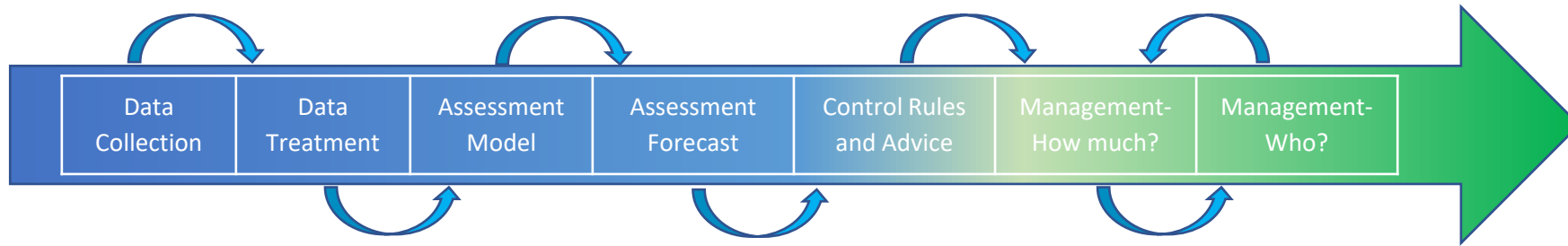


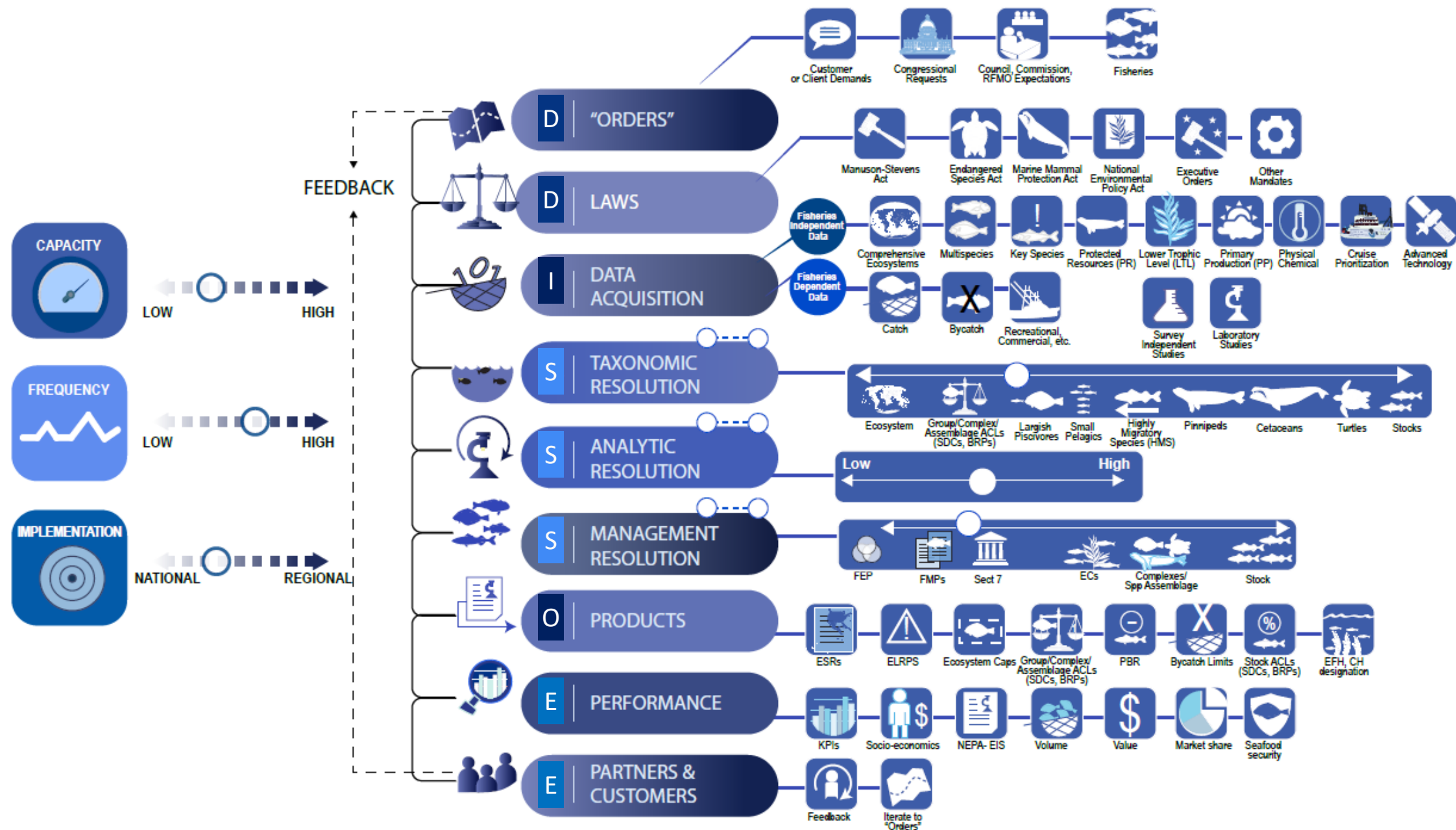
Portfolio Analysis

Howard Townsend, Jason Link Chris Kelble

NOAA Fisheries

Should be viewed as part of a process (or work flow)
which combines a set of (different) analytical methods

