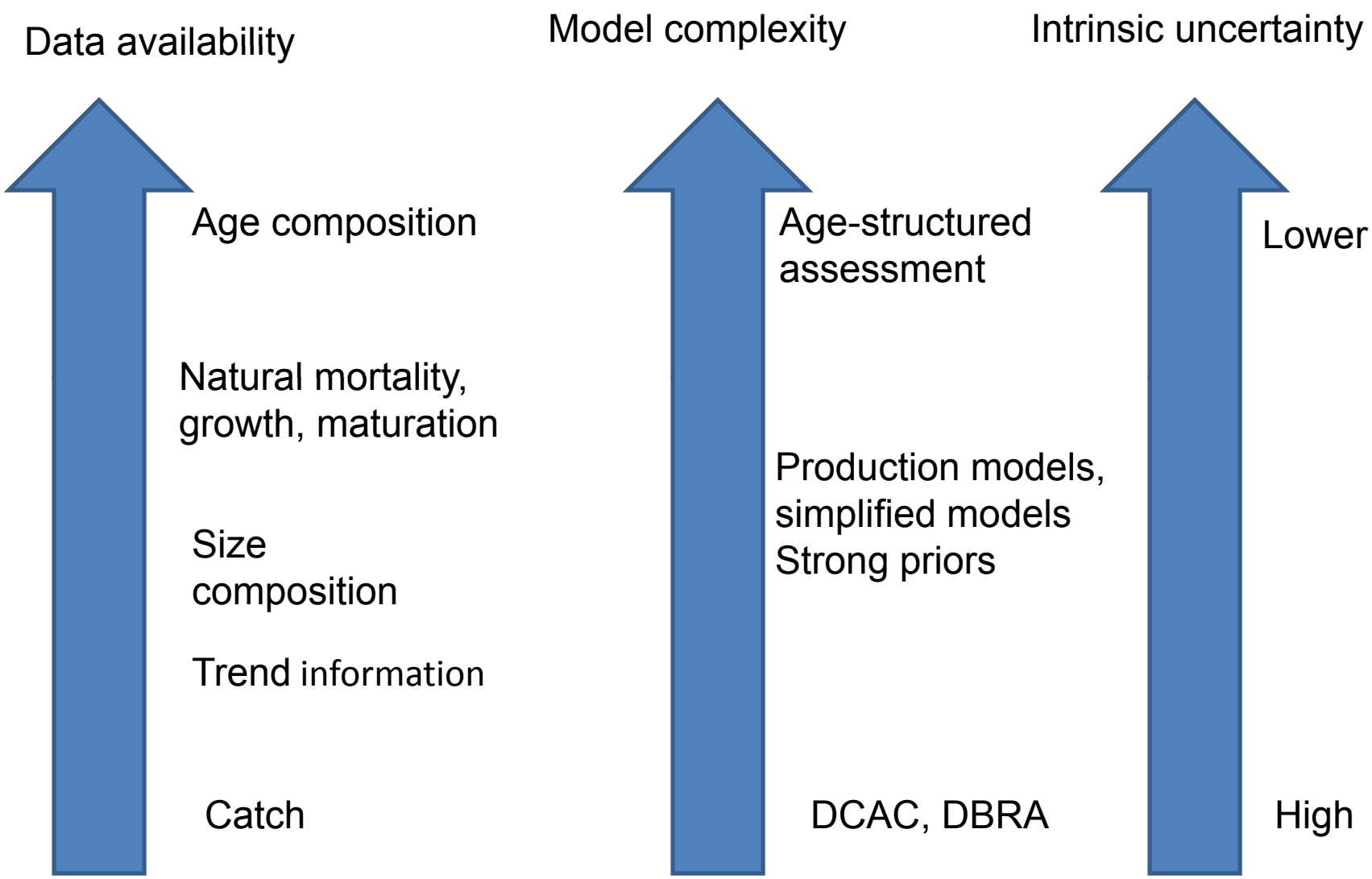
The Basics

- Catch data
  Landed catch, discard, effort, size/age composition, spatial and seasonal patterns

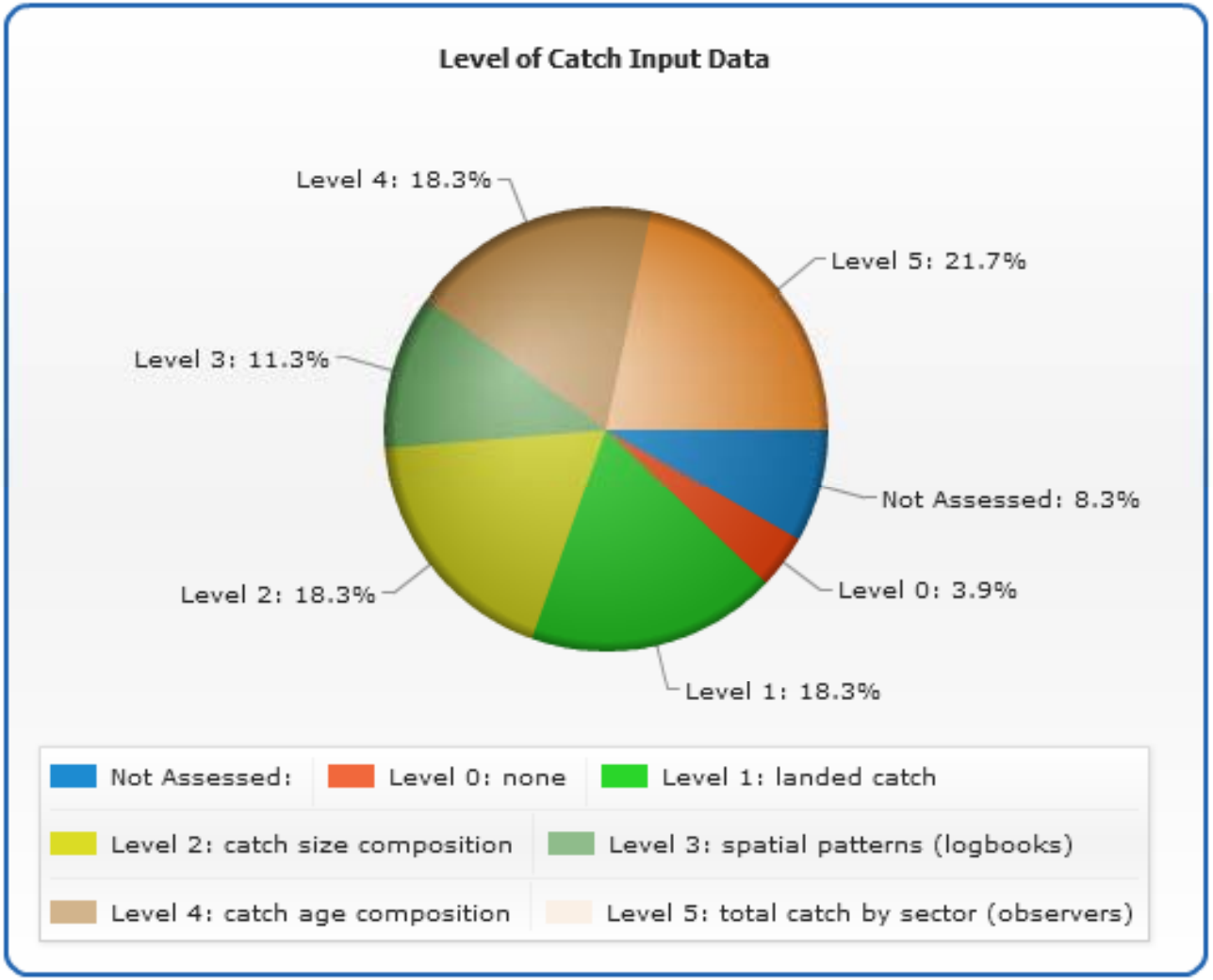
- Abundance trends
  Fishery CPUE, survey CPUE, absolute abundance estimate, size/age composition

