RODA-SIOW Joint Industry Educational Forum
October 15 – 16, 2019

RODA

UNIVERSITY OF DELAWARE | College of Earth, Ocean, & Environment

SPECIAL INITIATIVE ON OFFSHORE WIND

GROUND RULES:

- The primary goal of this meeting is education, learning, and exploration. It is NOT to satisfy particular regulatory needs from either, to solve particular problems, or to reach any kind of agreement.
- The purpose of this meeting is also to set a common backbone for dialogue so that project-specific questions can be answered more effectively in the future.
- Please keep all presentations and discussions high-level. Avoid getting into project-specific discussions.
- Please refrain from rehashing old conversations from past meetings. All participants should be here in good faith to learn from each other with an open mind.
- NO media, social media, video, or audio recording.

FISHERIES 101

- **Michelle Bachman**, Habitat Plan Coordinator, New England Fishery Management Council
- **Doug Christel**, Fishery Policy Analyst, NOAA GARFO
- **Eric Reid**, Seafreeze Shoreside, Inc., Atlantic States Marine Fisheries Commission Proxy for S. Sosnowski (RI)

Introduction to fisheries management in the Northeastern United States

Michelle Bachman, New England Fishery Management Council
Doug Christel, NOAA Fisheries Greater Atlantic Regional Fisheries Office
Eric Reid, Seafreeze Shoreside, Inc.

Outline

- Federal fisheries management – NOAA Fisheries and the Councils, Council FMP process
- State fisheries management – Atlantic States Marine Fisheries Commission
- Fisheries engagement in offshore wind work, from a fisheries management perspective

Federal fisheries management:

NOAA Fisheries and the Councils

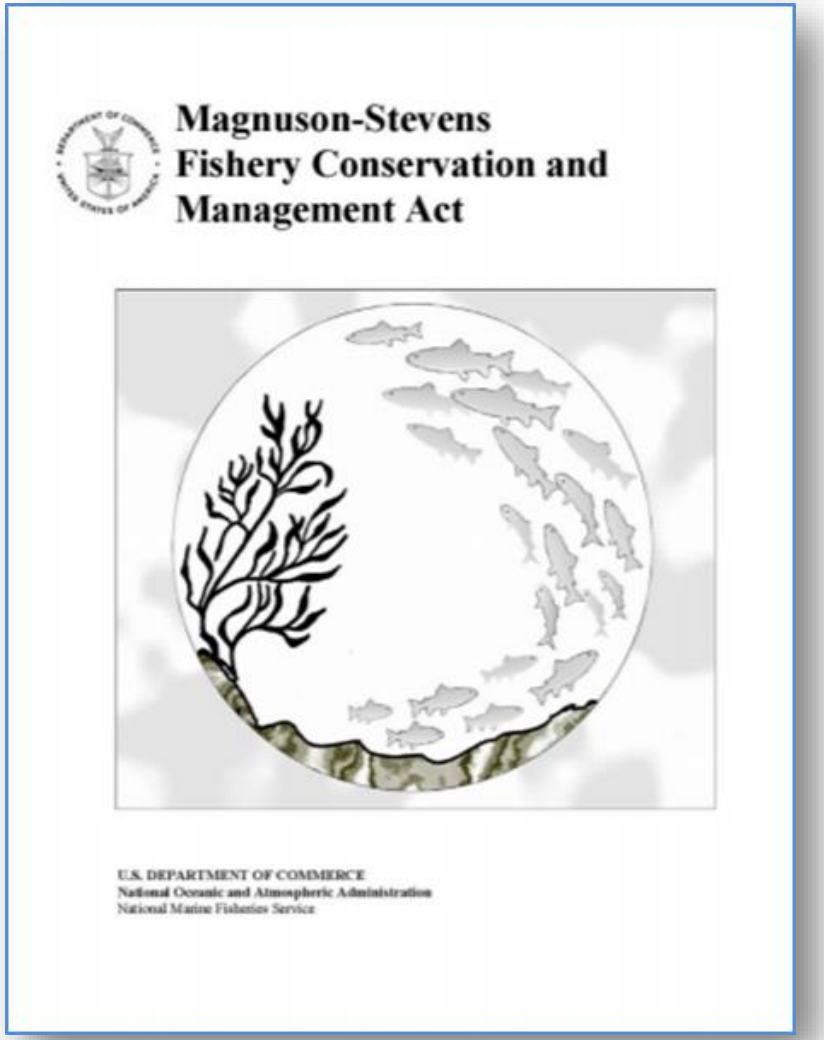
New England Fishery Management Council

NOAA — National Oceanic and Atmospheric Administration — U.S. Department of Commerce

Mid-Atlantic Fishery Management Council

The Mission | "The Congress finds and declares….[see page 1 of MSA]"

"A national program for the conservation and management of the fishery resources of the United States is necessary to prevent overfishing, to rebuild overfished stocks, to insure conservation, to facilitate long-term protection of essential fish habitats, and to realize the full potential of the Nation's fishery resources."



Links: MSA and guidance materials

Fisheries Conservation and Management Act (1976)

- Expanded Federal Jurisdiction – Exclusive Economic Zone
- Established National Standards
- Created the Councils (NOAA Fisheries/Councils Process)
- Requirements for Fishery Management Plans (FMPs)
  - Consistent with National Standards
  - Mandatory and Discretionary Components
  - Relation to Other Applicable Laws (OALs)
  - Secretarial Review
- Special Provisions

MSA | 1996

- Required time certain stock rebuilding
- Specific stock status determination criteria
- Optimum Yield cannot exceed Maximum Sustainable Yield
- Added 3 national standards
- Essential Fish Habitat (EFH; Designations and Consults)

MSA | 2007

- Emphasis on accountability and science
- End overfishing immediately
- Annual catch limits (ACLs) and accountability measures (AMs)
- Strengthened role of Scientific and Statistical Committees (SSCs)