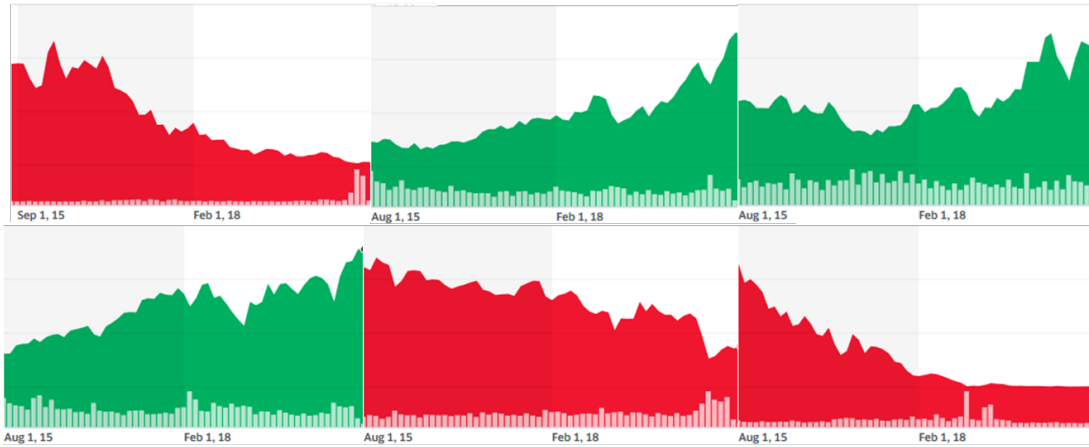




Summary Up Front

- Method description: [Portfolio Analysis](#)
- Data inputs (especially critical data and their viability now and in the future): [Landings data \(both mass and value\), either commercial or recreational \(or both\)](#)
- Analysis/data output summary: [Portfolio Frontier Curves, risk gaps](#)
- How this method can inform management: [Potential Fisheries Performance Indicator, useful to evaluate Mgt Scenarios risk and return](#)
- Caveats for this method: [Needs reliable economic data, typically value, of catches; can be based off of other measures](#)
- Previous applications of this method: [multiple, see list](#)
- Any graphs or diagrams to show for this method: [see more info](#)

