

Introduction, Workshop Goal, and Report on Bering Sea Operational Objectives

Gordon H. Kruse

**University of Alaska Fairbanks
School of Fisheries & Ocean Sciences
Juneau, Alaska. U.S.A.**

Diana Evans

**North Pacific Fishery Management Council
Anchorage, Alaska. U.S.A.**

Project Objectives

- **Report on the current understanding of ecosystem indicators in the BS/AI**
- **Evaluate pros and cons of existing indicators**
- **Identify next steps toward developing and/or validating indicators and evaluating their performance**
- **Describe how indicators can best be used as a tool for resource managers**

Project Approach

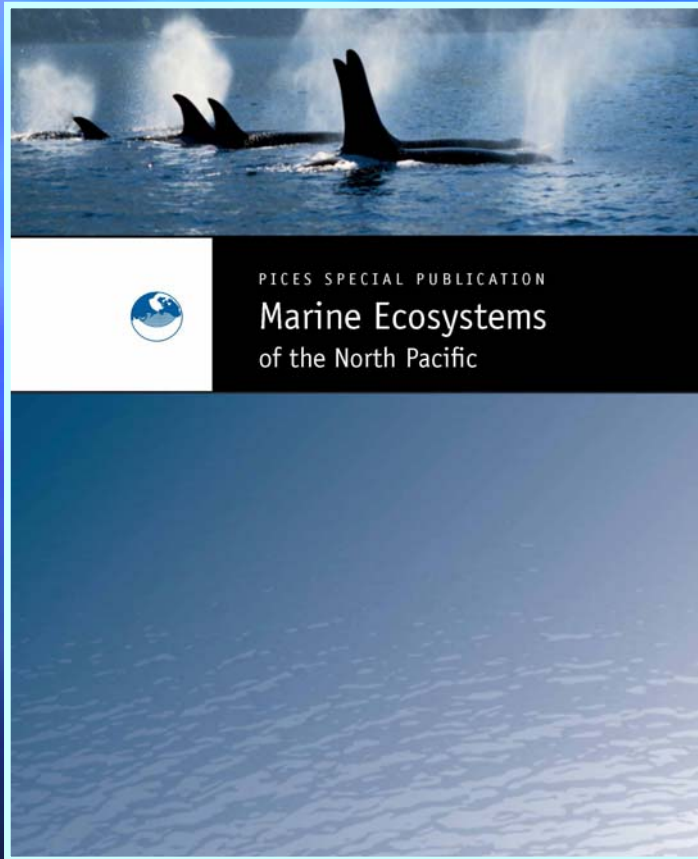
1. Workshop of regional experts:

- Develop a set of operational objectives for the southeast Bering Sea ecosystem
- Address challenges of developing indicators and evaluating their utility



Project Approach

2. Evaluate two ecosystem status reports:



North Pacific
Ecosystem Status
Report (PICES)



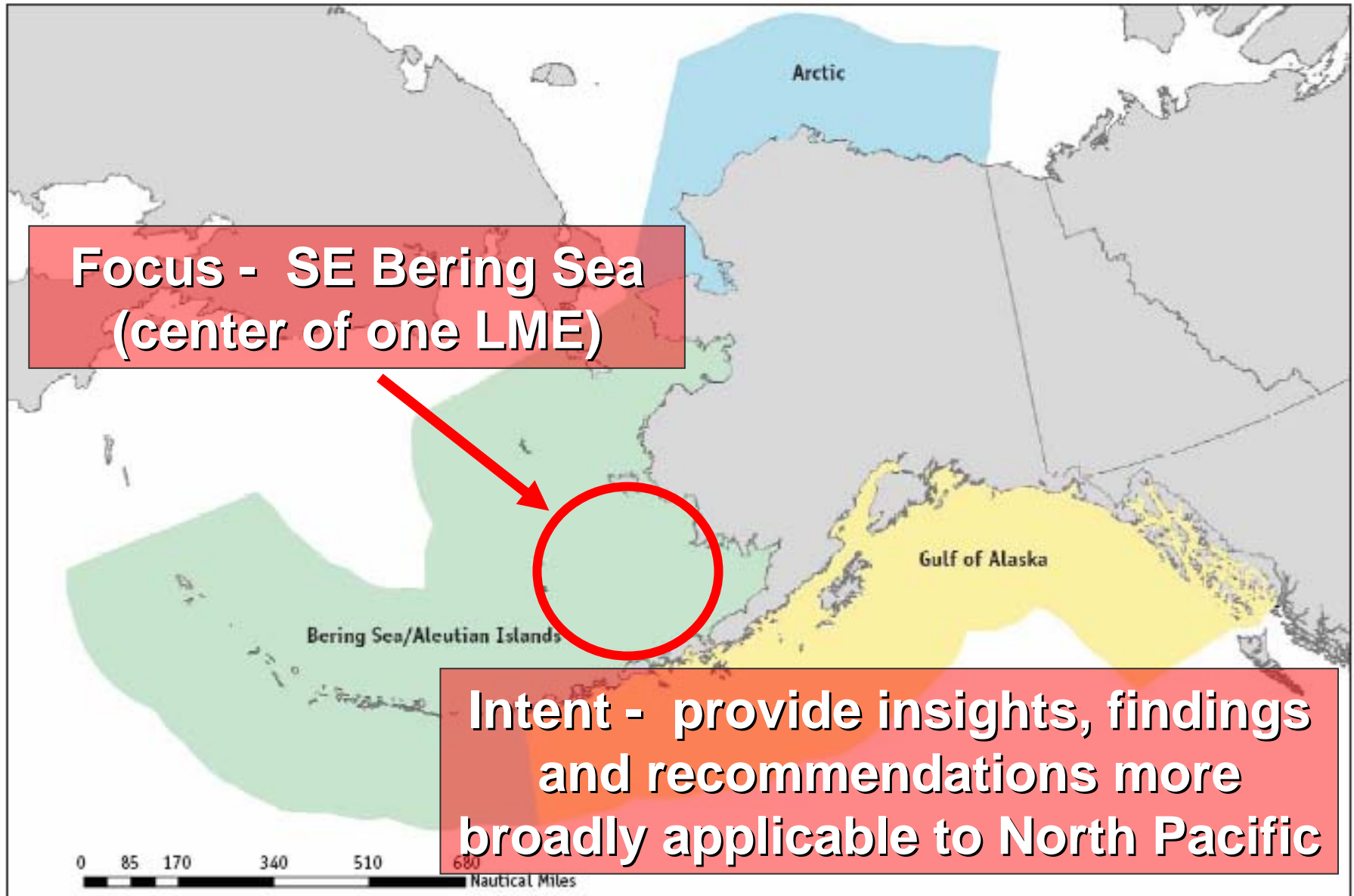
Ecosystem
Considerations Chapter
(NPFMC)