- Life history information
  Longevity/natural mortality, growth, maturation, diet

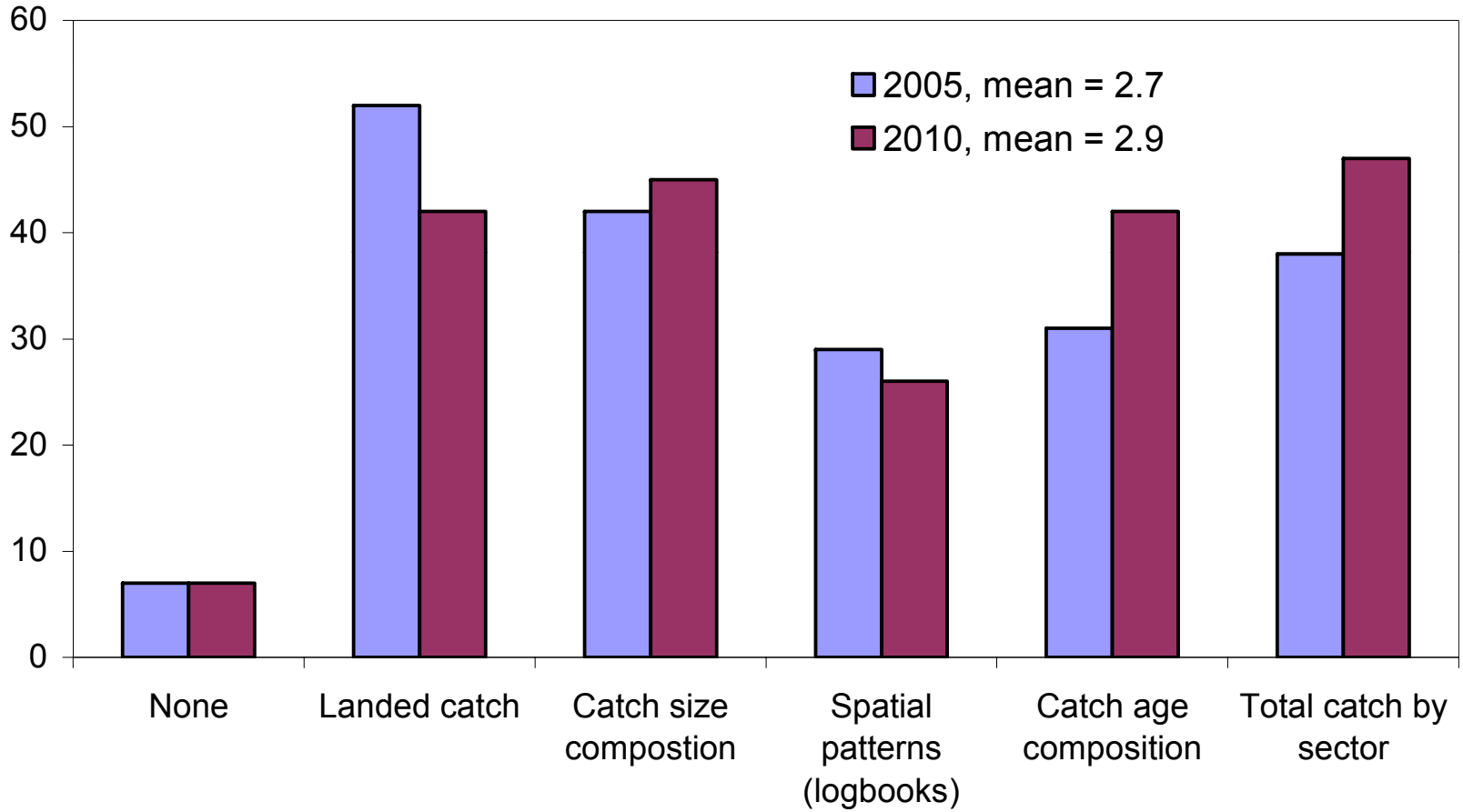

Data availability
Age composition
Natural mortality, growth, maturation
Size composition
Trend information
Catch
Model complexity
Age-structured assessment
Production models, simplified models
Strong priors
DCAC, DBRA
Intrinsic uncertainty
Lower
High

Summary of catch input data for FSSI

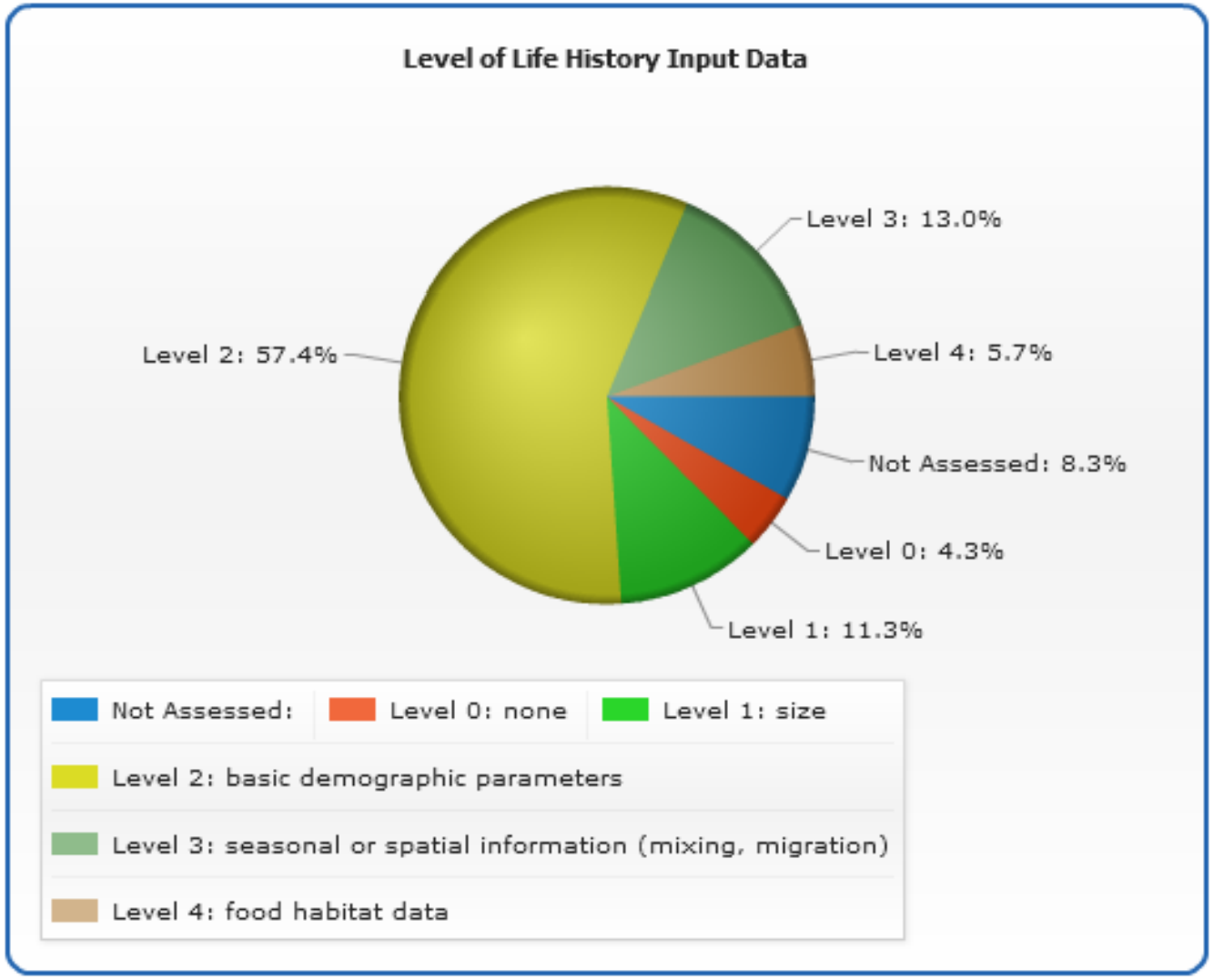
https://www.st.nmfs.noaa.gov/sisPortal/sisPortalMain.jsp