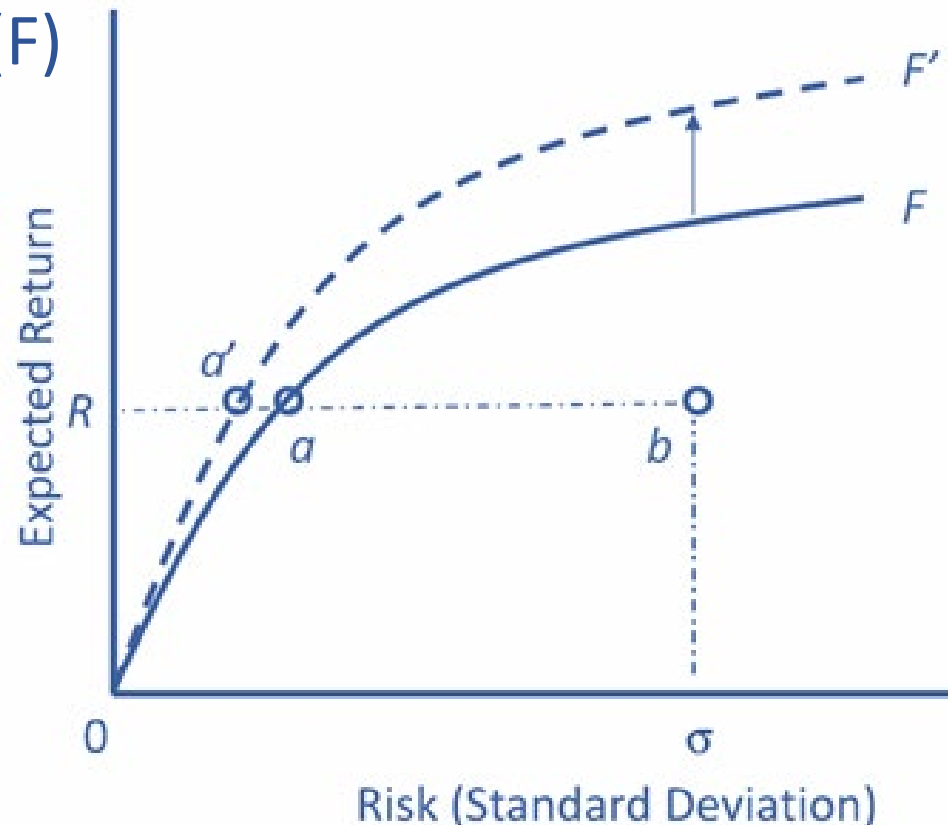
Multispecies Portfolio Management

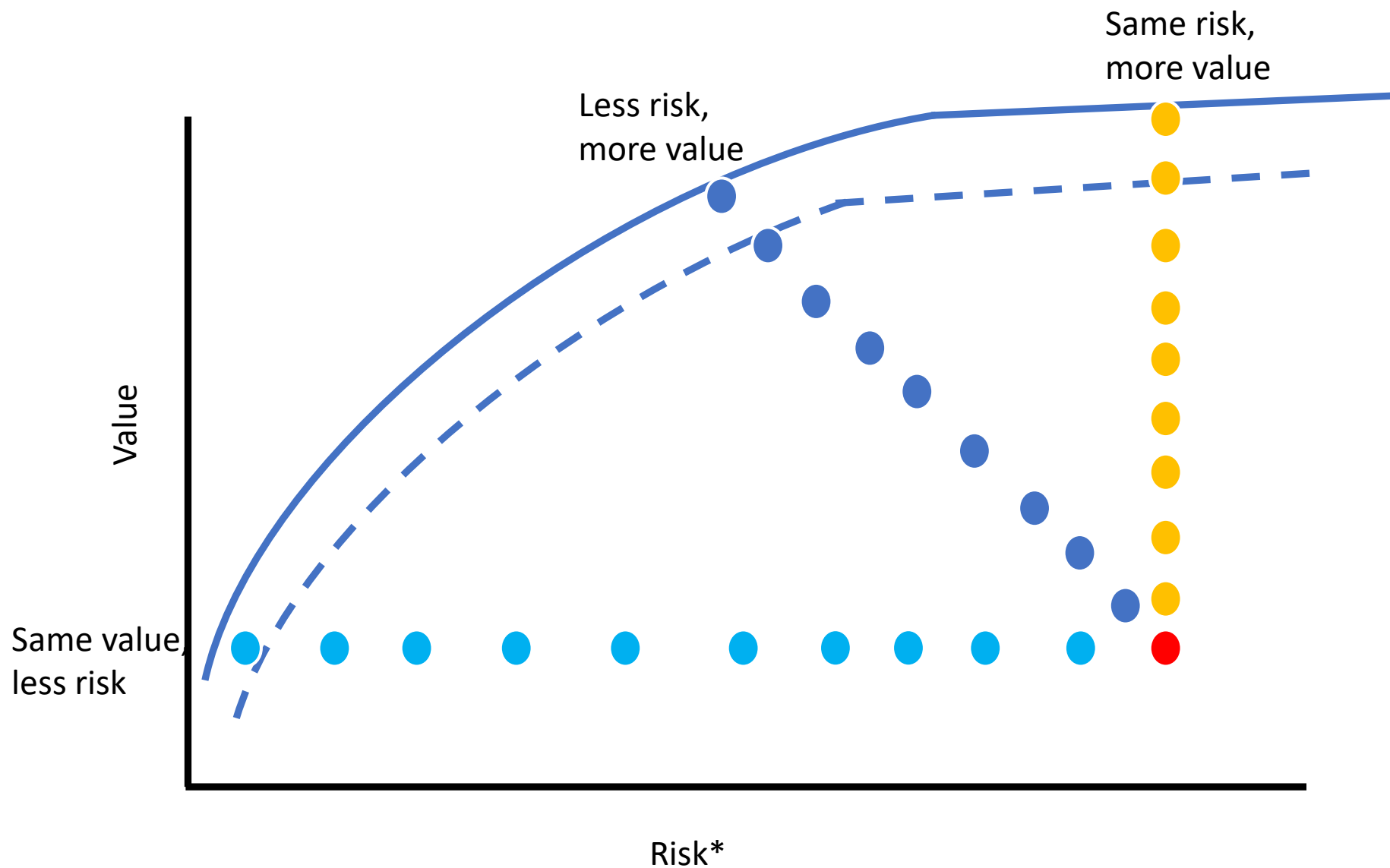


- As with a financial stock portfolio, the emergent properties of a diverse portfolio of management units will be more stable than any one unit on its own.
- Portfolio approaches and theory have been explored for marine fisheries to mitigate risks (e.g., loss in revenue, overfishing, fishery efficiency, market shifts, catchability, climate change impacts, etc.).
- This approach represents a systemic treatment of all stocks or fisheries in an ecosystem and focuses on the aggregate dynamics of a group of management units (e.g., many species or populations).

Multispecies Portfolio Management

- Theoretical studies demonstrate that the further away from the “**efficiency frontier**” that a set of aggregated landings is, the more risk is incurred, and the less economic yield is obtained.
- Also that more aggregated estimates of **efficiency frontier (F')** outperform single stock-based approaches (F)