Project Components (continued)

3. Investigate whole-system methodologies for indicators of structural changes
4. Identify next steps:
 - validating indicators performance
 - improving monitoring system
 - integration into predictive models



Large Marine Ecosystems of Alaska



Definitions

Ecosystem Approach to Management

A geographically specified and adaptive process which:

- takes into account ecosystem knowledge and uncertainties,
- considers multiple external influences, and
- strives to balance diverse societal objectives.

NOAA's Ecosystems Principles Advisory Panel (1999)

Ecosystem Services

Benefits that people receive from ecosystems

Provisioning

Food, fiber, etc.

Regulating

Climate, disease, etc.

Cultural

Tourism, aesthetics,
education, etc.

Supporting

Nutrient cycling,
primary prod., etc.

Making EAM Operational

Setting Objectives



An Example

High-level Policy Goal:

- Maintain ecosystem structure and function

Broad Objective for Fishery:

- Maintain predators within ecologically viable levels

Operational Objectives:

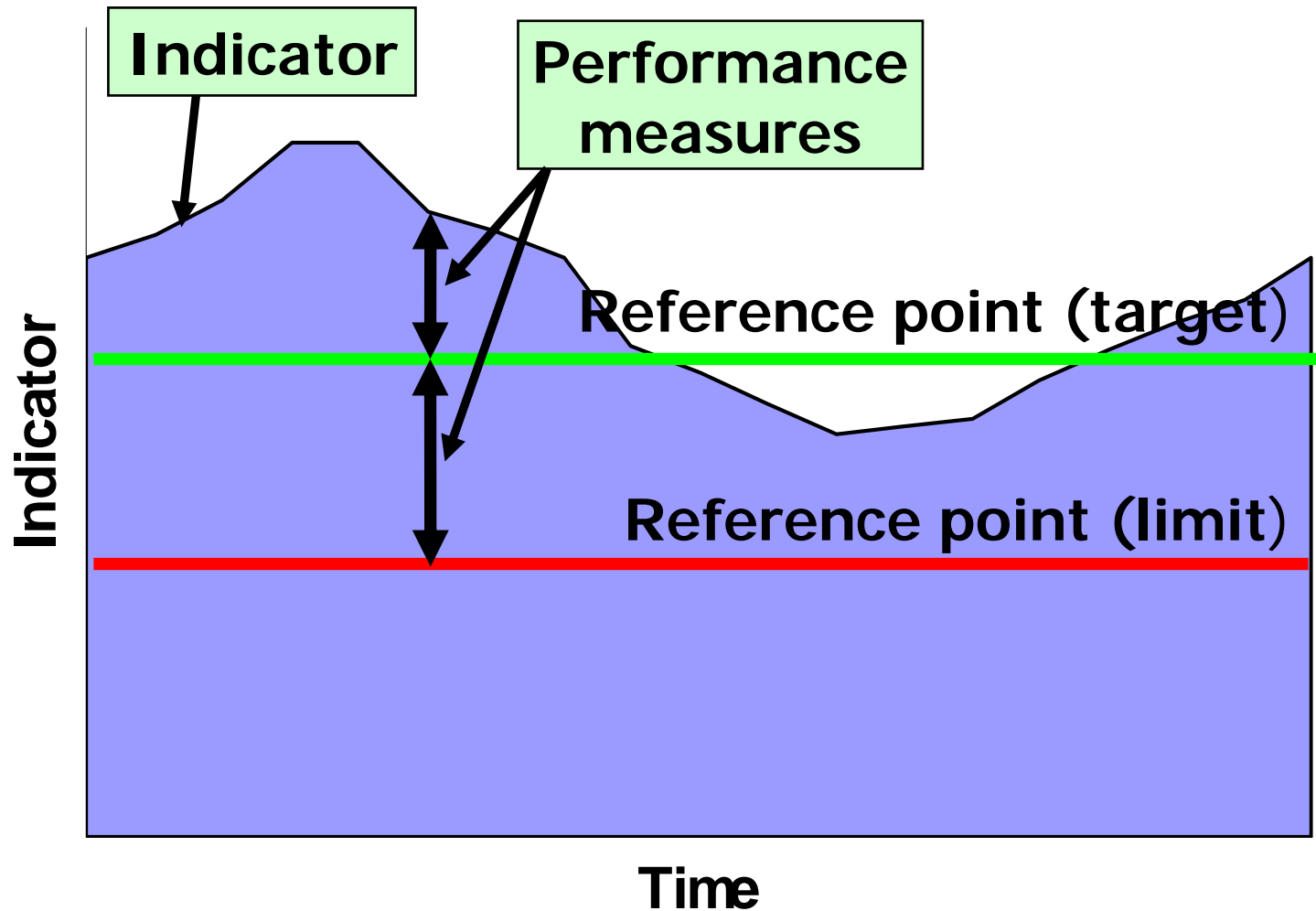
- Maintaining the spawning biomass of predators (e.g., sharks, cod, and halibut) at $\geq 35\%$ of unfished levels while banning the harvest of forage species (e.g., capelin, eulachon, sand lance) to maintain natural fluctuations in prey abundance