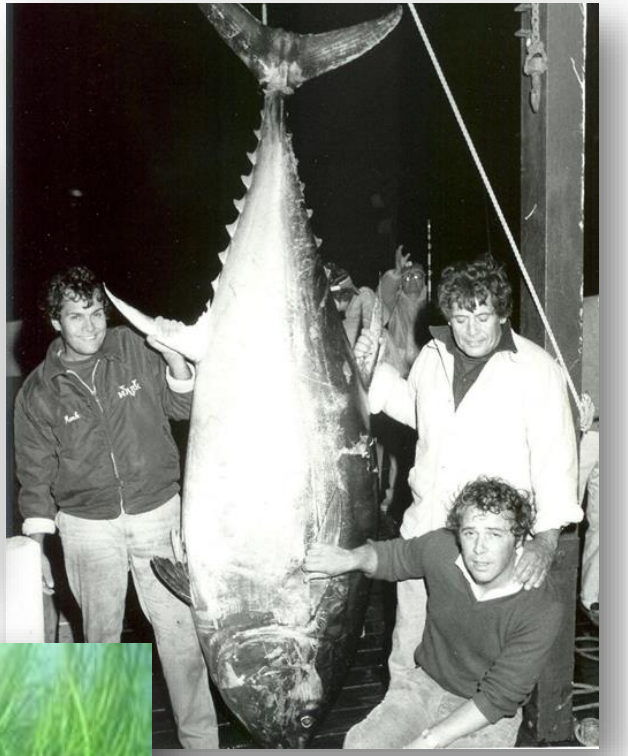
National Standards for Fishery Management Plans | In Brief

1. Prevent overfishing while achieving optimum yield
2. Use best scientific information available
3. Manage individual stocks throughout their range
4. Allocation of privileges to fish must be fair and equitable
5. No such measure shall have economic allocation as its sole purpose
6. Allow for variation among the contingencies in fisheries, fishery resources, and catches
7. Minimize costs, avoid duplication, where practicable
8. Account for importance of fishery resources to fishing communities
9. Minimize bycatch or mortality from bycatch
10. Promote safety of human life at sea

http://www.nmfs.noaa.gov/sfa/laws_policies/msa/

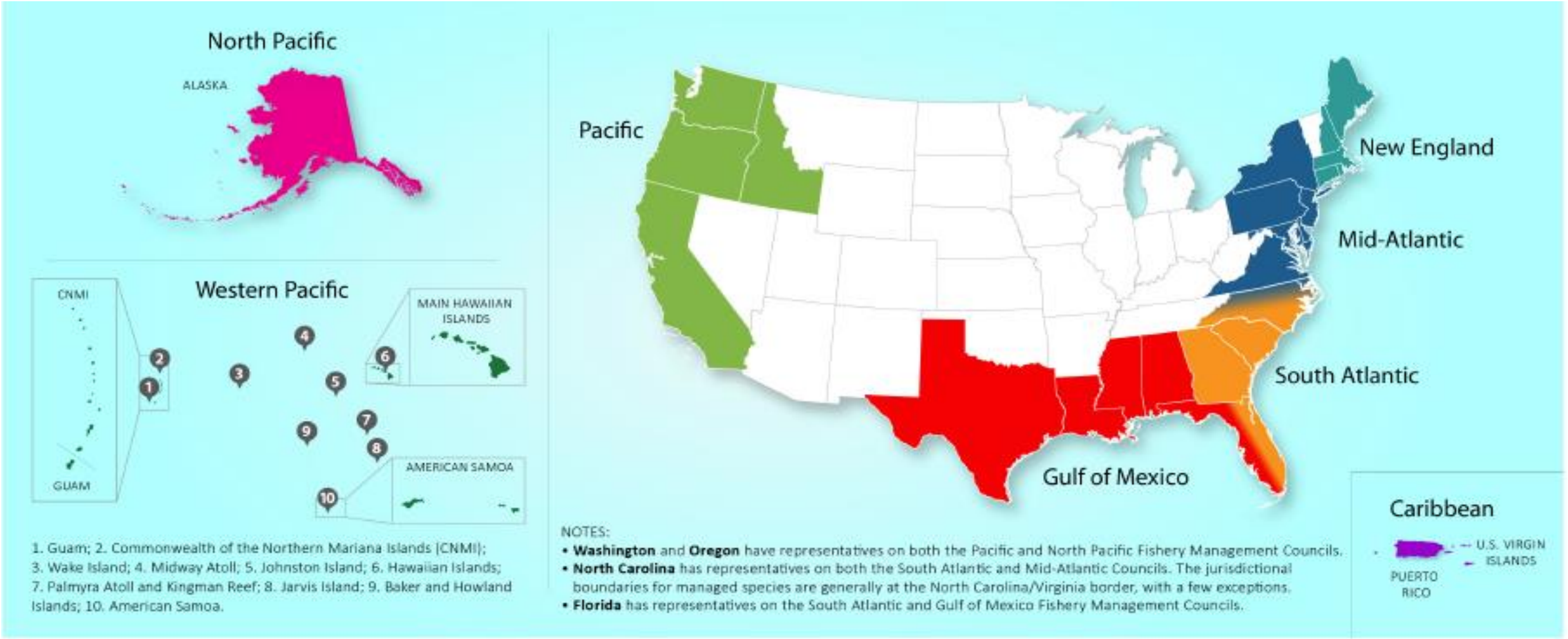
Other Special Provisions of the MSA

- Secretarial FMPs/Amendments
- Highly migratory species (HMS) management
- Emergency actions
- Tribal rights, native customs, indigenous communities
- Essential Fish Habitat



The Councils

Develop and amend fishery management plans for approval/implementation by the National Marine Fisheries Service (NMFS) on behalf of the Secretary of Commerce

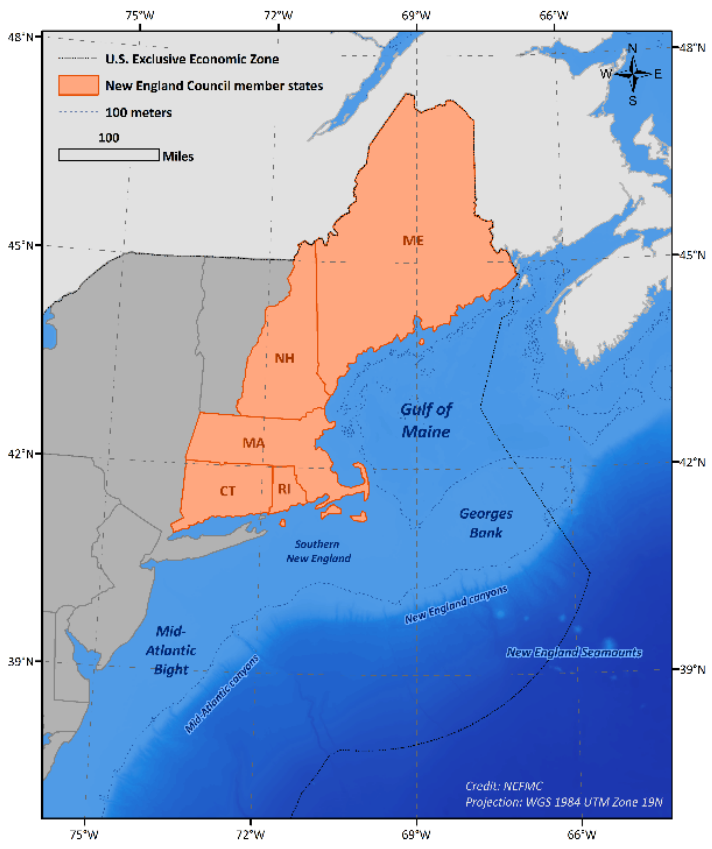


1. Guam; 2. Commonwealth of the Northern Mariana Islands (CNMI); 3. Wake Island; 4. Midway Atoll; 5. Johnston Island; 6. Hawaiian Islands; 7. Palmyra Atoll and Kingman Reef; 8. Jarvis Island; 9. Baker and Howland Islands; 10. American Samoa.