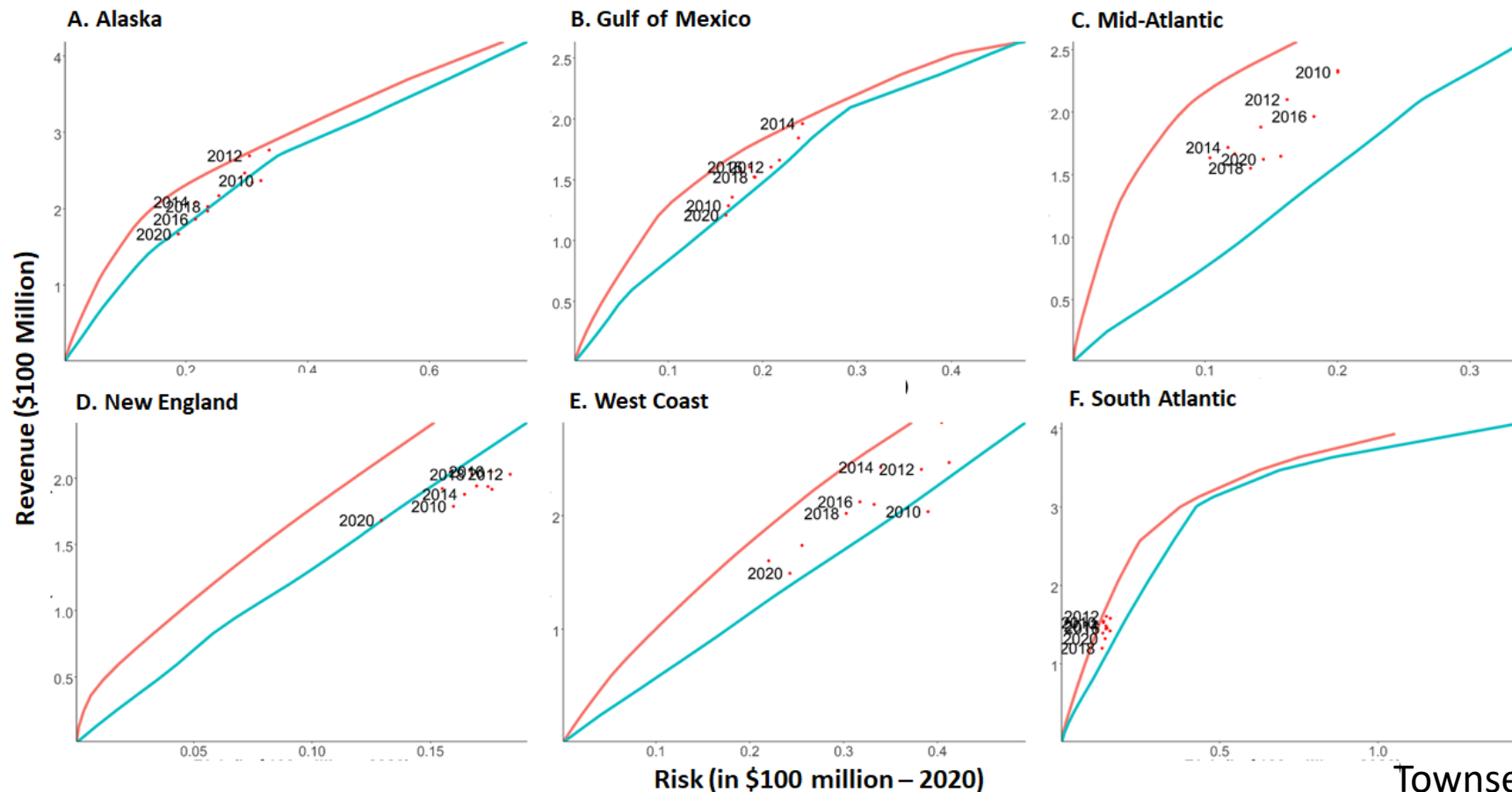




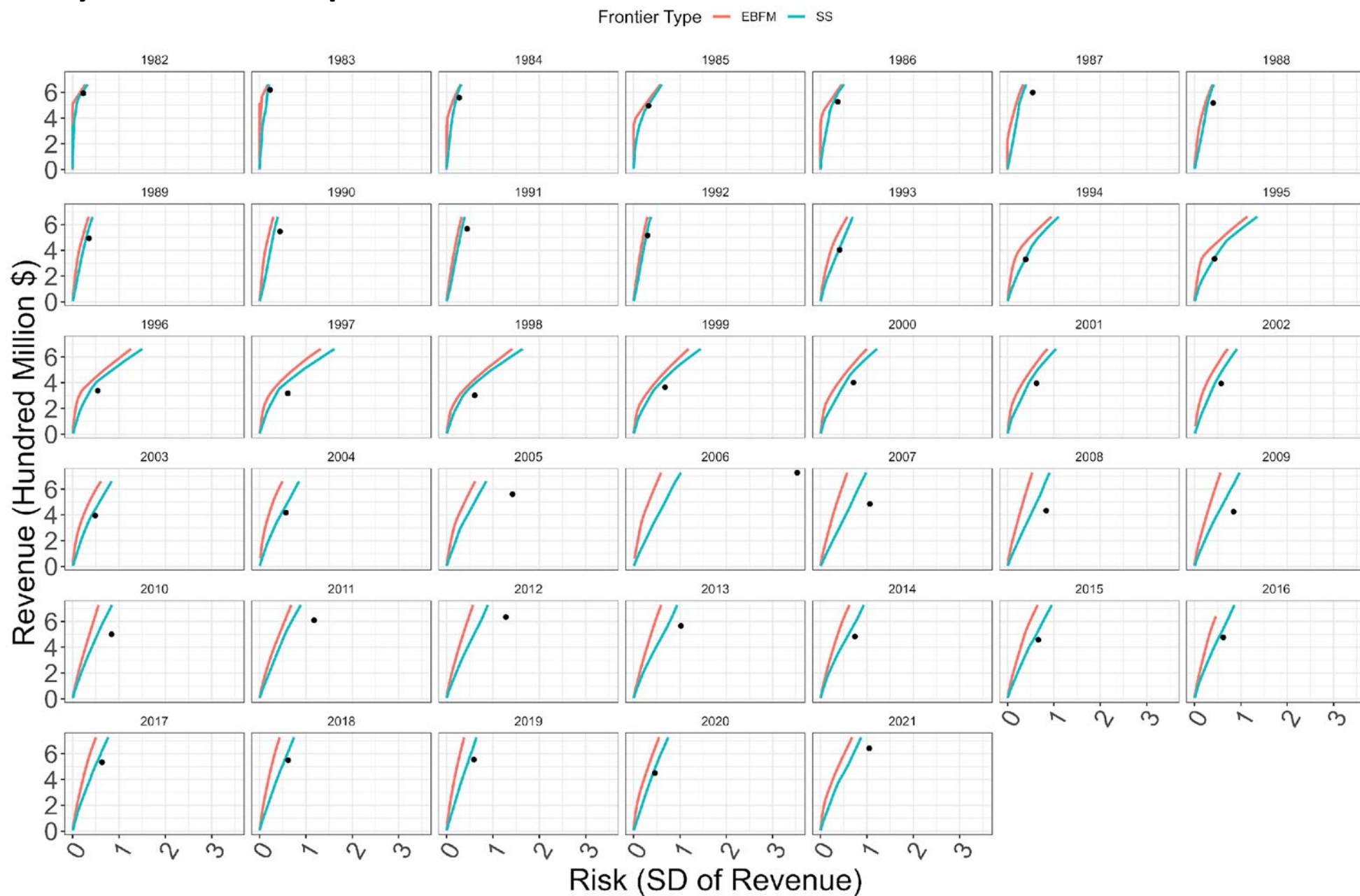
*Beyond ACL, OFL, etc., but
variance of value