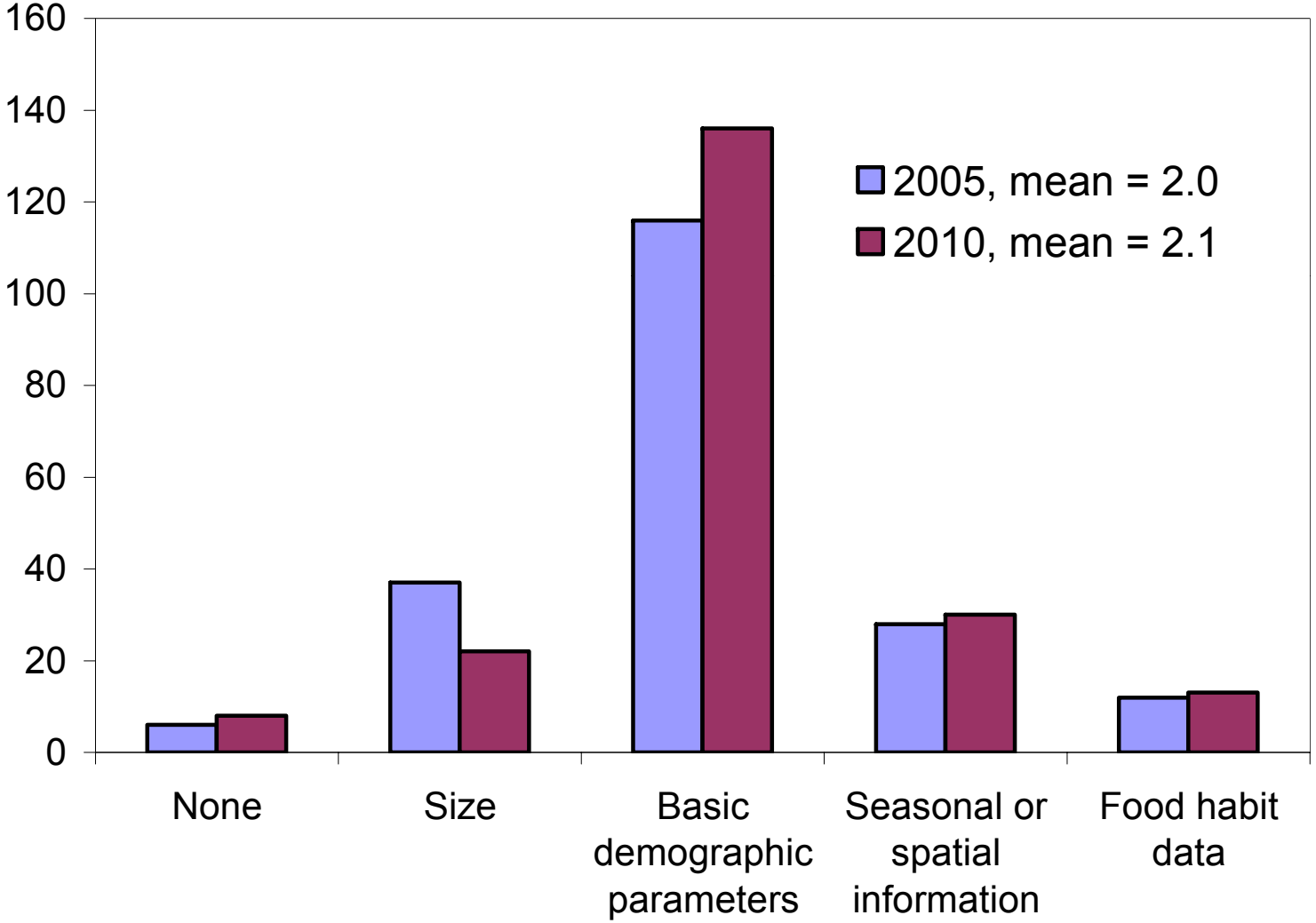
Modest gains in the availability of catch data