NOTES:

- **Washington** and **Oregon** have representatives on both the Pacific and North Pacific Fishery Management Councils.
- **North Carolina** has representatives on both the South Atlantic and Mid-Atlantic Councils. The jurisdictional boundaries for managed species are generally at the North Carolina/Virginia border, with a few exceptions.
- **Florida** has representatives on the South Atlantic and Gulf of Mexico Fishery Management Councils.

New England Fishery Management Council



5 states, 28 species, 9 Fishery Management Plans

- Northeast Multispecies: 1985 (original 1978) 13 species, 22 stocks
- Atlantic Sea Scallop: 1982
- Atlantic Herring: 1986
- Atlantic Salmon: 1988, no possession
- Monkfish (joint with MAFMC): 1999
- Spiny Dogfish (joint with MAFMC): 2000
- Small Mesh Multispecies (whiting, hakes): 2000, 3 species, 5 stocks
- Red Crab: 2002
- Northeast Skate Complex: 2003, 7 species

Mid-Atlantic Fishery Management Council

7
States

64+ Species
7 Fishery Management Plans

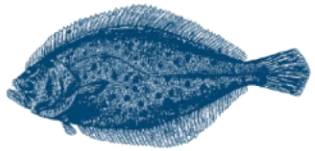
Longfin Squid

Shortfin *"Illex"* Squid

Butterfish

Atlantic Mackerel

Bluefish

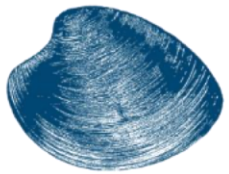


Summer Flounder

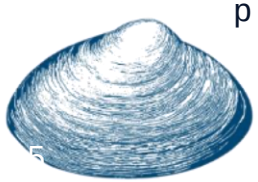
Black Sea Bass

Scup

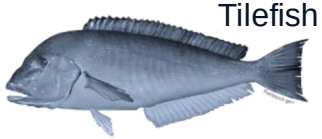
Golden Tilefish



Ocean Quahog



Atlantic Surfclam



Blueline Tilefish

Spiny Dogfish

Monkfish

Chub Mackerel

+ More than 50 Ecosystem Component Species

Council Membership

- Voting members
  - Federal designee – (NOAA Fisheries Regional Administrator, Mike Pentony)
  - State designees - marine fishery management official
  - Other members as nominated by the states and appointed by the Secretary of Commerce

- Non-voting members
  - USFWS Regional Director
  - USCG Regional Commander
  - Executive Director of Marine Fisheries Commissions
  - US Department of State representative

Others at the Table

- Additional non-voting participants vary by Council
  - Other Council's Liaison
  - NOAA General Counsel
  - Fisheries Science Center
  - NOAA Law Enforcement
  - SSC Chair

Council Structure | Members

- Council Members
  - Chair/Vice-Chair
  - Executive committee
  - Committee Structure
    - Species/FMP – scallops, summer flounder/scup/black sea bass
    - Topic – habitat, ecosystem-based fishery management

Scientific and Statistical Committee

- Ongoing scientific advice,
- Acceptable biological catch (ABCs),
- Preventing overfishing,
- Maximum sustainable yield (MSY),
- Rebuilding, socioeconomic., etc.

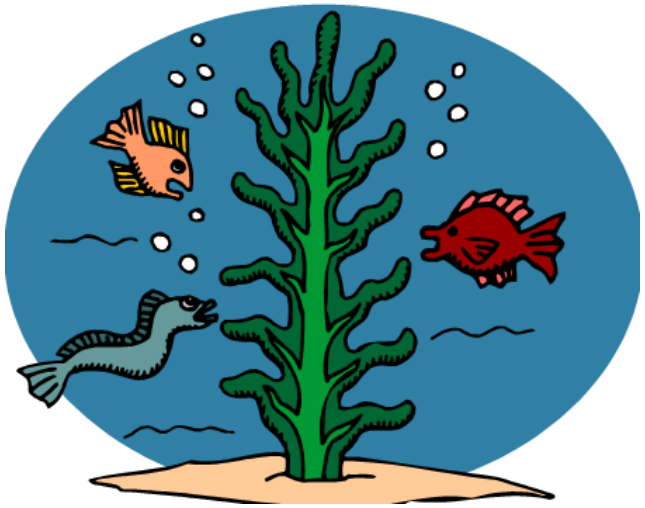
- Members of SSCs are engaged in the stock assessment process
  - In the Northeast, SAW/SARC

Council Structure | Staff and Other Groups

- Council Staff
  - Executive Director
  - Deputy Executive Director
  - Technical staff (chair plan development teams)
  - Administrative staff
- Advisory Panels
  - Fishing industry members
  - May include other members as well, e.g. from ENGOs
  - Means to facilitate stakeholder input into FMPs and other actions
- Scientific and Statistical Committee

Other Useful Process Tools

- Statement of Organization Practices and Procedures (SOPPs)
- Regional Operating Agreements
- Overall Operational Guidelines
- Regional Planning and Council Strategic Planning Tools