Multispecies Portfolio Management

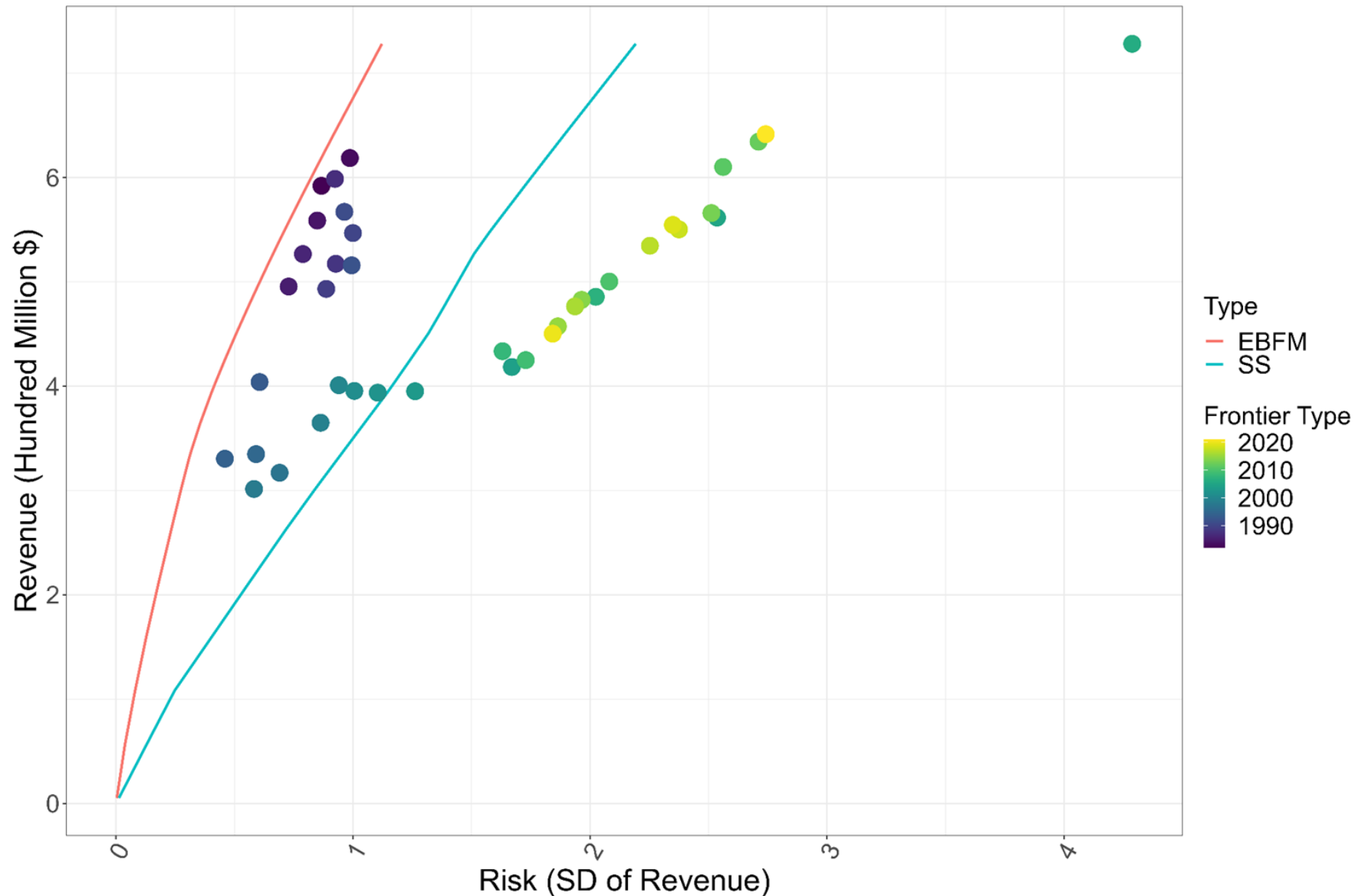
- Portfolio Estimates for all regions feasible in US using Nat'l Landings dbs
- Demonstrate relative benefits to meet the regulatory mandates of maintaining stock status
- Can help to facilitate the implementation of ecosystem-based fisheries management



Dynamic plots as well- c.f. Jin et al. 2016

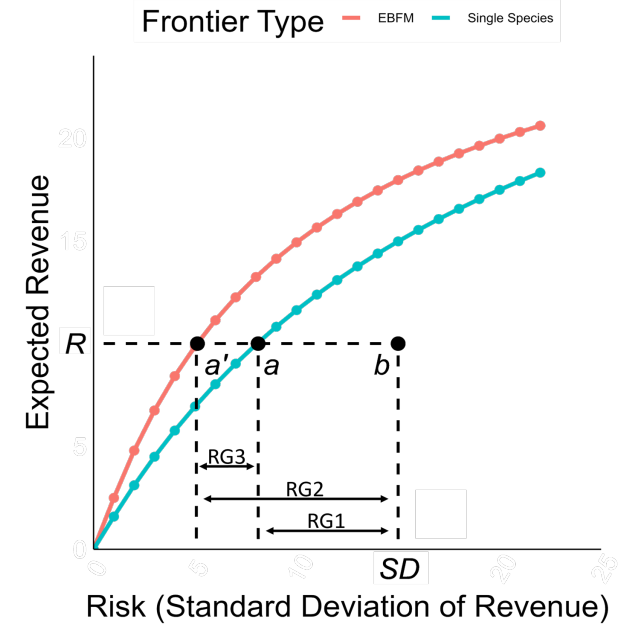
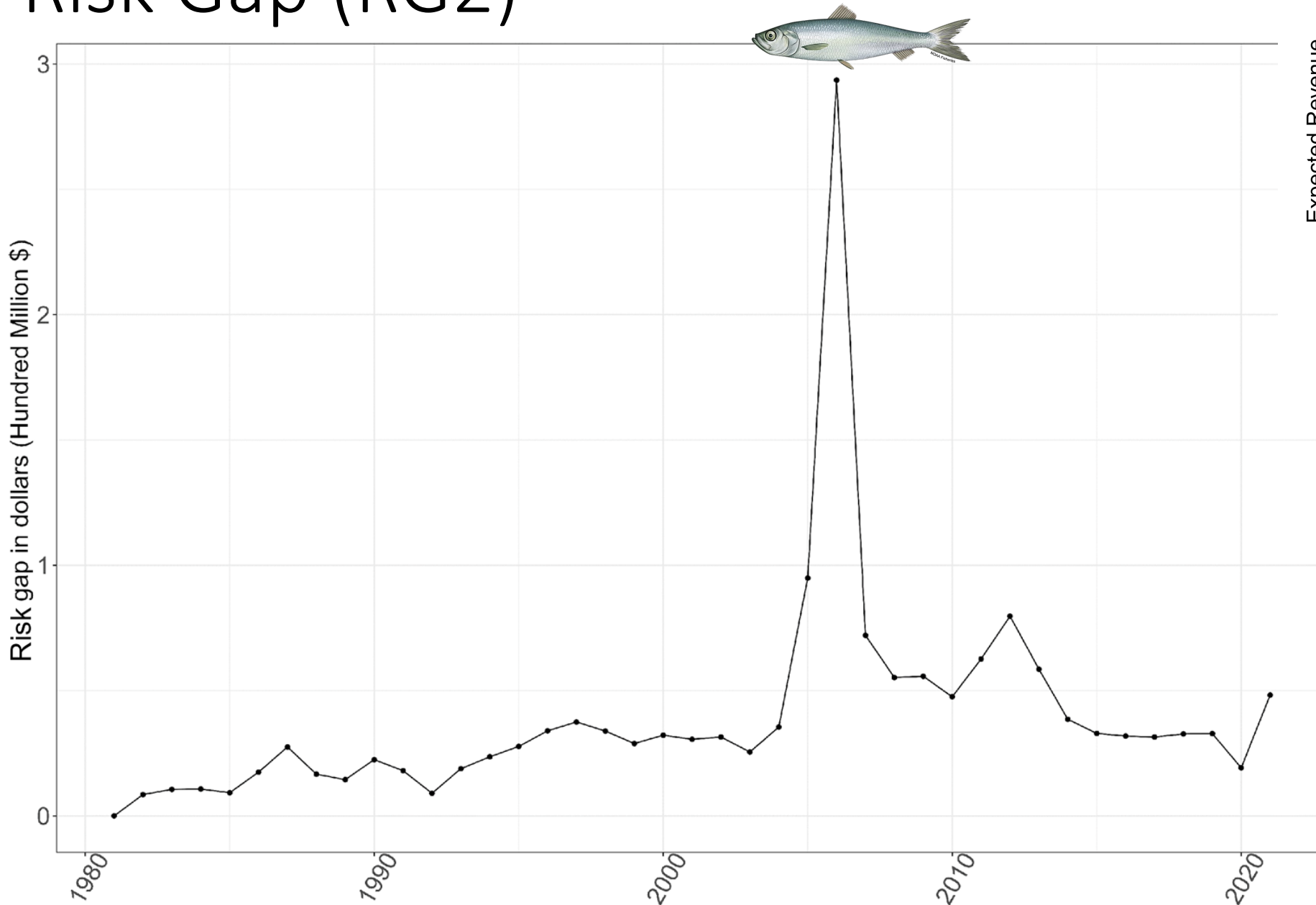


