Advancing Climate Ready Resource Management

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Extreme Events

Longer term change

| Droughts & Floods | Warming Oceans | Loss of Sea Ice | Rising Seas | Ocean Acidification |

CHANGE AHEAD

Changing Habitats

Shifting Distributions

Cod population, 1968-72
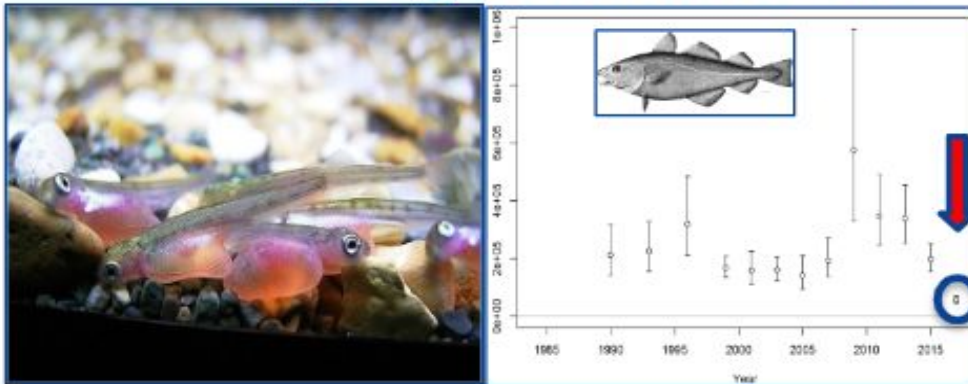
Cod population, 2003-08

Changing Abundance

Changing Ocean Uses
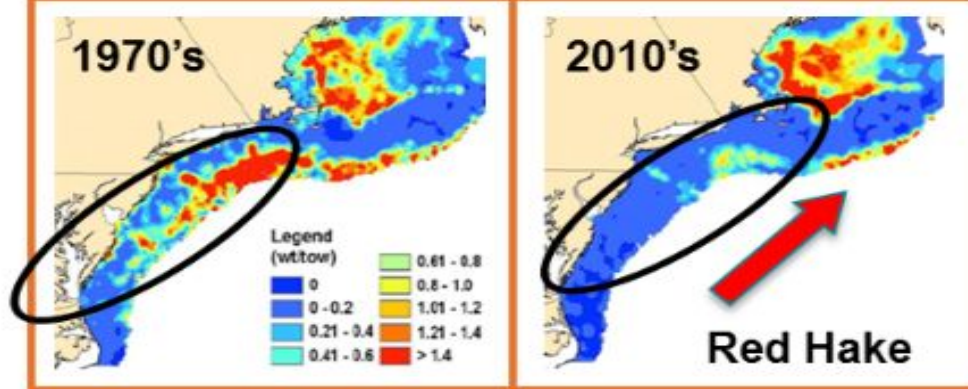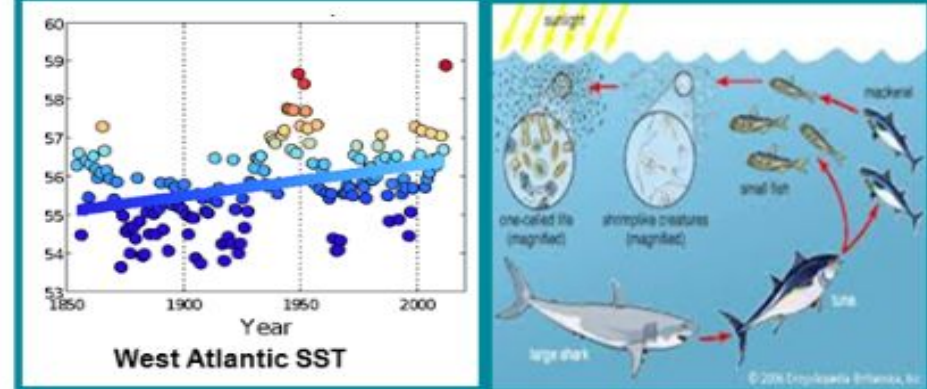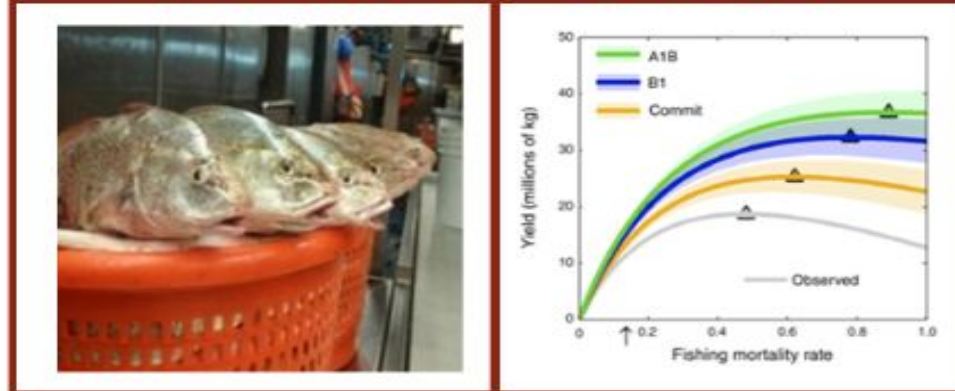
Major barriers to climate-ready resource management