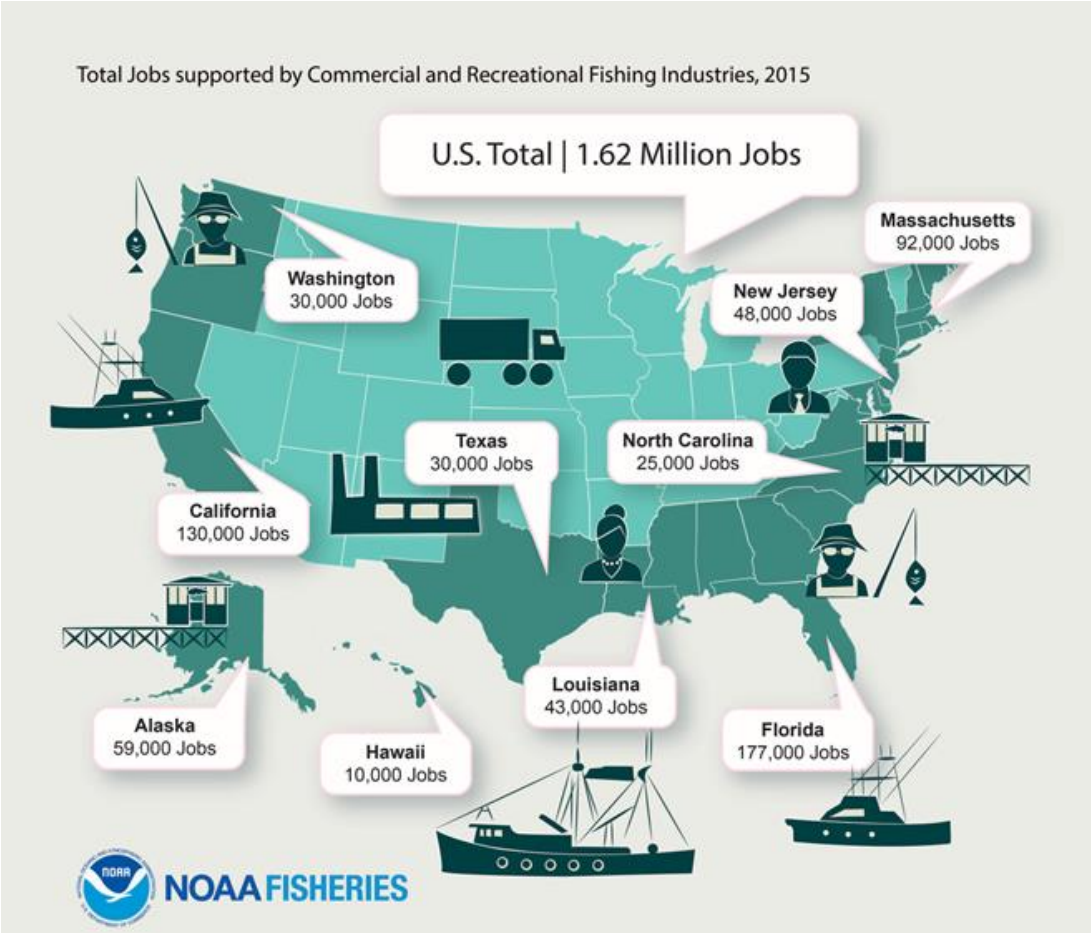
More details: http://www.fisheriesforum.org/our-work/forums/2018-forum/2018-forum-materials/

NOAA Fisheries | Stewardship of ocean resources and habitat

U.S.
Department of Commerce

National Oceanic &
Atmospheric Administration

National Marine Fisheries Service
(NOAA Fisheries Service)



NMFS Greater Atlantic Region

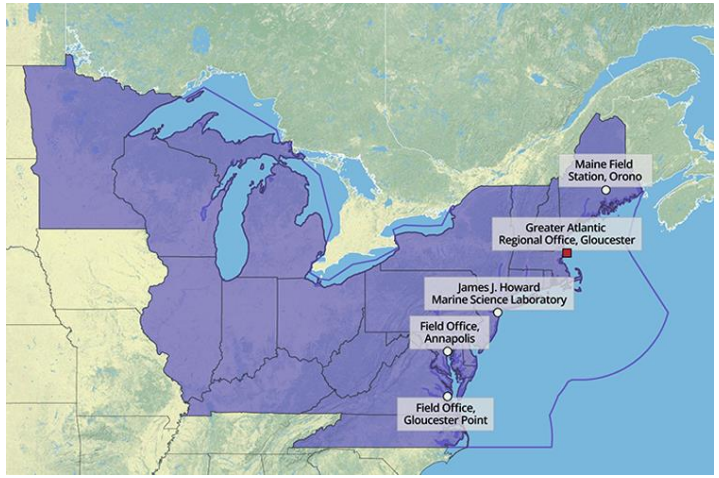
National Marine Fisheries Service

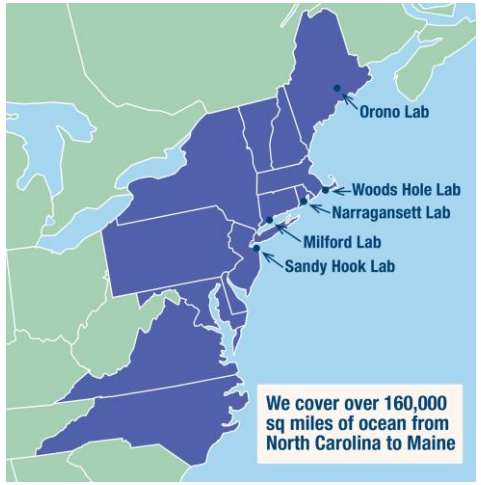
Silver Spring, Maryland

Greater Atlantic Regional Fisheries Office (Gloucester, MA; additional field offices in ME, NJ, MD, and VA)