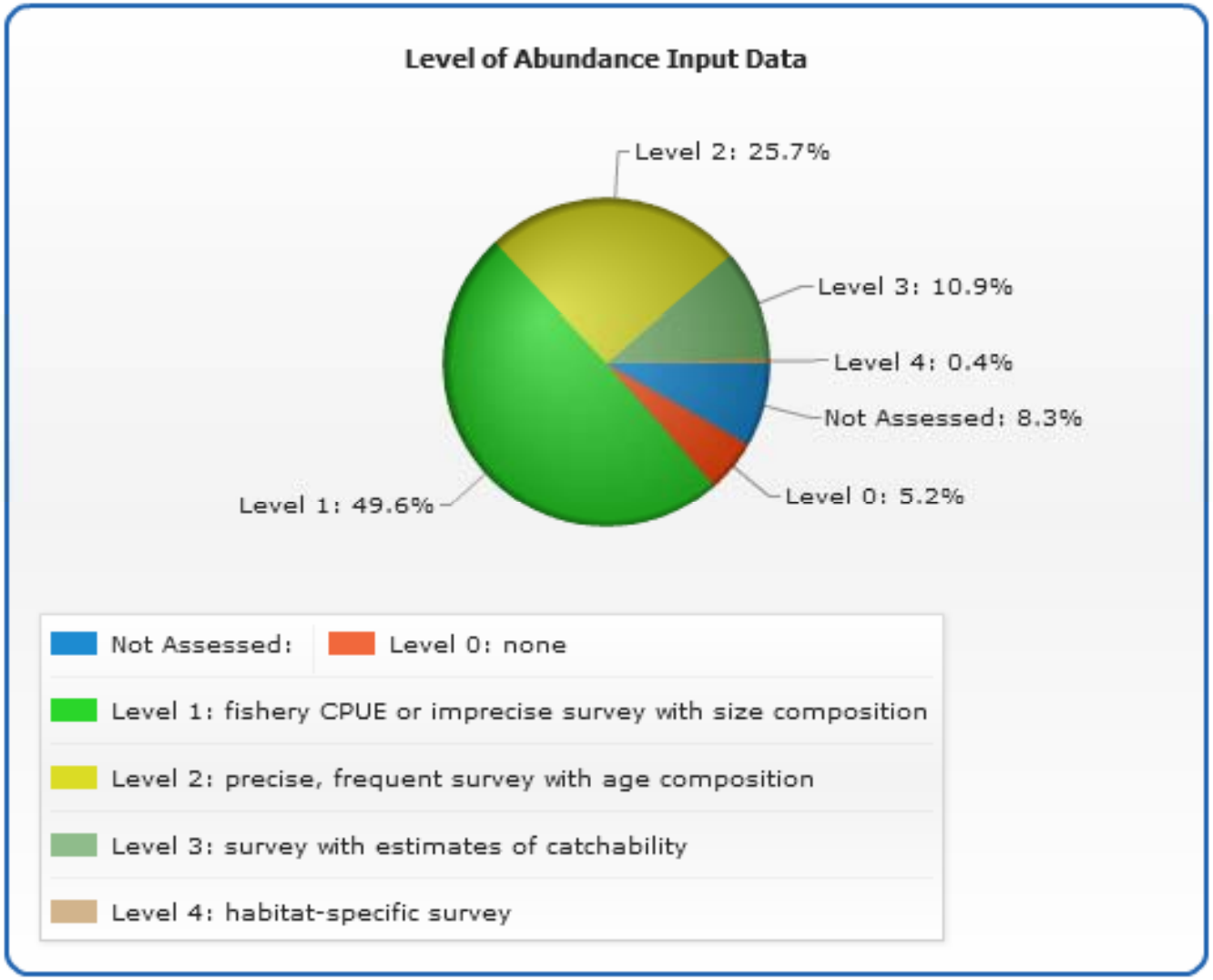
Summary of life history data for FSSI



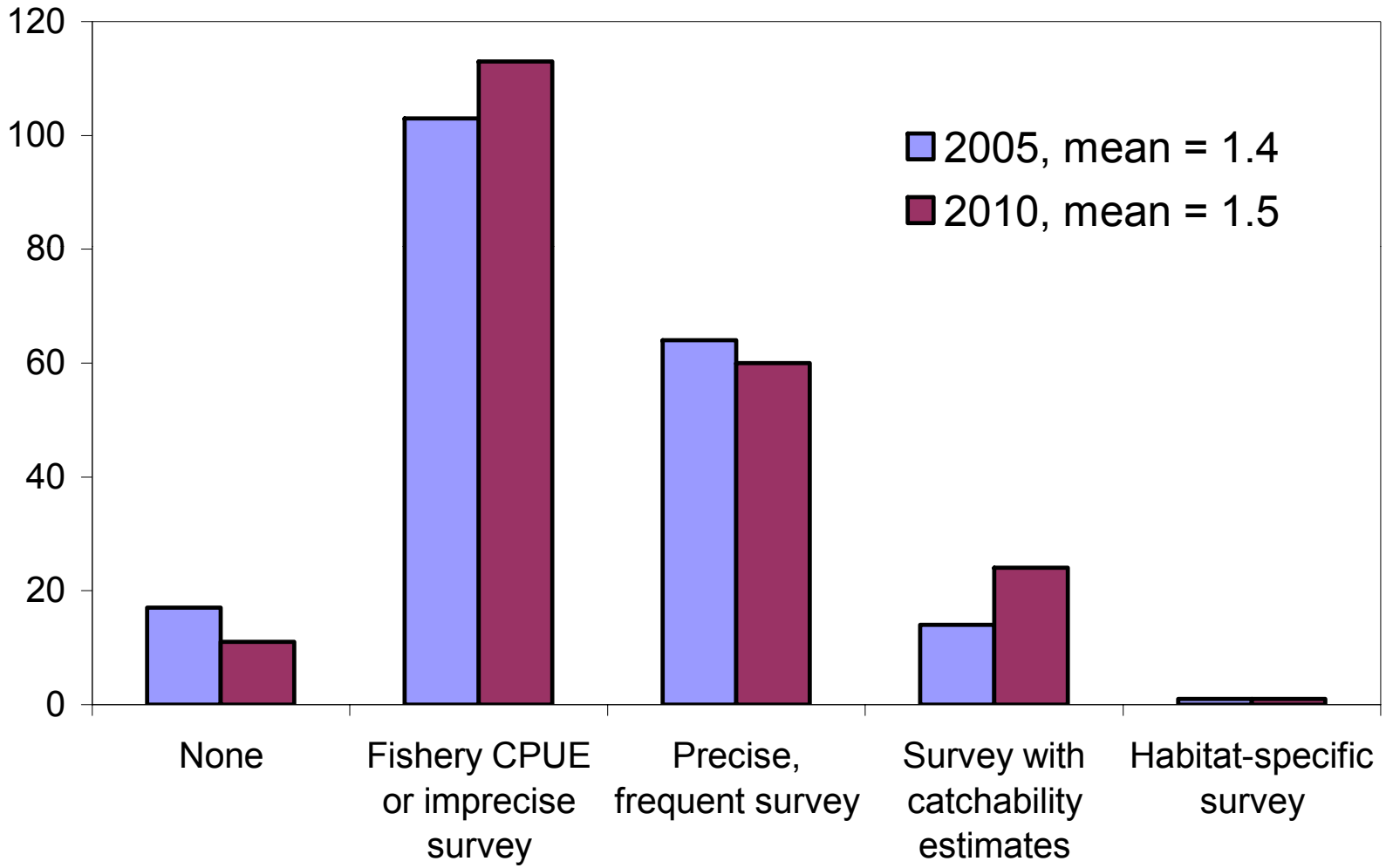
Modest gains in the availability of life history data