Today

1. **No regular delivery** of ocean forecasts and projections.
2. **Weak observation systems** to track and project change.
3. **No operational system** to produce ecosystem scenarios, risk assessments & management advice.
4. **Low capacity** to use climate-informed advice to reduce risks and increase resilience.
5. **Weak planning** for extreme events and longer term changes.

With CEFI

1. **Regular delivery** of robust ocean forecasts and projections.
2. **Improved observation systems** to track and project change.
3. **Operational delivery** of ecosystem scenarios, risk assessments and best management options.
4. **High capacity** to use climate-informed advice to reduce risks and increase resilience.
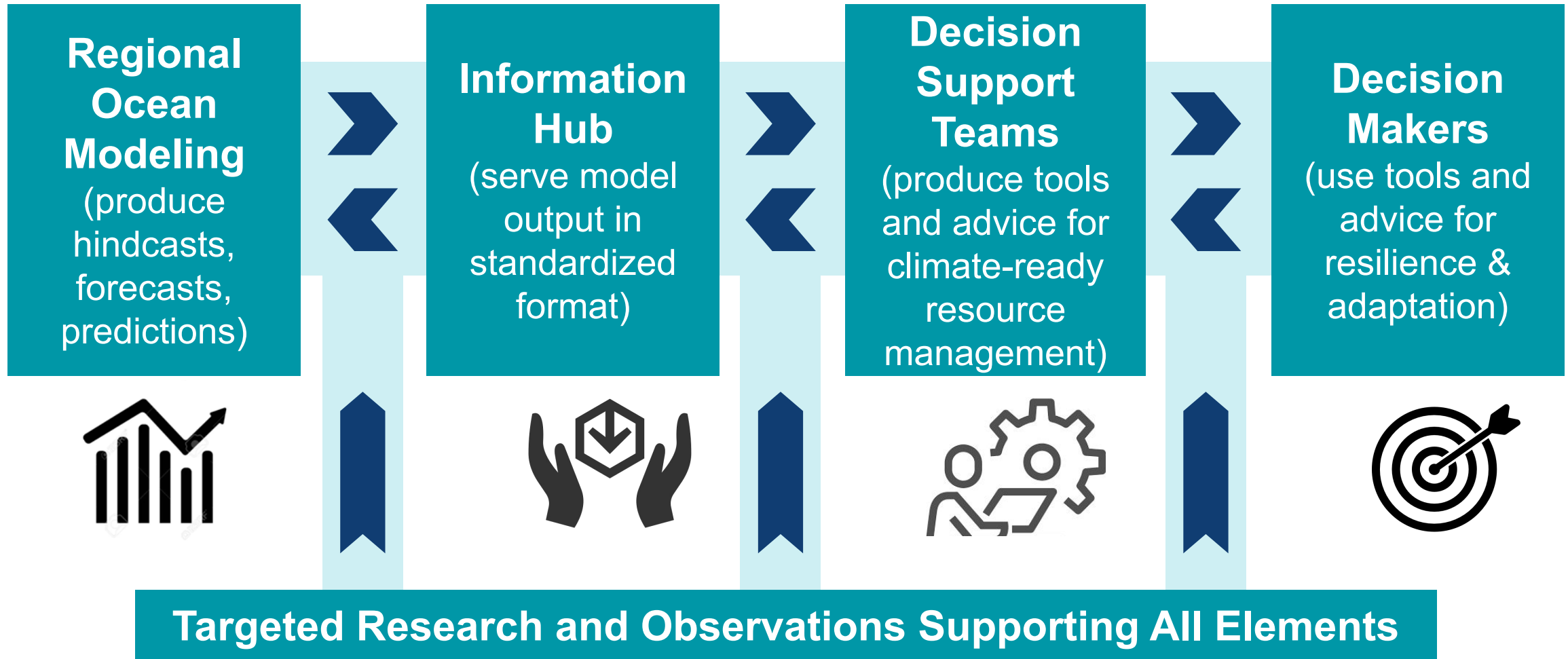5. **Improved planning** for extreme events and longer term changes.