Indicator and Performance Measure:

- Biomass estimates of predators (indicator) relative to estimates of unfished biomass (performance measure)



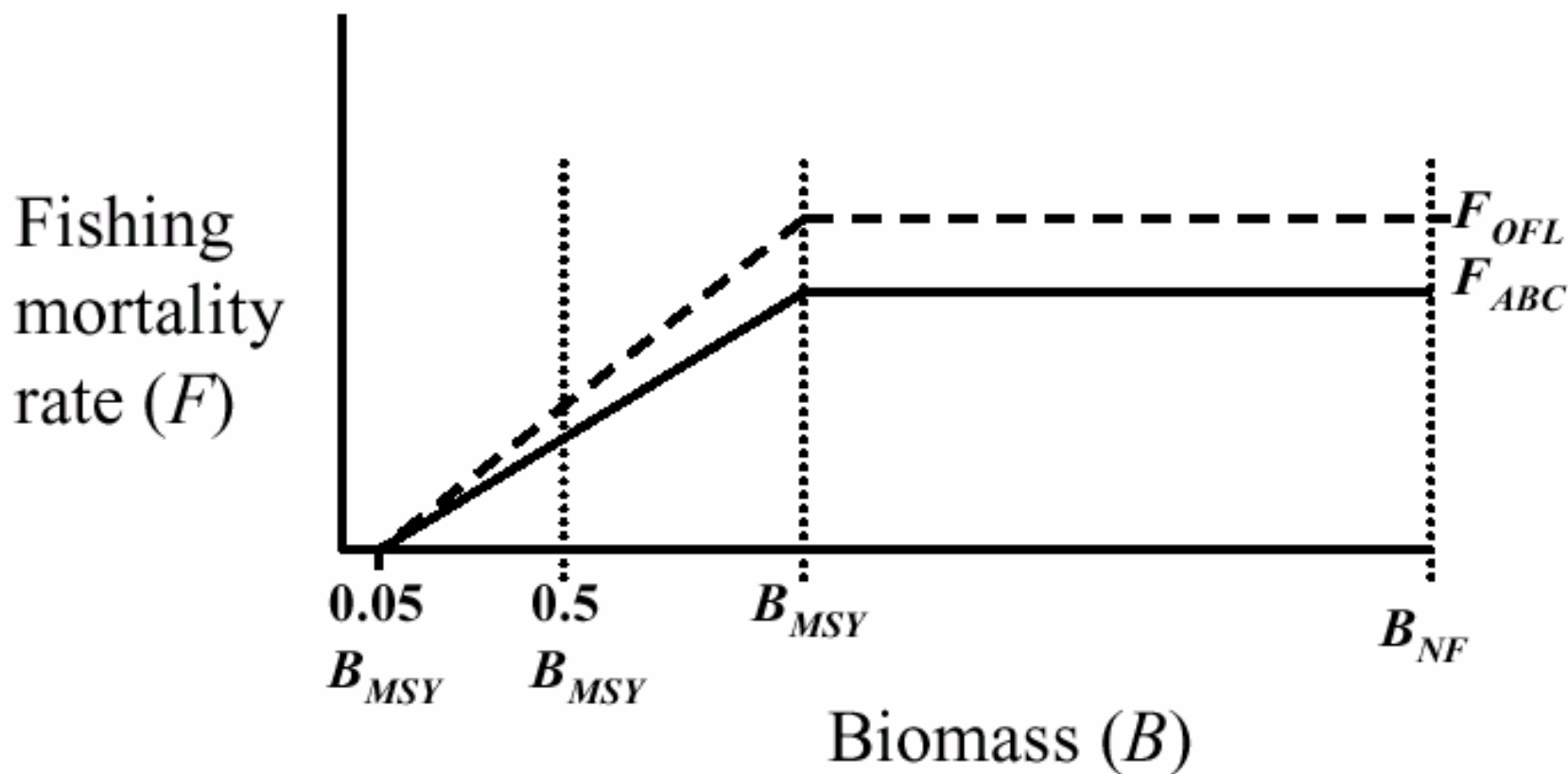
Indicator and Performance Measures



**Current Ecosystem
Considerations in Fisheries
Management in the Eastern
Bering Sea**

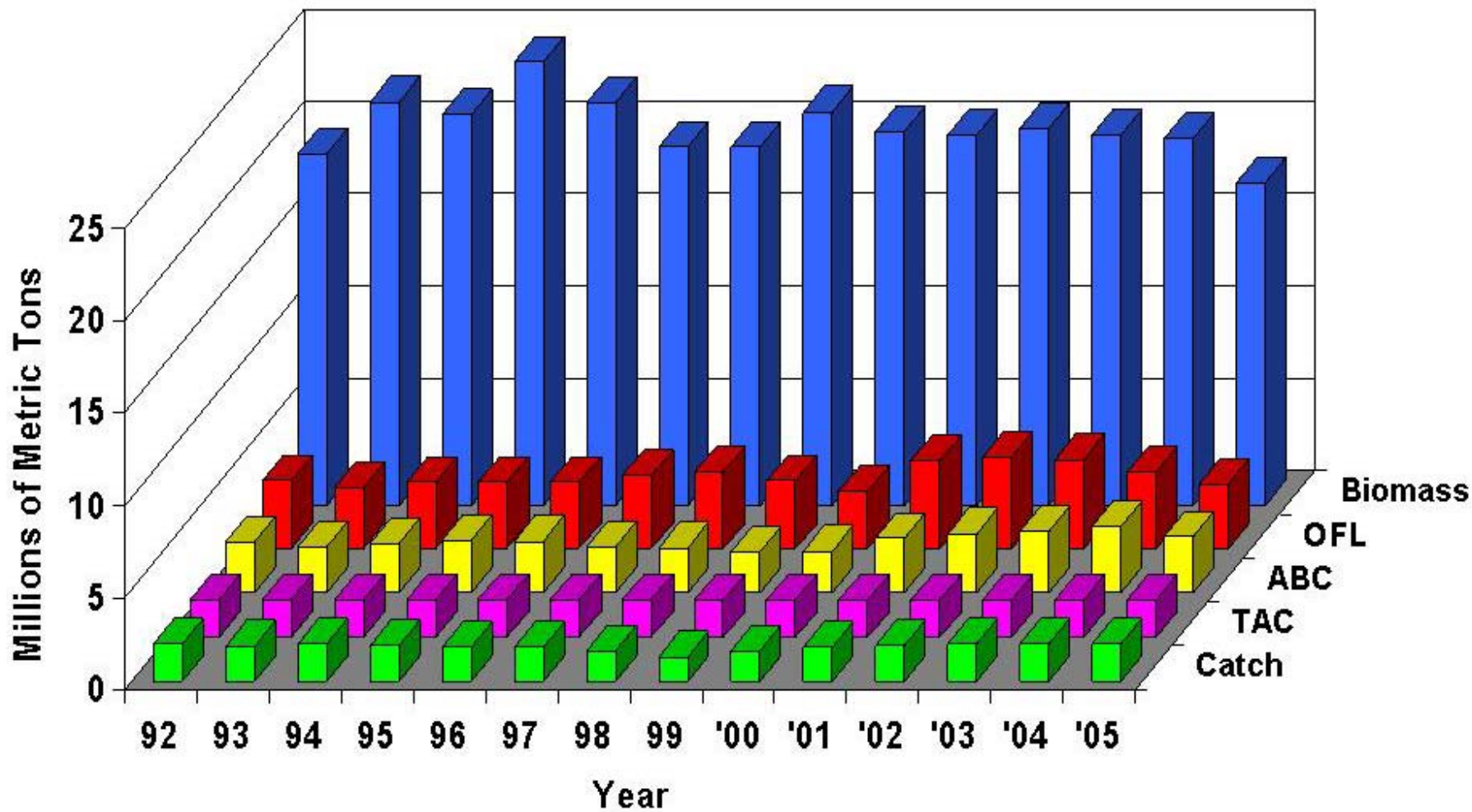
BS/AI Catch Specifications

- Ban on forage fish fisheries
- Conservative catch levels for harvested species