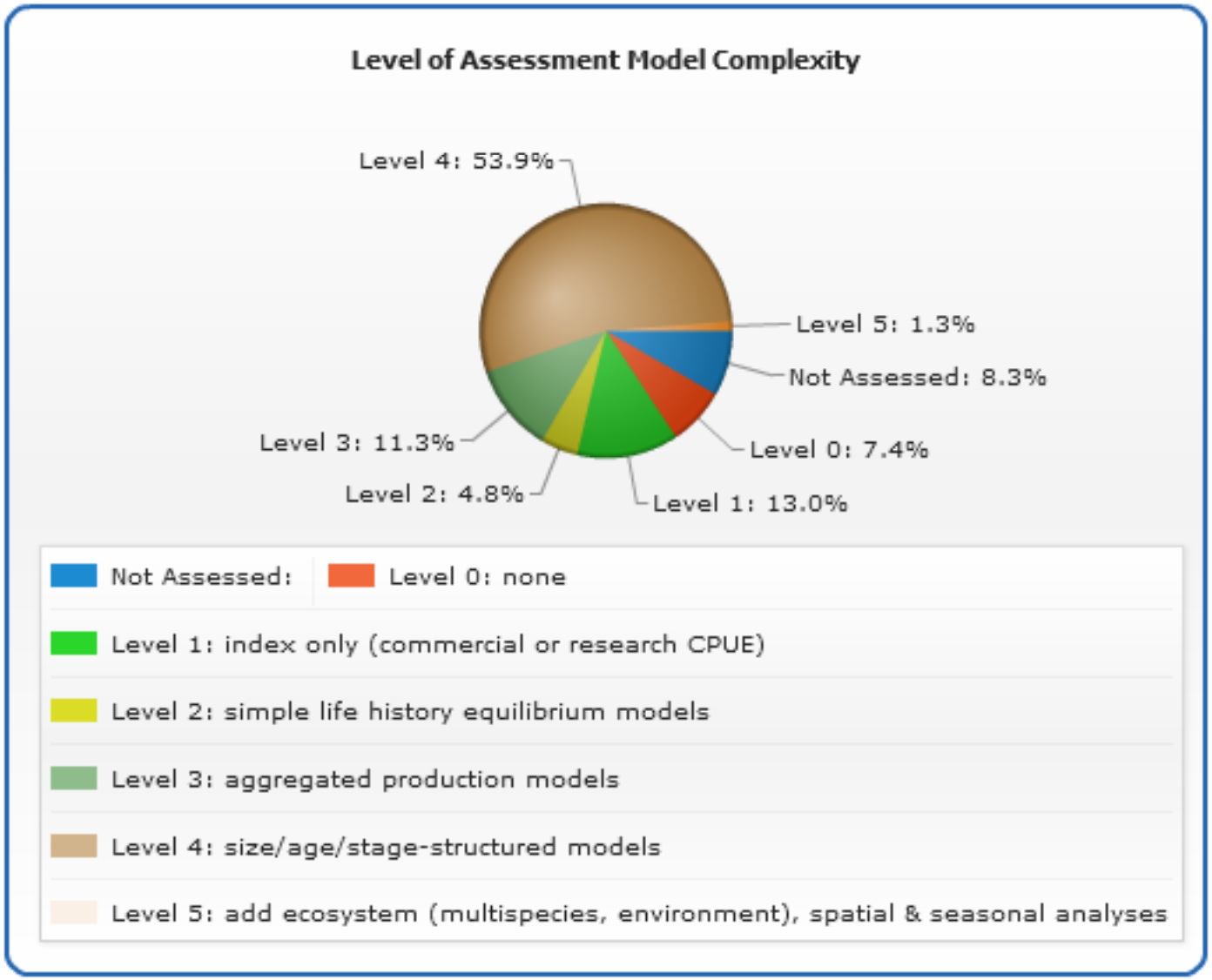
Summary of abundance trend data for FSSI



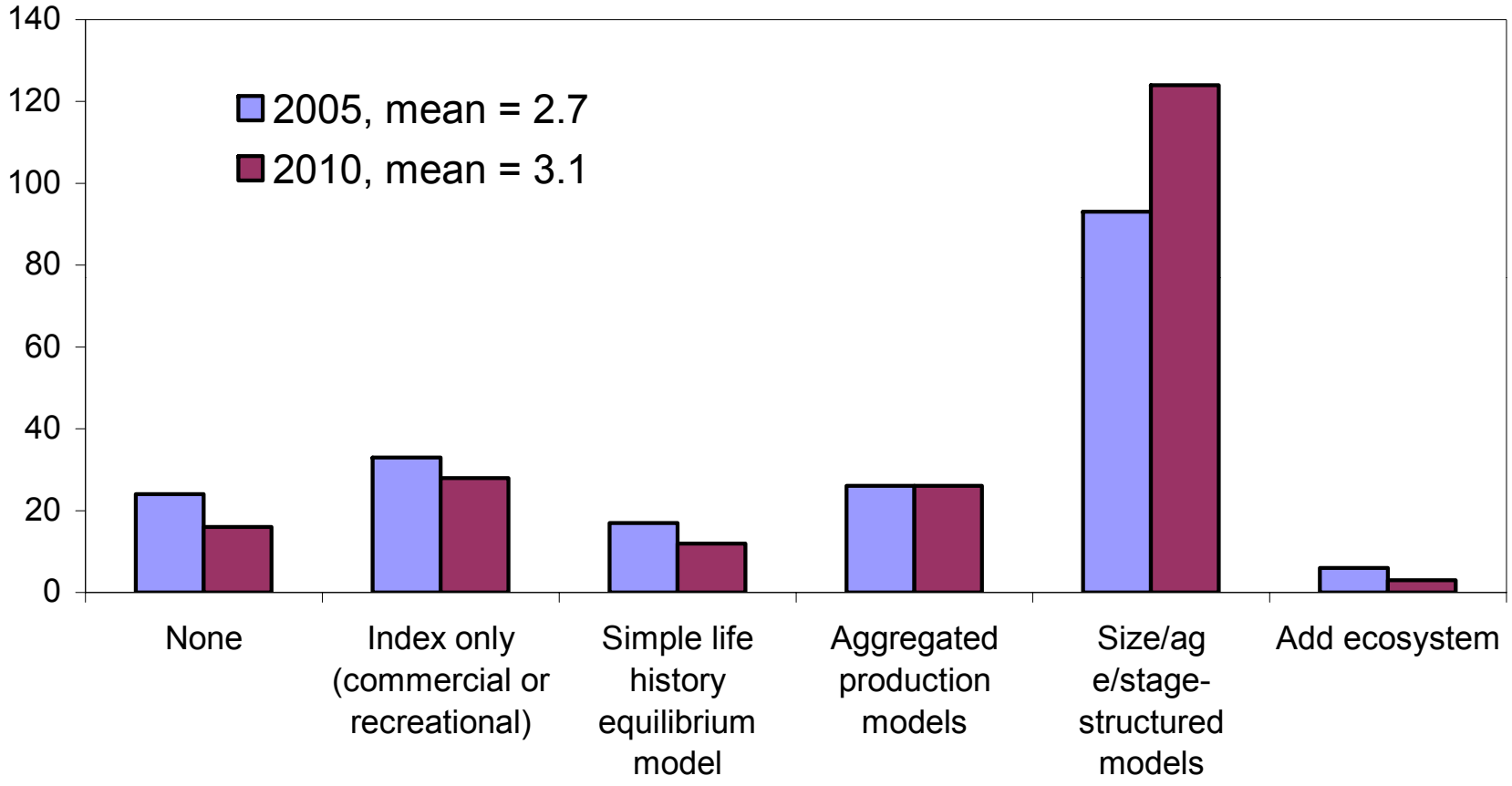
Modest gains in the availability of abundance trend data