Northeast Fisheries Science Center

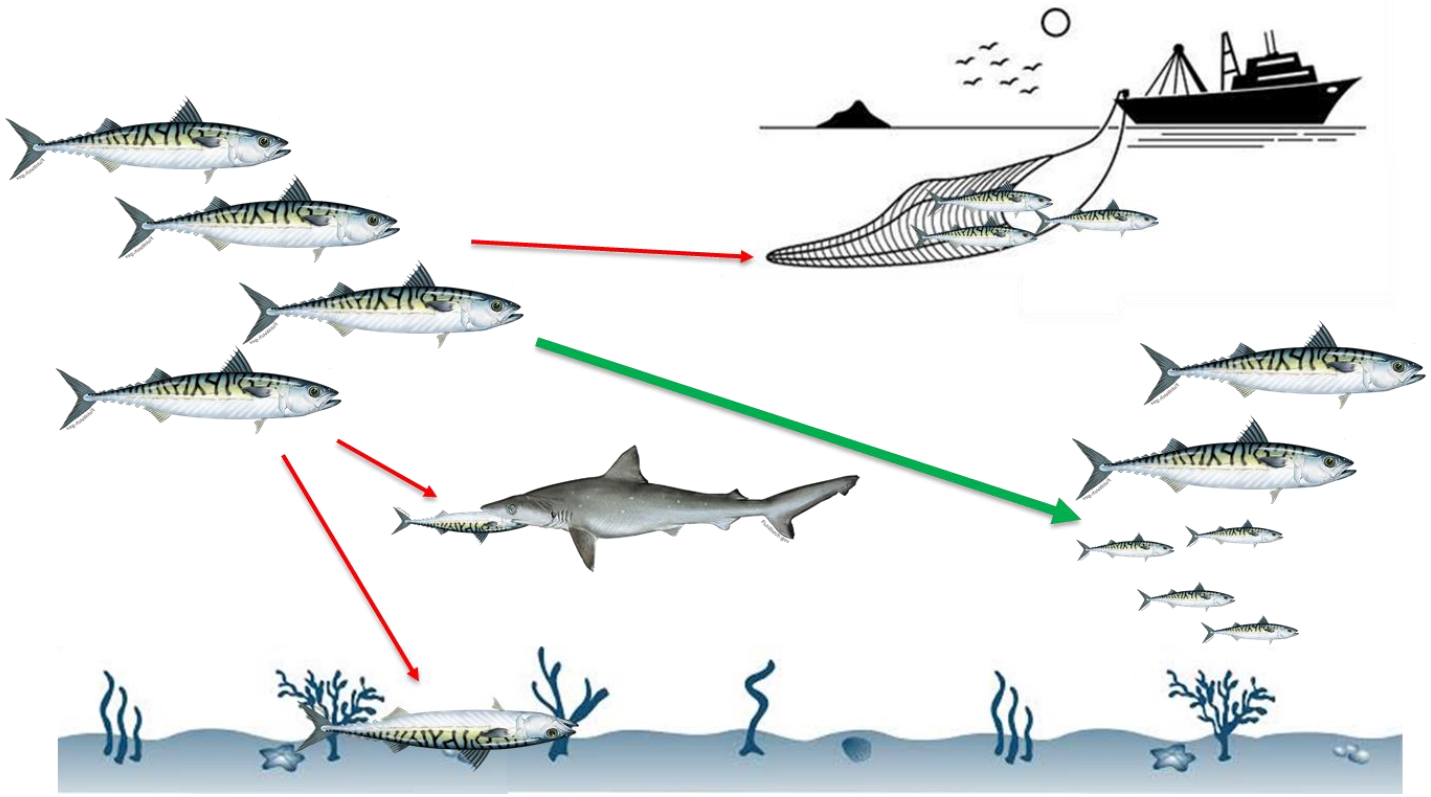
(Orono, ME; Woods Hole, MA; Narragansett, RI; Milford, CT; Sandy Hook, NJ)



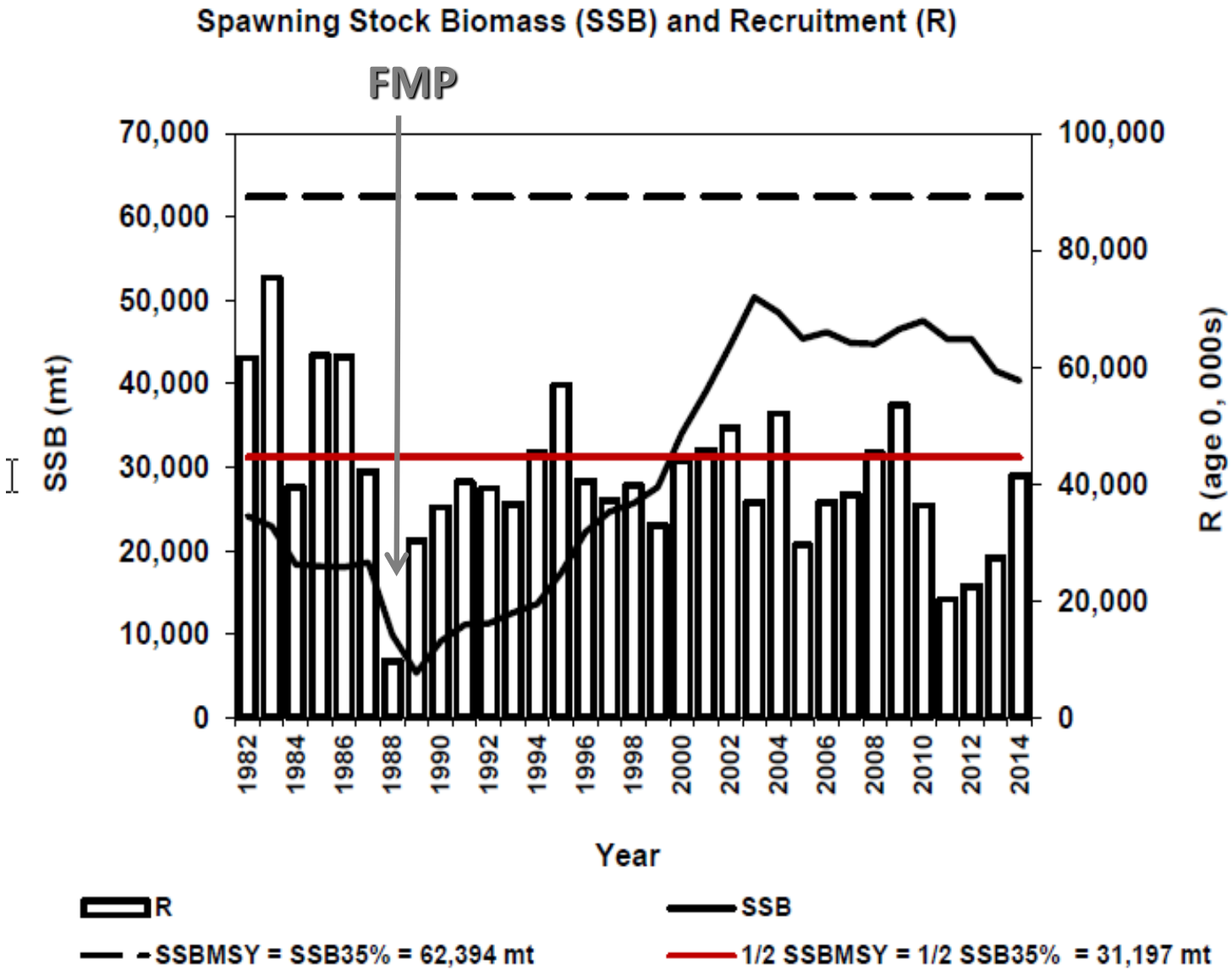


Federal fisheries management:

FMP process



Why Develop an FMP?