Static plot- c.f. Sanchirico et al. 2008



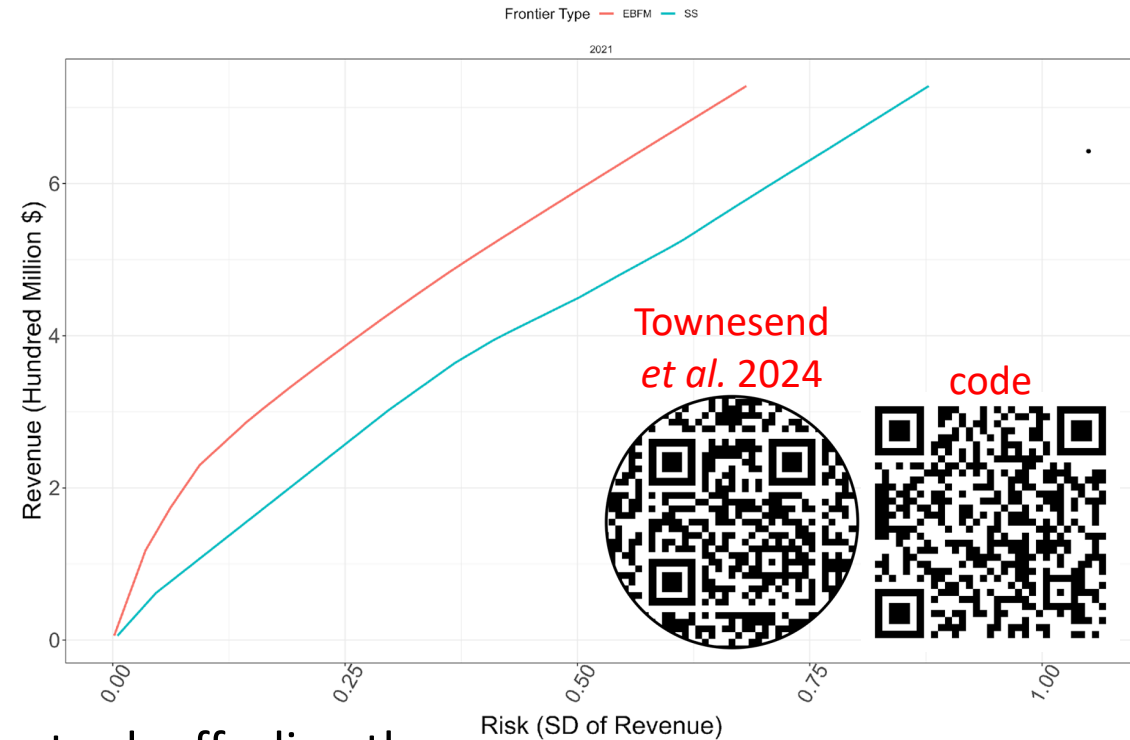
- Simpler visualization
- Risk associated with each year of observed revenue (colored dots) is calculated using the covariance matrix for the full time period, matching that which is used to generate the frontier
- To make each frontier more applicable when plotted with the observed revenues, the time series could be broken into shorter stanzas.