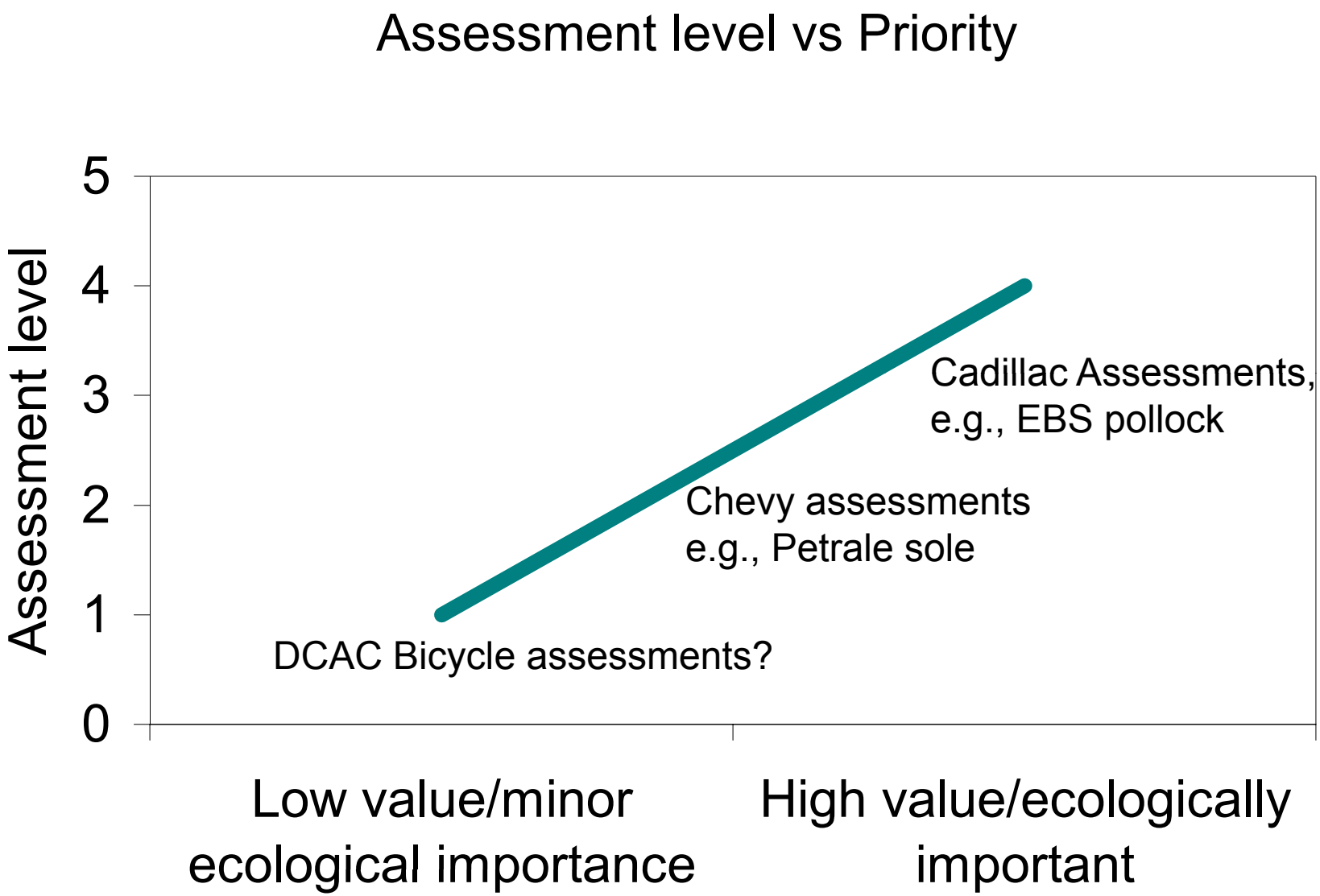


Summary of model complexity for FSSI



Increases in model complexity!




Assessment level vs Priority
Assessment level
5
4
3
2
1
0
Cadillac Assessments,
e.g., EBS pollock
Chevy assessments
e.g., Petrale sole
DCAC Bicycle assessments?
Low value/minor
ecological importance
High value/ecologically
important

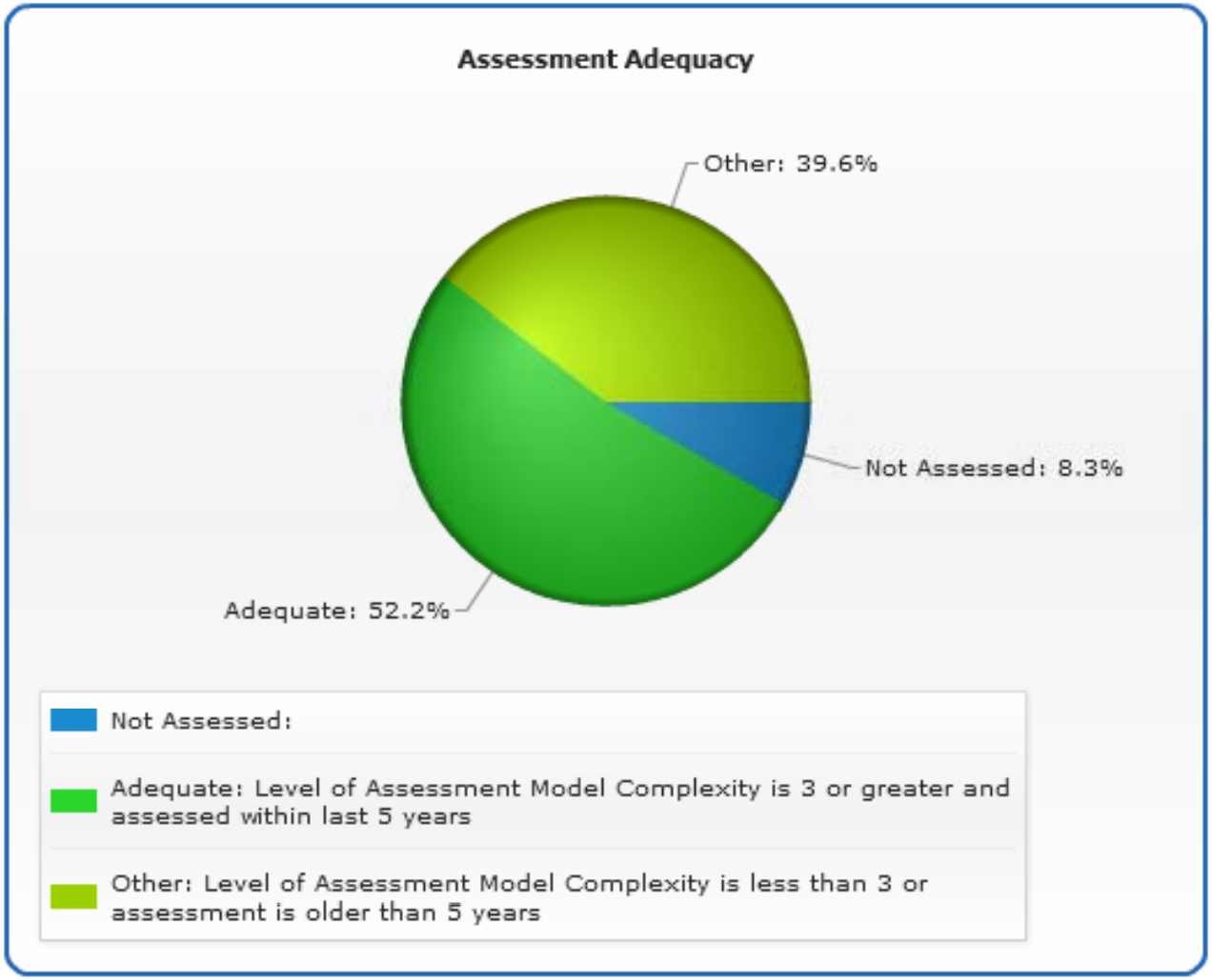
Northeast Groundfish: surveys to assessments