Provisions in FMPs | Required

1. Prevent overfishing; rebuild; protect, restore, promote long-term health and stability.
2. Description of the fishery.
3. Specify maximum sustainable yield (MSY) and optimum yield (OY).
4. Specify capacity to harvest and process OY.
5. Specify the data to be submitted to the Secretary.
6. Temporary adjustments to address unsafe ocean conditions.
7. Essential Fish Habitat: identify; minimize impacts from fishing.
8. Specify scientific data needed to implement plan.
9. Fishery impact statement.
10. Objective and measurable criteria.
11. Bycatch: Standardized reporting methodology & measures to minimize.
12. Assess number, types, & mortality of fish caught and released recreationally; minimize mortality.
13. Describe sectors (commercial, recreational, & charter); quantify landings trends by sector.

Provisions in FMPs | Discretionary

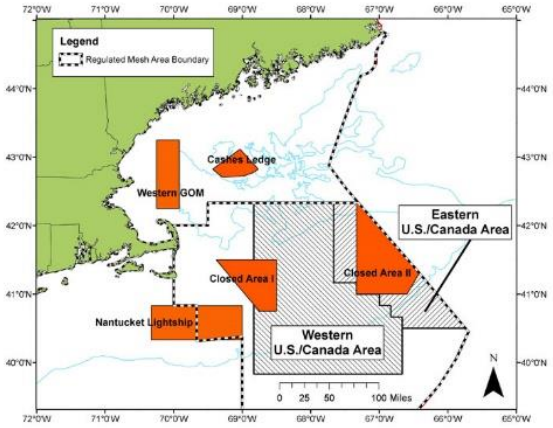
1. Require permits and fees.
2. Designate zones and times where fishing restrictions apply.
3. Establish restrictions on catch, sale, and transshipment.
4. Include gear requirements.
5. Incorporate state measures.
6. Establish a limited access system.
7. Require processors to submit data.
8. Require observer coverage.
9. Assess and specify the effect of the FMP on anadromous fish.
10. Include harvest incentives for reduced bycatch.
11. Reserve a portion of the allowable biological catch for use in research.
12. Conserve target and non-target species habitat.
13. Prescribe other measures, requirements, or conditions and restrictions necessary and appropriate for the conservation and management of the fishery.

Broad Steps to Develop Action

- Identify Issue(s) and type of action
- Develop options for solutions
- Analyze them/get public input
- Council considers and recommends action
- Submitted to NMFS to implement and enforce

Management Tools

- **Permits & catch shares (who can fish)**
- **Quotas (how much can be caught)**
- **Effort controls/seasons (when to fish)**
- **Area restrictions (where to fish)**
- **Gear Restrictions (how to fish)**



Source: www.seawifs.gsfc.nasa.gov

Different tools for different purposes




- Biological data
- Fishery dependent data
- Economic
- Social

Collect Data to Support Analysis

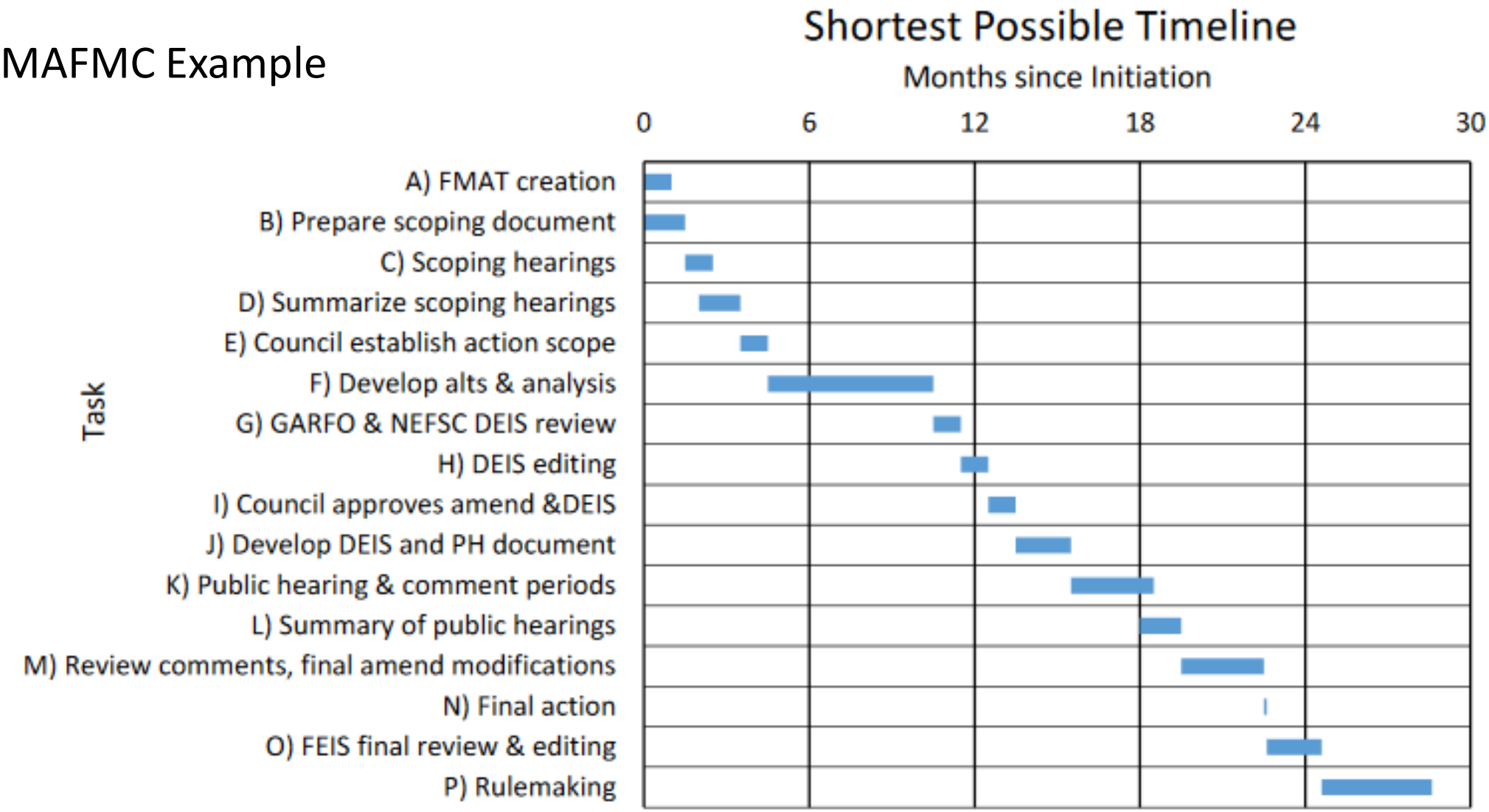
Conduits for Public Input

Council process is designed for stakeholder engagement

- Stakeholders are part of Council composition
- Advisory groups
- General public access to attend meetings, provide comments, ask questions of Council and NMFS staff
- Meetings are recorded, materials are available online
- Councils have dedicated public affairs officers who serve as media contacts, coordinate website content