BS/AI Groundfish Catch Specifications

BS/AI Groundfish Biomass and Harvest Limits, 1992-2005



Habitat Conservation

Effort Controls

- License limitations
- IFQs, CDQs, cooperatives

Gear Restrictions

- bottom trawls banned for pollock

Closed Areas

- ~381,000 nm² closed to trawling to protect habitat, ~60,000 nm² for Steller sea lions



Year-round Closures in the North Pacific

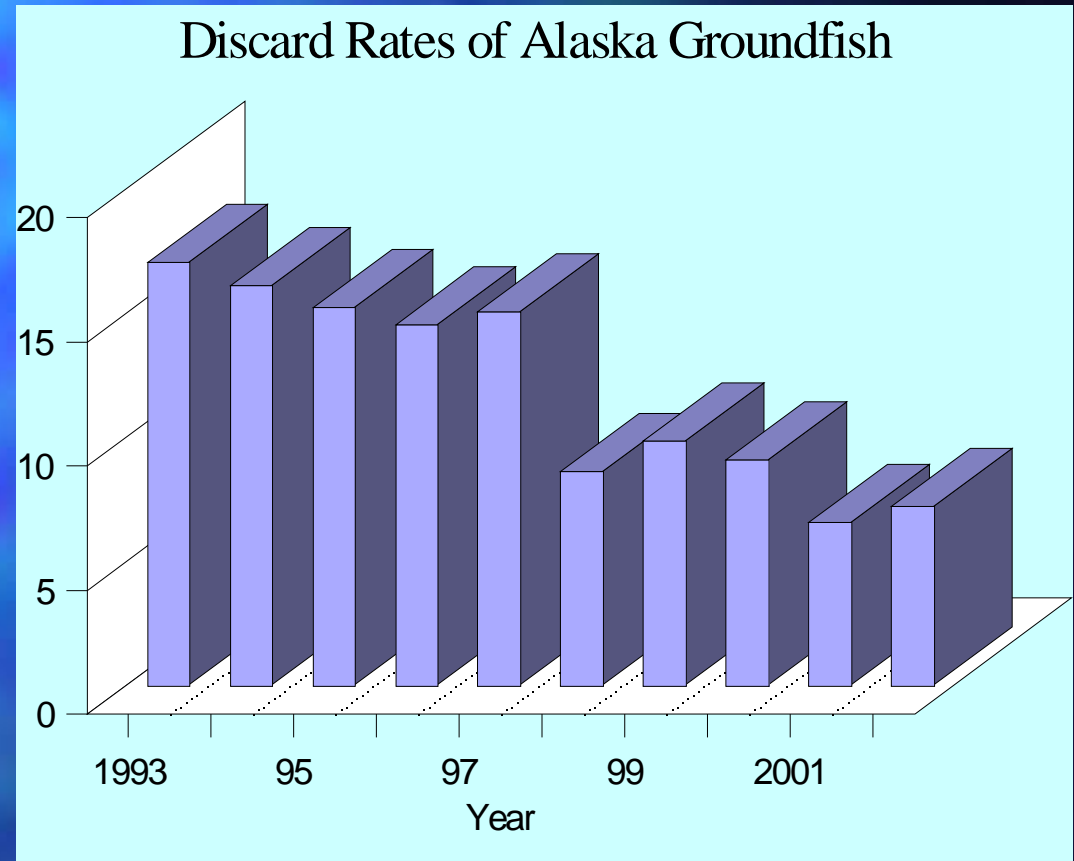
Newly Adopted Closures for Essential Fish Habitat Conservation