Survey/index	Number of assessments supported by survey			
	Level 1	Level 2	Level 3	Level 4
NEFSC Autumn Trawl	12	2		25
NEFSC Spring Trawl	6	2		22
DFO Trawl				5
NEFSC Scallop Dredge				2
NEFSC Clam Dredge				2
NEFSC Acoustic				1
State Surveys	1			10
Shrimp Survey				2
Comm CPUE	2	1	1	2
MRFSS/MRIP				2

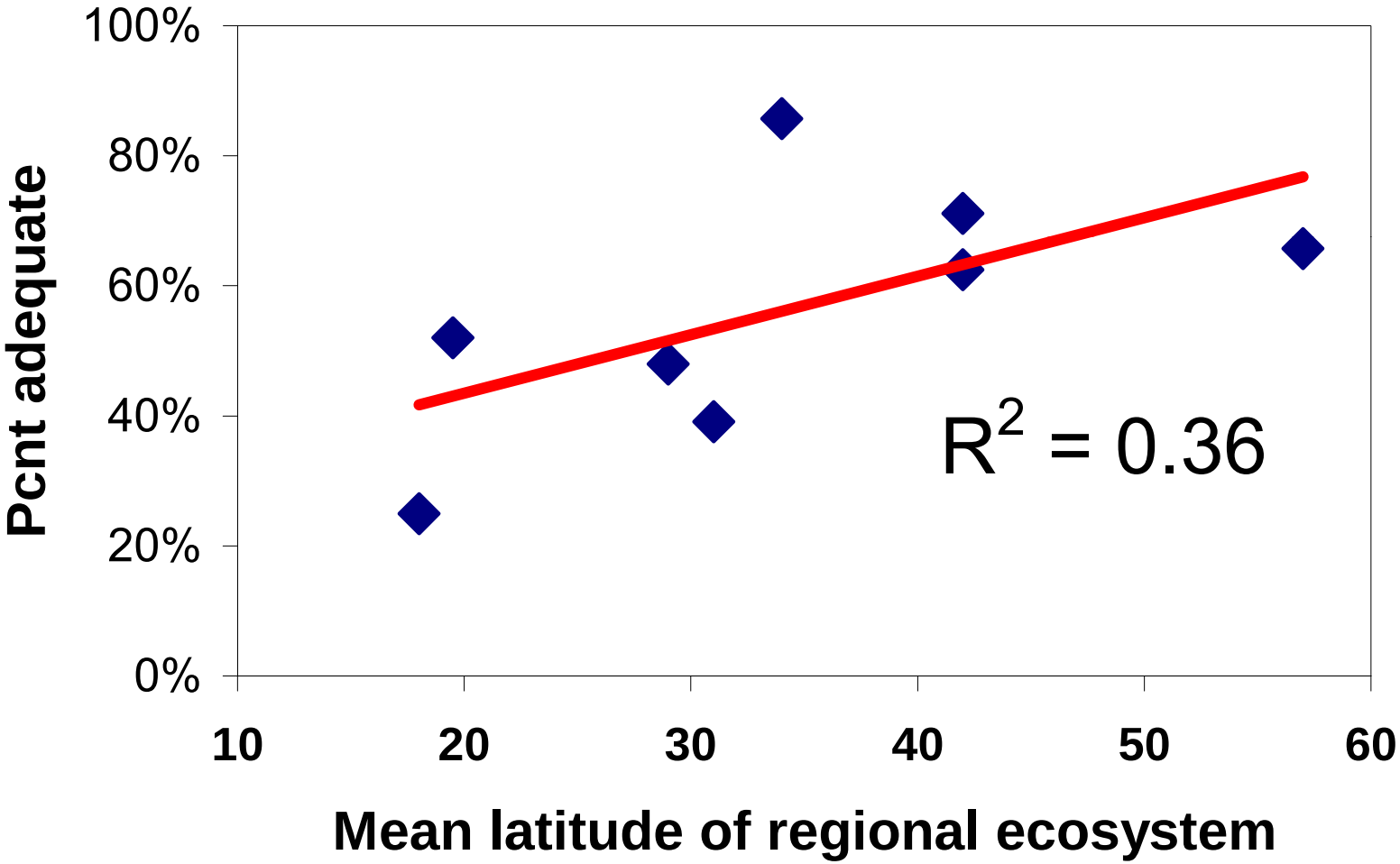
Gulf of Mexico: surveys to assessments

Survey/index	Number of assessments supported by survey			
	Level 1	Level 2	Level 3	Level 4
SEAMAP Fall Trawl				6
SEAMAP Summer Trawl				4
SEAMAP Ichthyoplankton				3
SEAMAP Video/Trap				6
SEFSC Bottom longline				5
Misc. local surveys			3	4
CPUE only	2	2	6	2

Summary of assessment adequacy for FSSI



Changes in latitudes, changes in attitudes?



Survey and Assess paradigm (SAP)

- Standard tools of fisheries science, resource surveys and quantitative stock assessments, were developed for temperate and subarctic marine ecosystems (ICES, Woods Hole, Seattle).

- Legislation and NS1 guidance is largely aimed temperate ecosystems

- North: Low species diversity, relatively young ecosystems, trawl and acoustic surveys effective, ageing feasible.

- South: High species diversity, mature ecosystems, trawl surveys not so effective, ageing more difficult/expensive.

Strategies for progress

Current model (clear-hold-build):

- Establish a minimum standard.
- For stocks below the standard, raise to standard, one by one.
- For stock above the minimum standard, attempt to maintain currency.

Perhaps this strategy needs to be re-thought given the ACL requirement that every stock must be assessed in some fashion.

Some suggestions

All stocks need to be moved immediately into some minimal assessment (Average catch, DCAC, etc).

Develop and apply simple “ruggedized” assessment tools with available trend information and/or size composition to many stocks.

- Could be used to set ACLs, but would not necessarily be used for status determination.
- At-risk stocks would be elevated to high priority for more detailed assessment.
- Identify indicator species that can represent stock complexes.
- Let’s not kid ourselves that resources will be available to raise all stocks to the current minimum standard.

Fishery dependent vs fishery independent data

• Is this an artificial dichotomy?

• Scientific surveys are refined/standardized adaptations of commercial fisheries (there are some exceptions).

• A gradient exists between fishery-dependent CPUE and standardized surveys.

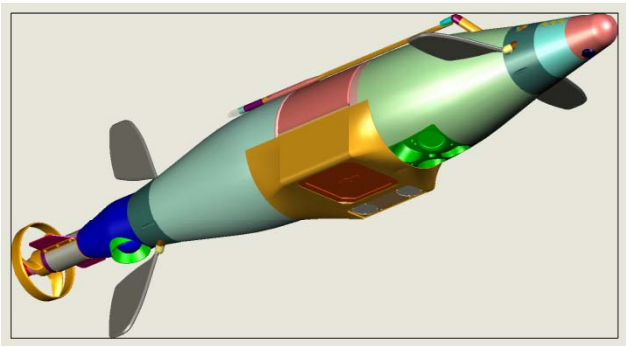
Fishery CPUE ⟷ FSV surveys

Examples:
– Surveys from chartered vessels
– Fixed station samples from fishing vessels
– Automated data collection from fishing vessels
– GLM modeling of fishery CPUE data

Cooperative research (first thoughts)

- Catch shares can lead to strong incentives to improve assessments
- Initial motivation is often to get more fish
- Tends not to fit well within current institutional structures in NMFS
- Legislation isn’t favorable for self-funding cooperative research
- Novel funding strategies are often required.