Example | Amendment Development

MAFMC Example



Amendment Development Process

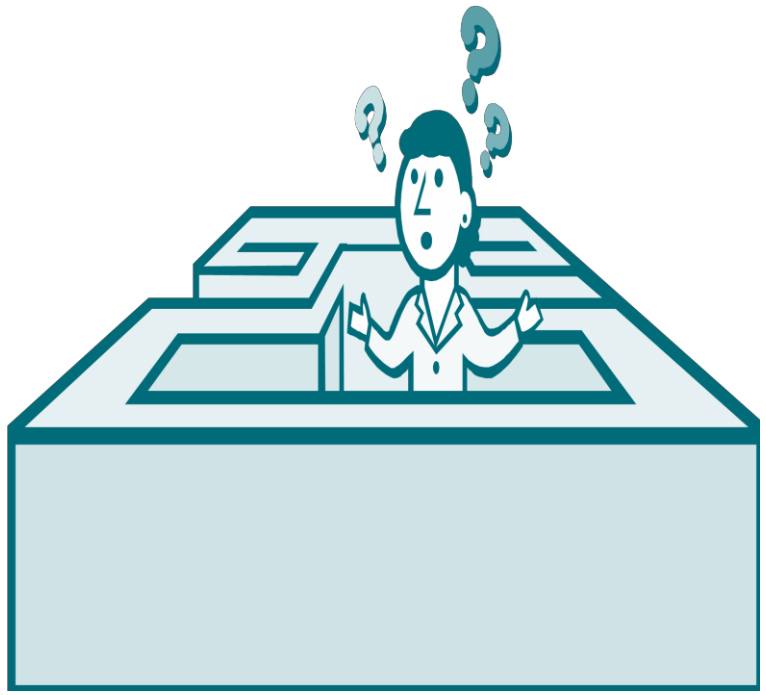
- Why so many steps?
- Creates an administrative record and record of decision
- If sued, federal agency decisions for new or revised rules, are generally reviewed using only the information contained in the administrative record as assembled by the decision making agency

NMFS Responsibilities

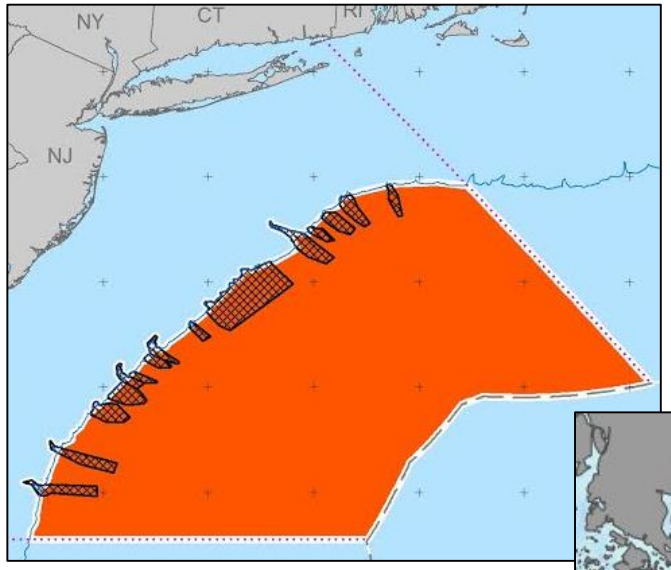
- Legal responsibility for implementing MSA
  - **<u>NMFS is subject to lawsuits</u>**
    - We use the "Administrative Record" as the basis for decision-making, which includes everything in the public record, including written comments, Council minutes, etc.
    - The Admin Record is used in lawsuits to demonstrate how the Agency made it's decision.
  - **Review and approve or disapprove** FMPs/Amendment/Framework Adjustments
    - Can approve in whole or in part
- Implement and enforce regulations
- Administer supporting programs (data collection)
- Serve as the principal source of scientific information to support the process

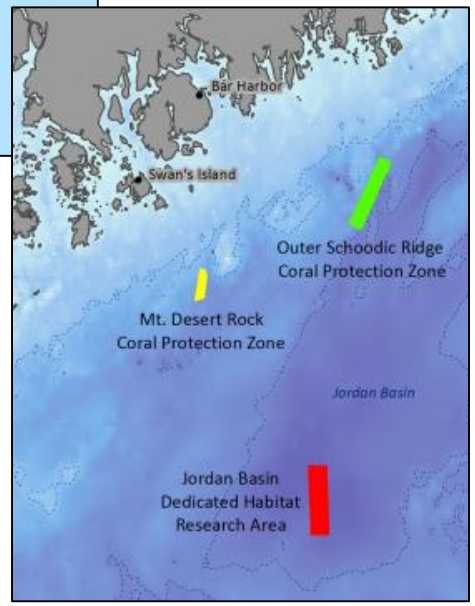
FMP process must comply with multiple applicable laws

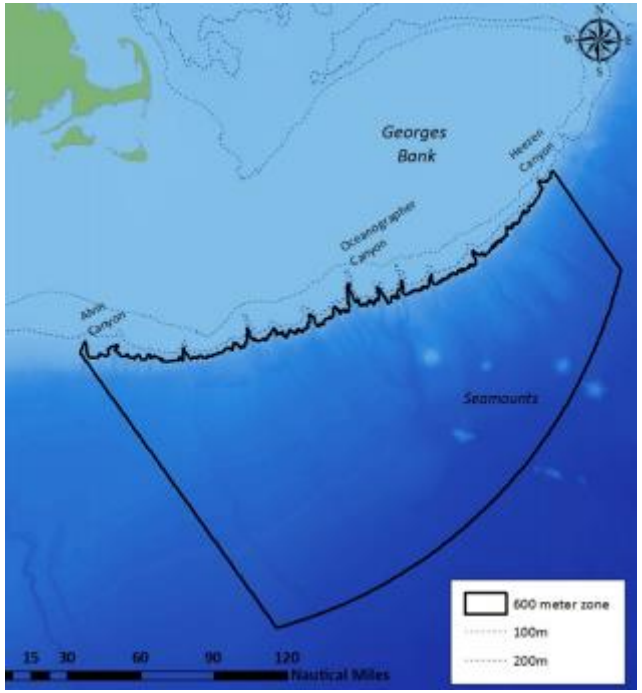
- Many laws apply, not justthe Magnuson-Stevens Act
  - Other important conservation laws – NEPA, ESA, MMPA
  - Procedural laws that apply to all rulemakings by Federal agencies - APA
- Laws are overlapping, detailed, change over time, and are subject to interpretation