Risk Gap (RG2)



Conclusions/Background

- Collaboration with regional experts is essential for understanding species interactions, management decisions and appropriate data and model decisions
- There are tradeoffs in data decisions (taxa selection and time series) for feasibility and economic benefits, and representing current conditions.
- A complement to other assessment approaches; can address tradeoffs directly
- Code publicly available (evolving)!
- [Been reviewed and being considered in NEFMC and SAFMC SSCs](#)



Further Reading:

Brewster et al. 2025 *NAJFM* 45
Townsend et al. 2024 *Fisheries* 49
Jin et al. 2016 *NAJFM* 36
Schindler et al. 2010 *Nature* 465
Sanchirico et al. 2008 *Ecol. Econ.* 64

Management implications

- Potential Fisheries Performance Indicator
- Useful to evaluate Mgt Scenarios
- Direct evaluation of risk and return for regional fisheries economies

Management Applications

- Has been presented to SAFMC SSC and related committees
- Has been presented to NEFMC SSC
- Being considered as a fisheries performance indicator by those Councils
- Other Councils are exploring them
- Beginning to be reported in Ecosystem Status Reports in various regions

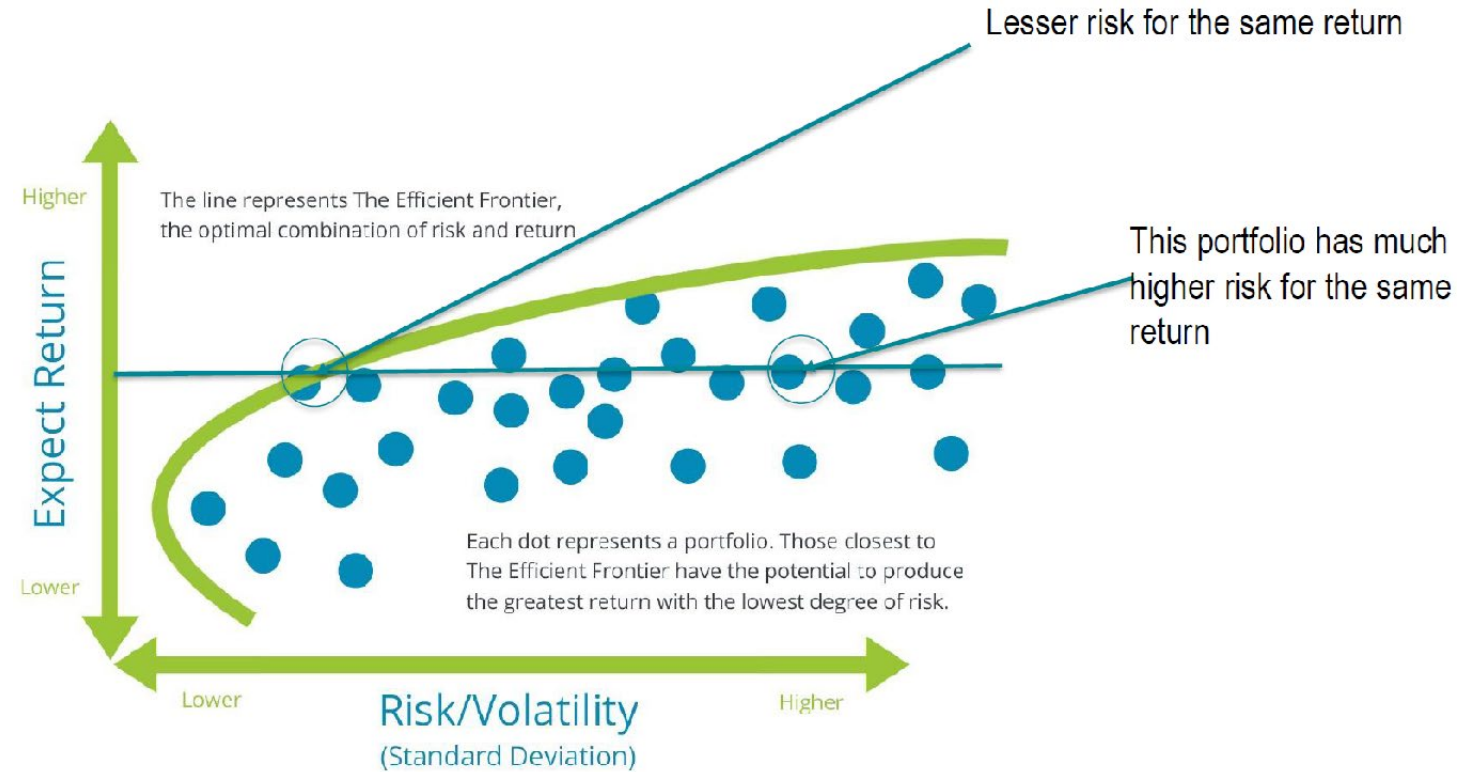
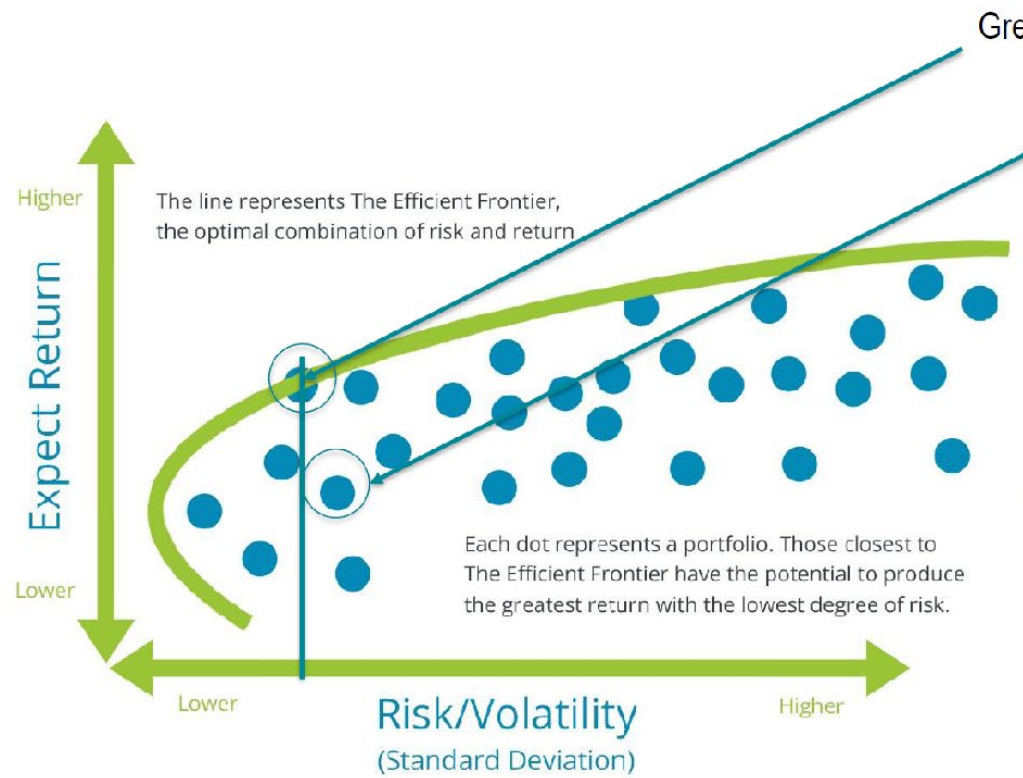
Responses specific to SEDAR 103 and CFMC