Climate, Ecosystems, & Fisheries Initiative

CEFI is an end-to-end decision support system for climate-ready decision making

- ***Cross-NOAA effort to provide climate-informed advice*** and increased capacity for effective resource management.

- ***Leverages existing NOAA investments*** in research, modeling, observations and decision-making.

- ***End-to-end decision support system*** addressing four core requirements:

  o **Reliable delivery** of robust ocean forecasts and projections.
  o **Operational production** of climate-informed ecosystem projections, risk assessments and adaptation strategies.
  o **Decision maker capacity** to use climate advice.
  o **Targeted observations & research** for continuous innovation.

CEFI Decision Support System

Regional Ocean Modeling (produce hindcasts, forecasts, predictions)

Information Hub (serve model output in standardized format)

Decision Support Teams (produce tools and advice for climate-ready resource management)

Decision Makers (use tools and advice for resilience & adaptation)

Targeted Research and Observations Supporting All Elements

Climate, Ecosystems, & Fisheries Initiative

Provide robust ocean outlooks across time and space

Expand NOAA coastal ocean forecasts systems

Modified from Tommasi et al., Progress in Oceanography, 2017
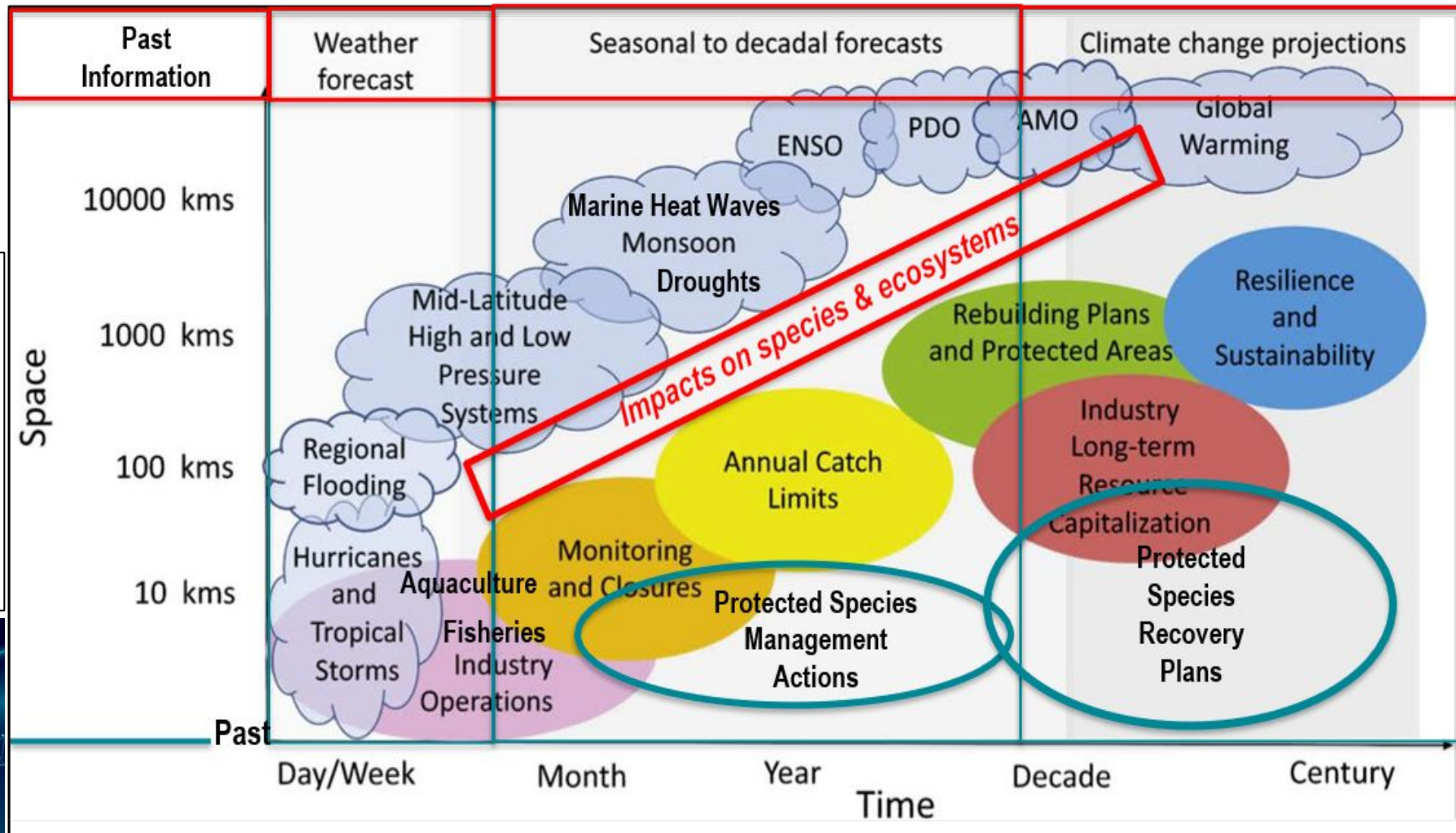
Expand NOAA Earth System Models for regional ocean projections