- AK Seamounts Marine Reserve
- GOA Slope Habitat Conservation Area
- AI Coral Gardens Marine Reserves
- Primnoa Coral Marine Reserve



Management of Bycatch and Discards

- **Bycatch limits** for prohibited species – crab, salmon, halibut, and herring
- **Gear restrictions** such as required streamer lines to avoid seabirds
- **Full retention** for pollock and cod



Need for Further EAM?

- No overfishing in 58 assessed stocks off Alaska (2004)
- 4 (crabs) of 32 assessed stocks were overfished (2004)
- “Depleted” not “overfished”?
- Other historical declines:
 - Steller sea cow
 - Whales
 - Sea otters
 - Steller sea lion
 - Northern fur seal
 - Spectacled & Steller’s eiders



Goals & Objectives for the Bering Sea



NPFMC's Policy Statement

... to apply judicious and responsible fisheries management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems for the benefit of future, as well as current generations.

NPFMC's Broad Objectives

- *provide sound conservation of the living marine resources;*
- *provide socially and economically viable fisheries for the well-being of fishing communities;*
- *minimize human-caused threats to protected species;*
- *maintain a healthy marine resource habitat; and*
- *incorporate ecosystem-based considerations into management decisions*

NPFMC's Priority Conservation Issues with Examples of Operational Objectives and Indicators

- *Prevent overfishing*
 - Operational Objective – maintain harvest rates below those defined to be overfishing, F_{OFL}
 - Indicator – estimated annual fishing mortality, i.e.,

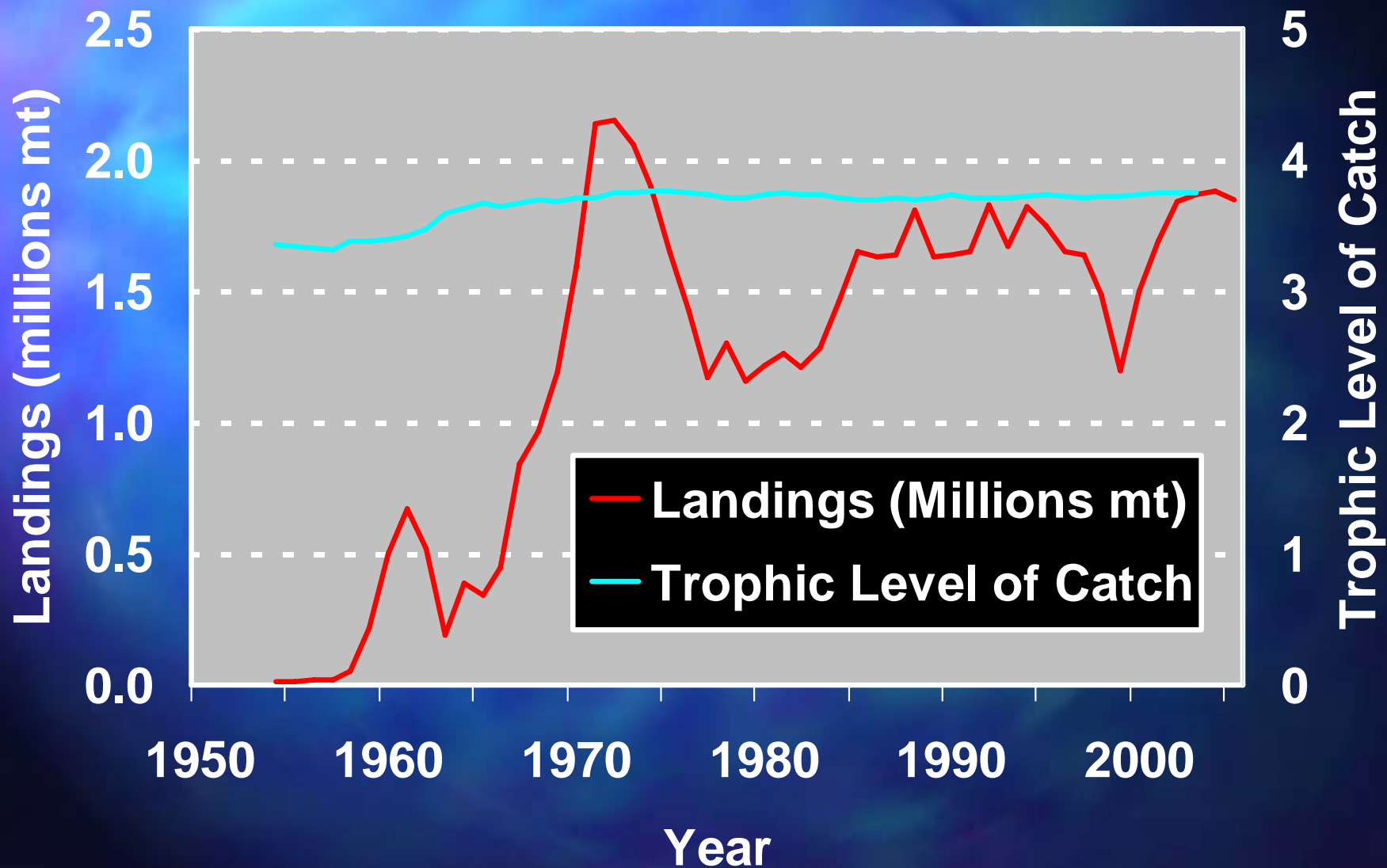
$$\text{Indicator} = \frac{\text{landings} + \text{discards} + \text{bycatch}}{\text{biomass estimate}}$$