- Are the required data currently available for some number of Caribbean species based on the data reviews provided in the Data Webinars? **Partly**
- What species or species groups can the method currently be performed on? **All**
- Does the time step (e.g., day, week, year) required for the method align with currently available data? **Typically annual, but can be flexible**
- Can the method inform management now? **Method, yes; dependent upon reliable input data**

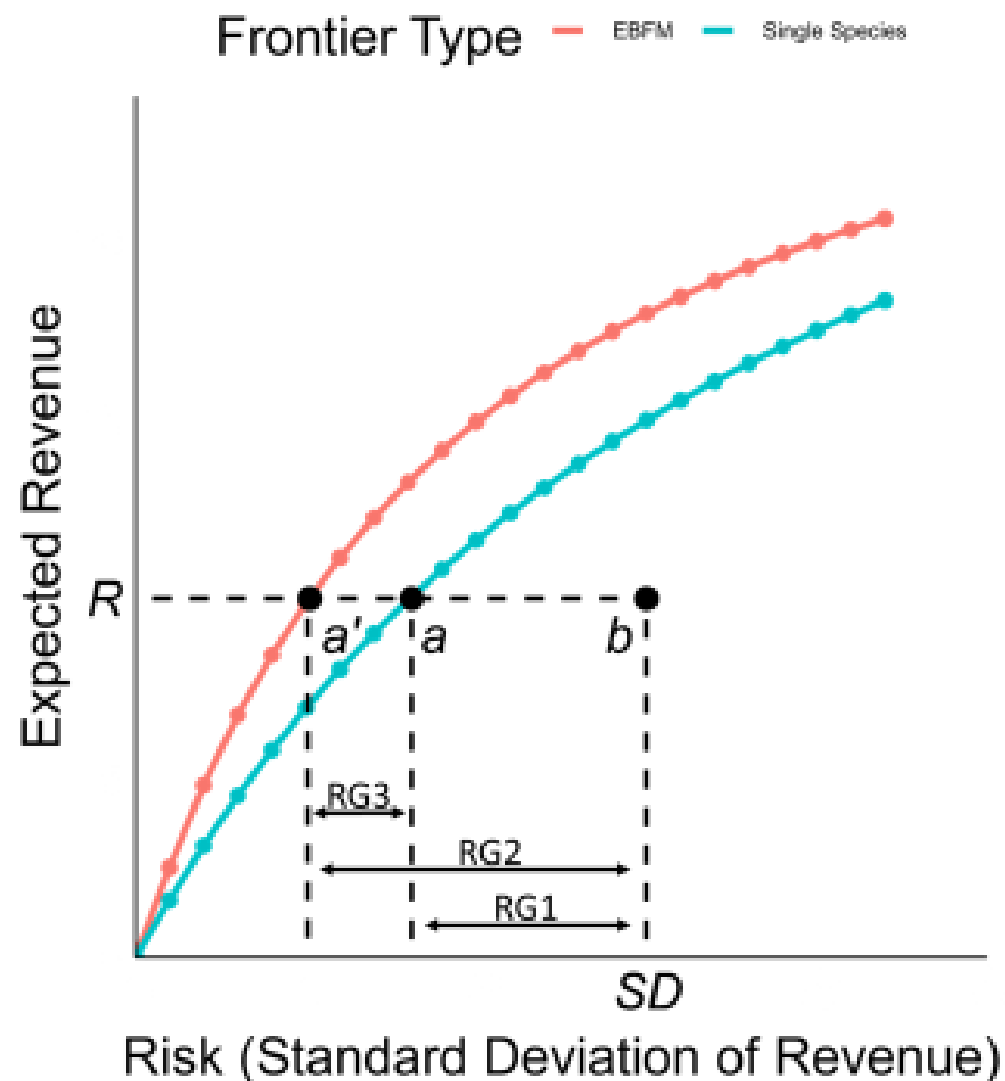
Recommended Approach to use all this information and address major considerations

1. Evaluate Ecosystem Caps for each Island
 - Use 1-2 main methods, complement with an ensemble for reality check
2. Estimate ACLs for guilds/aggregate groups
 - Use 1-2 main methods of modeling
3. Estimate ACLS/etc. for top 3-4 individual taxa
 - Use appropriate data ltd Stock Assessment methods
 - Use appropriate prioritization protocols
4. Evaluate economic performance
 - Some form of efficiency frontier
5. Translate to clear mgt decisions
 - Likely to focus on effort (input) controls

Extra Slides



Multispecies Portfolio Management



Modified from Jin et al. 2016

Some Jargon

Portfolio	<i>a combination of assets (e.g., stocks and bonds), in this case fish stocks</i>
Efficient Frontiers	<i>graphical representation of portfolios that maximize returns for the risk assumed</i>
Targets (e.g., a)	<i>target revenue values defined by the user</i>
Risk	<i>Risk to the revenue (foregone revenue or increased risk)</i>
Realized revenue (b)	<i>the revenue that was earned</i>
Risk gap	<i>the difference in risk between two values (e.g., realized revenue and a frontier)</i>
Negative covariance	<i>Inverse relationship between portfolio species, which manifests as negative covariance in revenue.</i>