Regional ocean prediction capacity from seasons to centuries built from OAR's Modular Ocean Model 6 (MOM6)

Figure from Andrew Ross (NOAA/GFDL)

1980-04-01 sea surface temperature (°C)
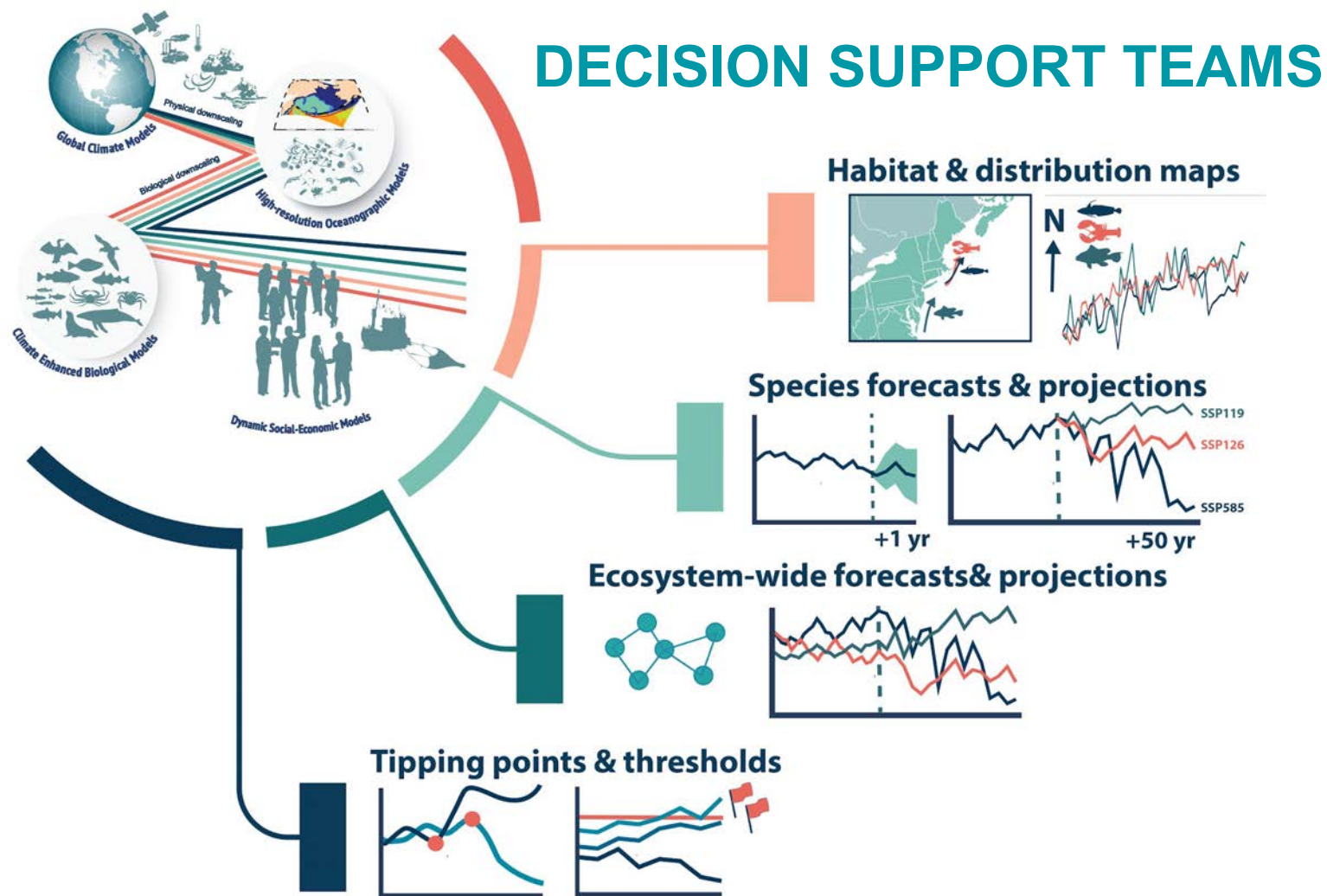
sea ice (%)
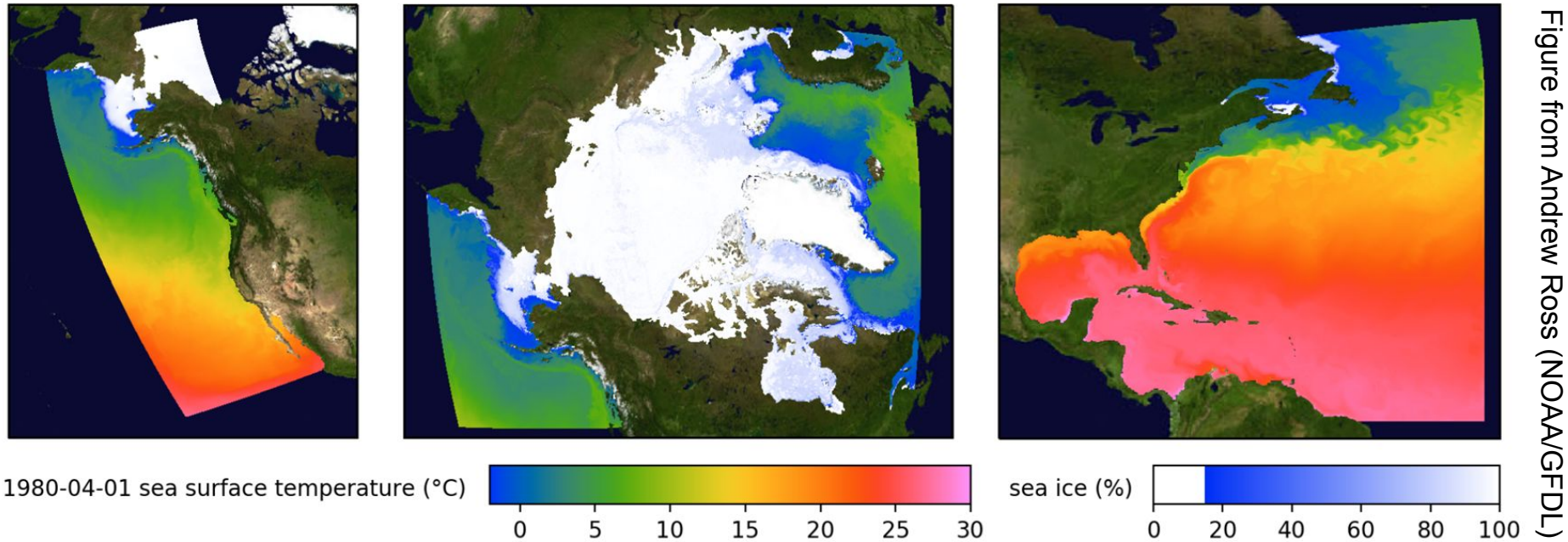
Prototype MOM6 coast-wide domains for seasons to decades **(Great Lakes, Pacific Islands in progress)**

- **Ocean predictions spanning the range of ocean futures**.
- **Regional Ocean Modeling Teams** customize products for NMFS and other users.
- **CEFI Information Portal** provides national data standards and efficient access.

https://www.gfdl.noaa.gov/improving-ocean-habitat-forecasts-for-the-northeast-u-s/