NPFMC's Priority Conservation Issues with Examples of Operational Objectives and Indicators



- *Preserve food web*
 - Operational Objective – do not “fish down the food web” by maintaining trophic level within 3.3 to 3.7 (mean 3.6) over 1954-1976
 - Indicator –mean trophic level of the catch

Landings and Trophic Level of Catch

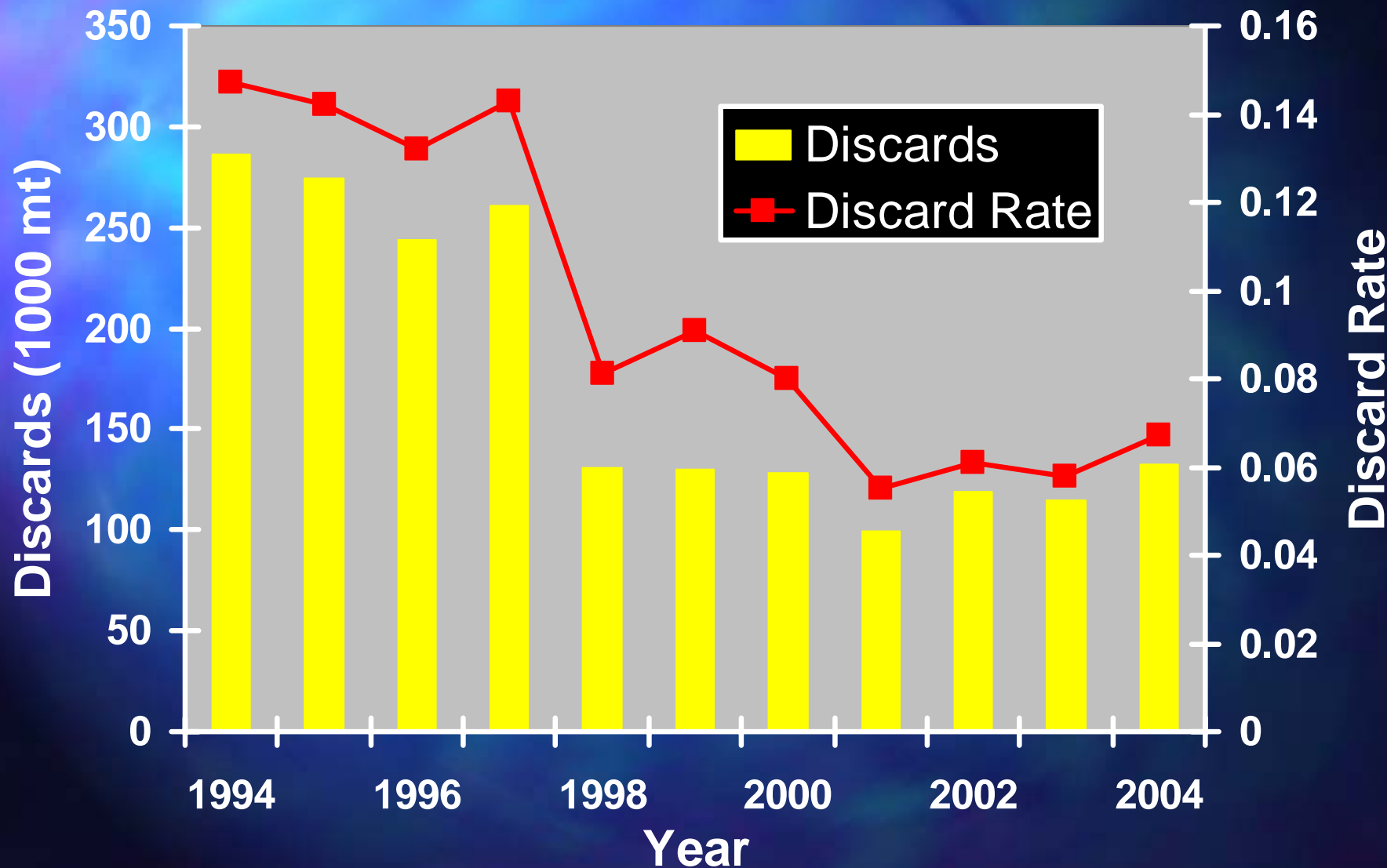


NPFMC's Priority Conservation Issues with Examples of Operational Objectives and Indicators