FSVs and Complimentary Advanced Sampling Technologies

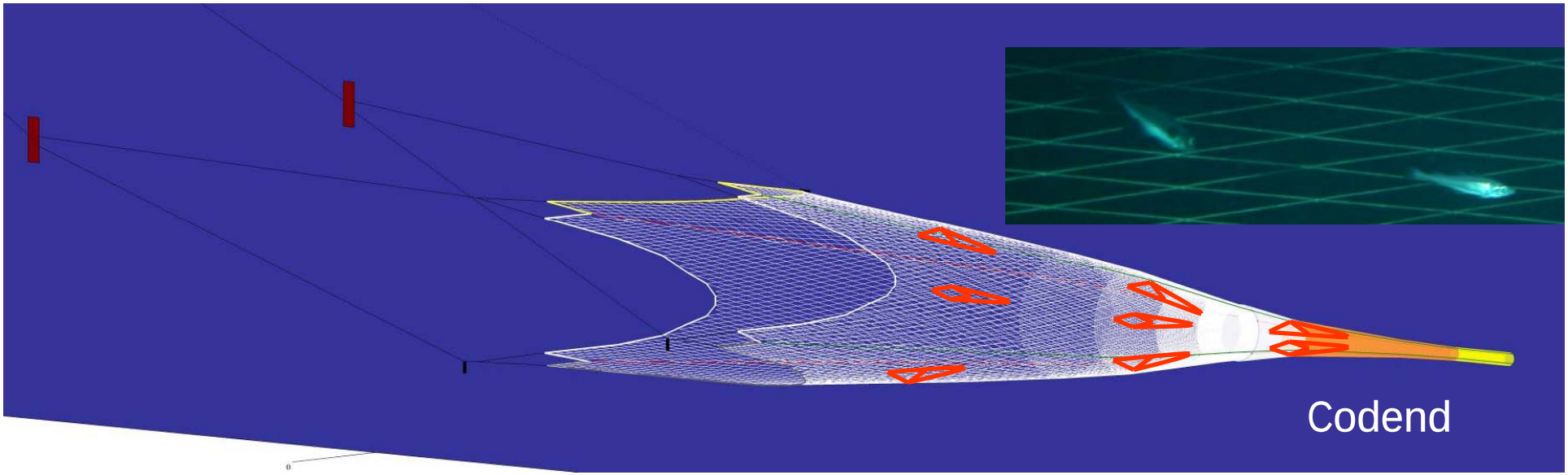


- No single technology or platform can provide all the necessary information on all the time- and space-scales that are vitally important to ecosystem-based stock assessments.
- Therefore, NOAA continues to invest in advanced sampling technologies, including sensors (acoustic echosounders, tags, lidar) and platforms (buoys, AUV, ROVs) that are complimentary and facilitate the sampling of different aspects of marine ecosystems.
- FSVs, however, remain the ***primary platform*** for studying, mapping, and monitoring the distributions and abundances of LMRs and their habitats. State-of-the-art FSVs:
  - support traditional capture techniques;
  - carry full suites of oceanographic and biological sensing instrumentation, and
  - often serve as the hub and deployment platform for other promising advanced technologies.

Advanced technology and stock assessment

- New surveys?
- Add value to existing surveys
  - Experiments to inform selectivity
  - Experiments to inform catchability
  - Absolute abundance vs relative abundance?

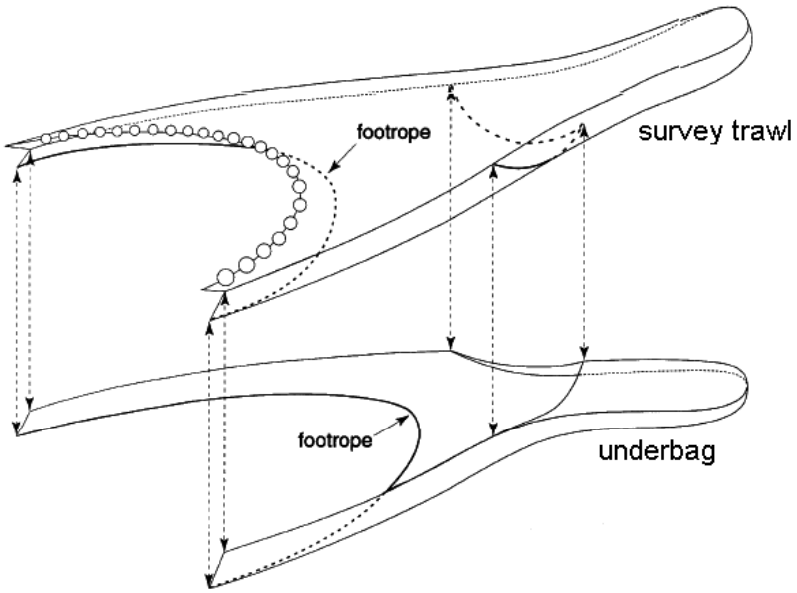
Estimating midwater trawl selectivity using pocket nets

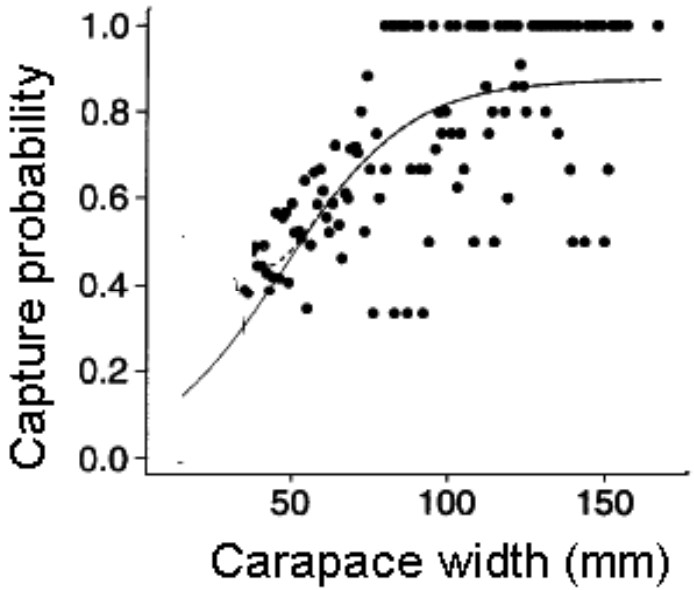


Estimating survey catchability for Bering Sea Tanner crab

Conduct experiment using underbag to collect escaping crab

$$Capture\ probability = \frac{Catch\ trawl}{Catch\ trawl + Catch\ bag}$$





Final comments

- Basic stuff
  - Catch of record
  - Inventory studies of age/growth/maturity
  - Improved quantification of effort

- Ancillary research to improve existing time series (experiments to estimate selectivity and catchability)

- Promote cooperative research efforts

- The economics of stock assessment
  - High tech-high cost solutions vs low tech-low cost appoaches
  - Incentives for reducing uncertainty (and economic costs of loss of sea days on FSVs).