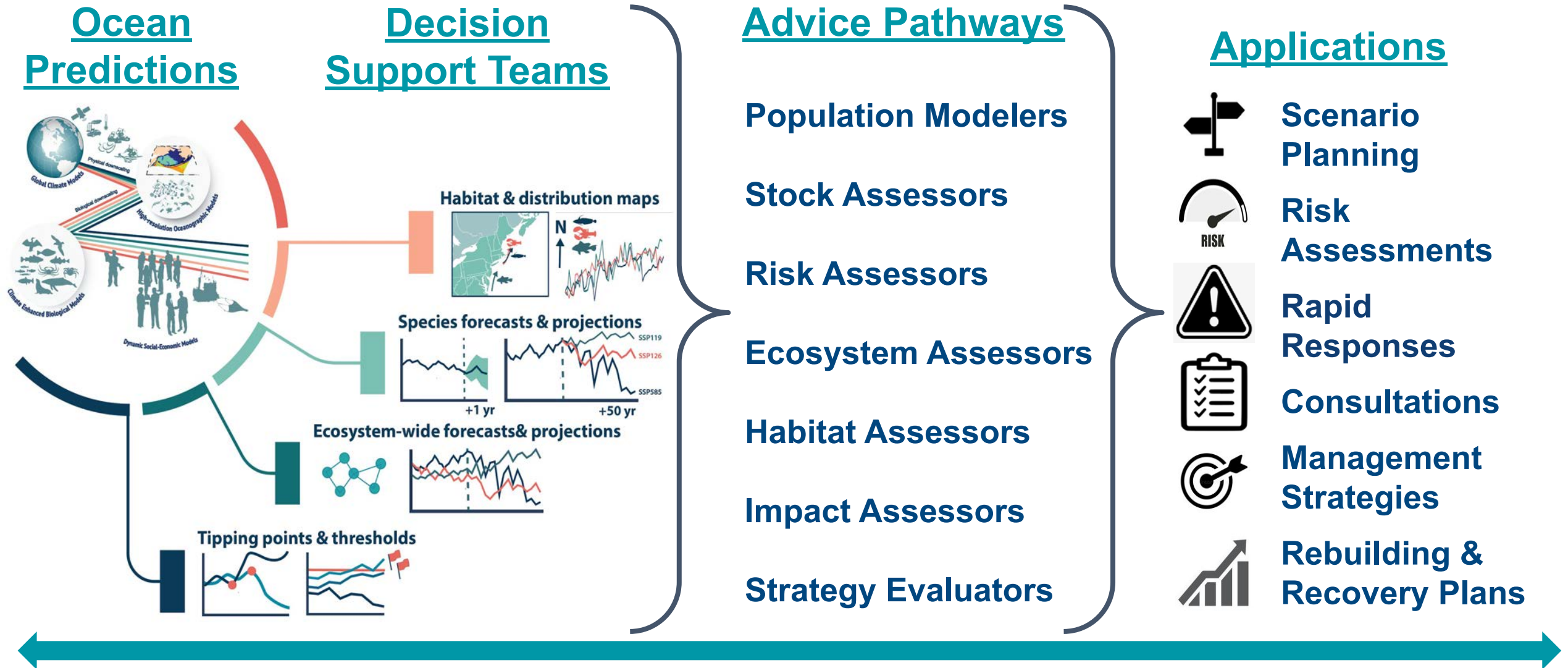**Climate, Ecosystems, & Fisheries Initiative**

DECISION SUPPORT TEAMS

- **Expert Teams at Science Centers**
- **Work with existing programs & partners**
- **Catalyze efforts**
- **Dedicated products**
- **Operational delivery**

Improved Delivery and Use of Climate-Informed Advice

Ocean Predictions

Decision Support Teams

Habitat & distribution maps

Species forecasts & projections

Ecosystem-wide forecasts & projections

Tipping points & thresholds

Advice Pathways

Population Modelers

Stock Assessors

Risk Assessors

Ecosystem Assessors

Habitat Assessors

Impact Assessors

Strategy Evaluators

Applications

Scenario Planning

Risk Assessments

Rapid Responses

Consultations

Management Strategies

Rebuilding & Recovery Plans

In Summary

- Climate-ready resource stewardship is the challenge of our time.
- CEFI designed to provide advice for climate-informed decision making.
- Expanded observations, modeling, and product development critical to CEFI implementation and and overall success.
- IOOS regional frameworks and expertise can play key roles including must needed information on marine life:

  - Changes in species distributions, phenology and productivity?
  - Changes in ecosystem structure and function (indicators)?
  - Where are the key gaps in existing obs and how fill them?
  - How use advanced technologies for improved performance?
  - *How collaborate to build the marine life observation system we need for climate-ready resource management?*

Thank you

More information on CEFI is here:

https://www.fisheries.noaa.gov/topic/climate-change/climate,-ecosystems,-and-fisheries