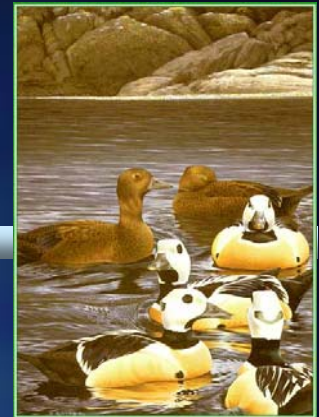


- *Manage incidental catch and reduce bycatch and waste*
 - Operational Objective – reduce discarded bycatch by 40% from levels estimated during 1994-1997
 - Indicator – estimated discards as a percentage of total groundfish catch

Discards and Discard Rate for Groundfish

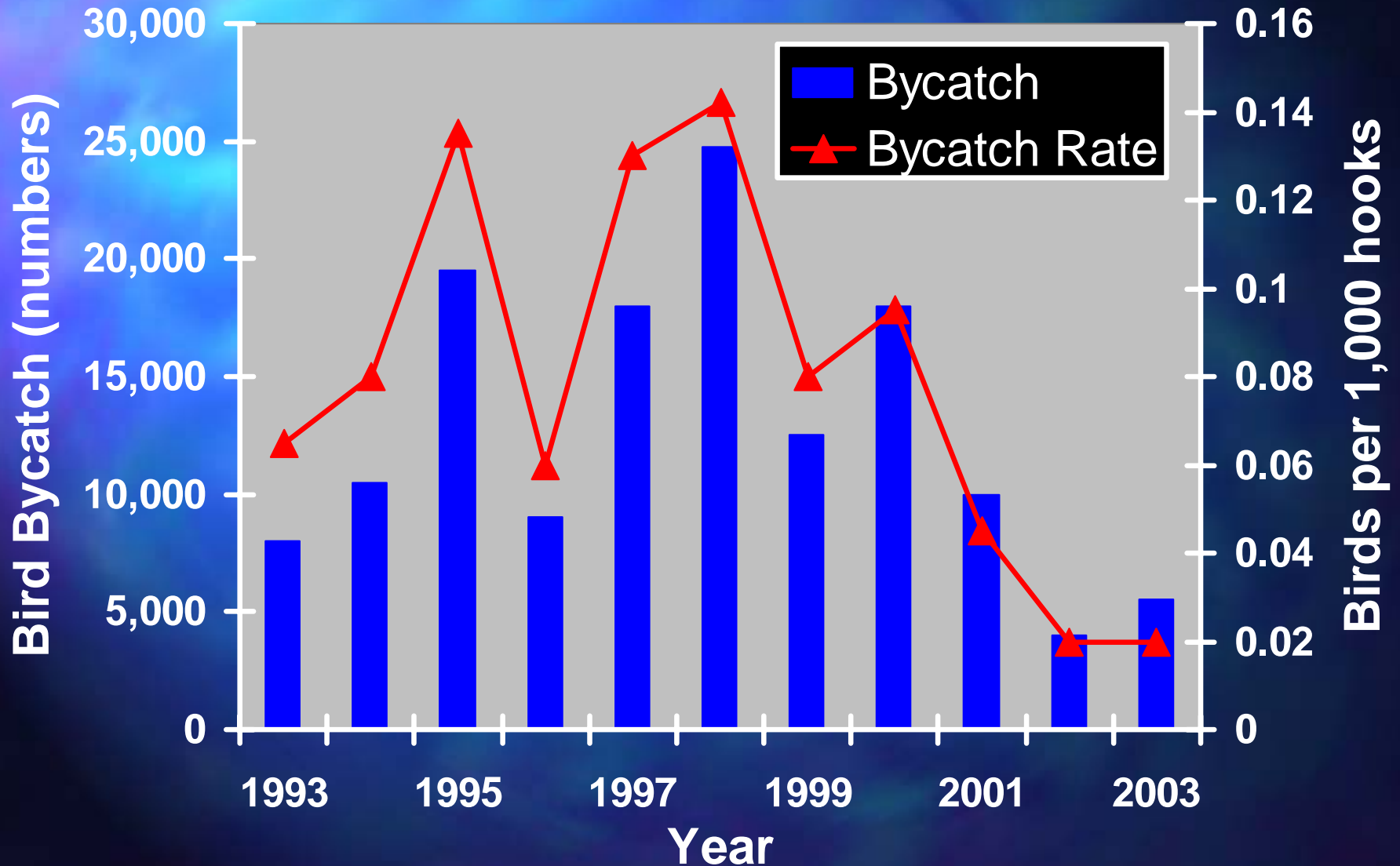


NPFMC's Priority Conservation Issues with Examples of Operational Objectives and Indicators



- *Avoid impacts to seabirds and marine mammals*
 - Operational Objective – reduce total seabird bycatch on longline vessels by 30% from levels during 1995-1998
 - Indicator – estimated seabird bycatch based on counts on vessels with observers extrapolated to the total longline fleet

BS/AI Longline Seabird Catch and Catch Rate

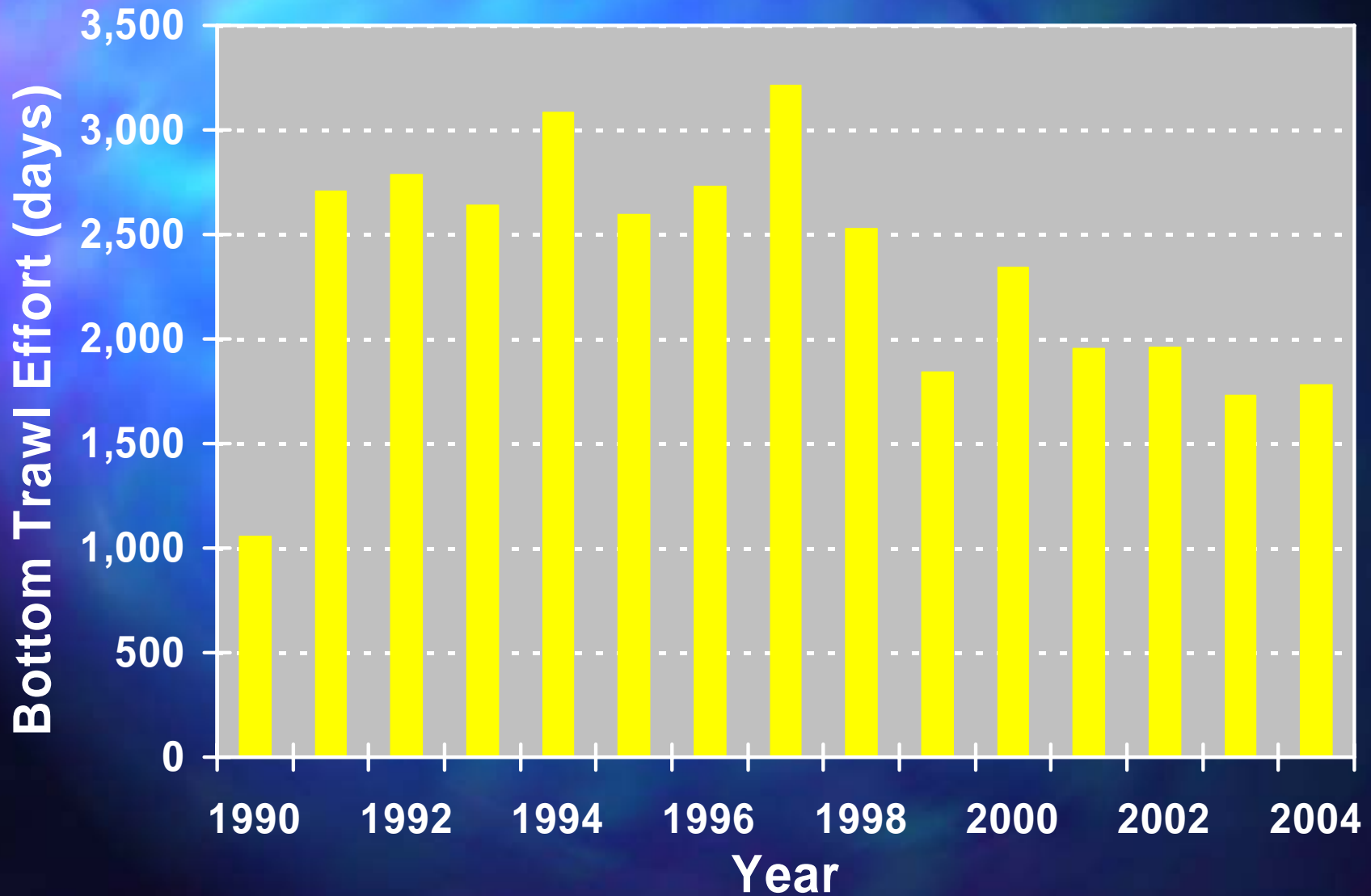


NPFMC's Priority Conservation Issues with Examples of Operational Objectives and Indicators



- *Reduce and avoid impacts to habitat*
 - Operational Objective – reduce bottom habitat disturbance by 25% from the base period, 1991-1998
 - Indicator – annual bottom trawl effort (days fished)

Bering Sea Bottom Trawl Effort



Reflections from Previous “Pre-workshops”

Some Previous Comments

- Indicators may change – e.g., sea ice may become useless for the BS, but remain useful in Arctic
- We try to maintain the mean but eliminate variance. What if the variance matters most?
- Use functional groups, such as winter spawners vs. summer spawners, or different feeding guilds, etc.
- Use species that we don't interact with directly – e.g., walrus in the BS that feed on clams. Use these for comparison to those we do affect.
- Use indicators that are useful in degraded systems
- Focus on indicators relevant to management

Outline of Workshop and Role of Participants

Day 1

- **Alaska ecosystem considerations report**
- **PICES North Pacific ecosystem status report**
- **Charge to workshop: synthesis and complexity**
- **Overview of ecosystem indicators relative to guidelines and operational objectives**
- **Use of indicators in other regions and suggestions for the North Pacific**
- **Status of the eastern Bering Sea**
- **Report on change detection algorithms**

Day 2

- Comments on two ecosystem reports
- Breakout groups: discuss objectives and use of indicators in the North Pacific
- Group reports
- Topic breakout groups:
 - Matching indicators to objectives
 - Methods to monitor ecosystem structural change
 - Monitoring networks: validating indicators
 - Communicating results

Day 3

- North Pacific Research Board perspective
- Review and discuss contributed indicator list

Role of Participants

- **Contributions toward operational objectives and ecosystem indicators**
 - *Maintain* biomass levels or *maintain* natural variability?
 - Are directional actions more appropriate – e.g., *reduce* mortality, etc.
 - What indicators are most appropriate for identified operational objectives?
- **Best ways to monitor structural change**
 - Multivariate statistical analysis
 - Ecological approaches - e.g., based functional groups of species
 - Monitor changes in ecological processes or rates

Role of Participants

- **Feedback on synthesis and complexity**
 - Possible to render long lists of indicators into most meaningful ones?
- **Data gaps and monitoring networks**
 - What variables or indicators are missing?
 - Ways to involve fishermen and others?
- **How to communicate results**
 - How to involve stakeholders?
 - How to incorporate social and economic considerations?
 - Lessons from other regions?