Other Council Initiatives: Deep Sea Coral Protection

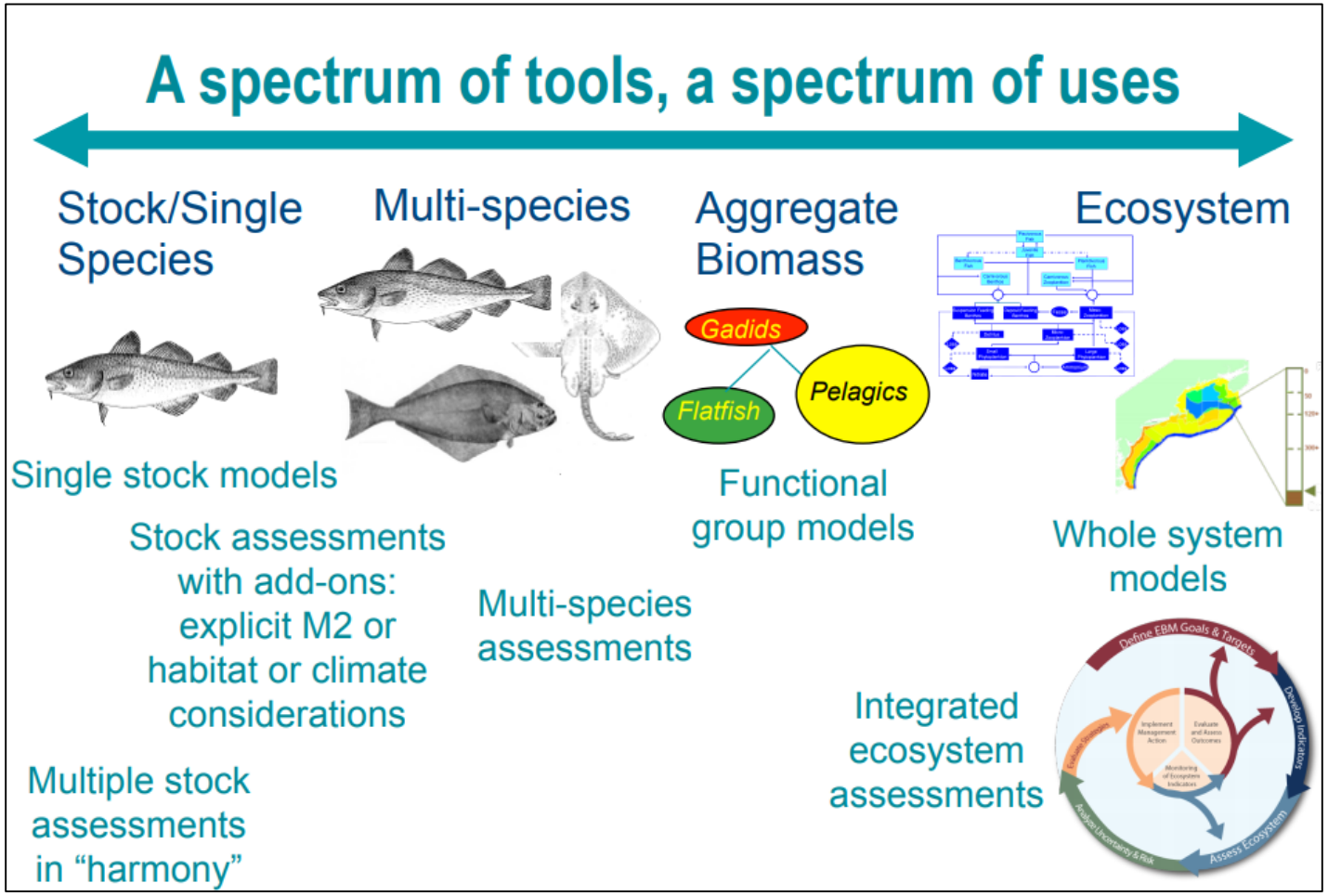






Closures for bottom-tending mobile gear

Ecosystem Based Fishery Management



Source: Sarah Gaichas

…so that we can move toward managing ecosystems.

Recreational Fishing and the Magnuson Act

- The Magnuson Act specifically requires the Agency and the Councils conservation and management measures to ensure healthy commercial and recreational fishing and fishing opportunities.
- When the Magnuson Act was reauthorized in 2007, Congress required that everyone* have a saltwater angler permit.
  - The majority of states' licenses qualify as a substitute
- NMFS has recently released a **Recreational Fisheries Policy** that is intended to more explicitly balancing the needs of the commercial and recreational fisheries.
- Each Region has a "Recreational Fishing Coordinator" (Moira Kelly, GARFO)

Interstate fisheries management

ASMFC Overview

- Formed in 1942 – Interstate Compact
- 15 Atlantic coast states,
  ME – FL
- Deliberative forum for states
- Cooperative management of transboundary resources
- Standards established by Atlantic Coastal Cooperative Management Act

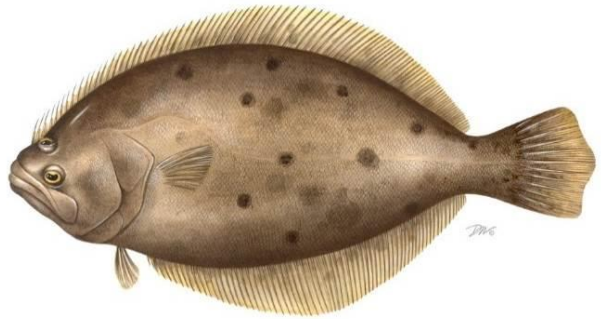
Atlantic Coastal Act (1993)

- Standards for fisheries management
- States implement regulations
- State compliance tied to conservation standards – Secretarial pre-emption
- Work cooperatively with federal partners on shared resources
- Authorizes funding to support
  - ASMFC & state management
  - Federal partners

Note: Magnuson-Stevens Act

- **Not directly applicable to ASMFC**
- **Applies to jointly managed species**
  - **Summer Flounder, Scup, Black Sea Bass Bluefish**

ASMFC Programs



- Interstate Fisheries Management
- Fisheries Science
  - Support to ISFMP
  - Stock Assessments and Assessment Training
- Habitat Conservation
  - Improve conservation through partnerships, policy development and advocacy
- Law Enforcement
  - Recreational/commercial compliance
- ACCSP
  - Commercial and recreational landings/effort

Commission Process

Purpose:

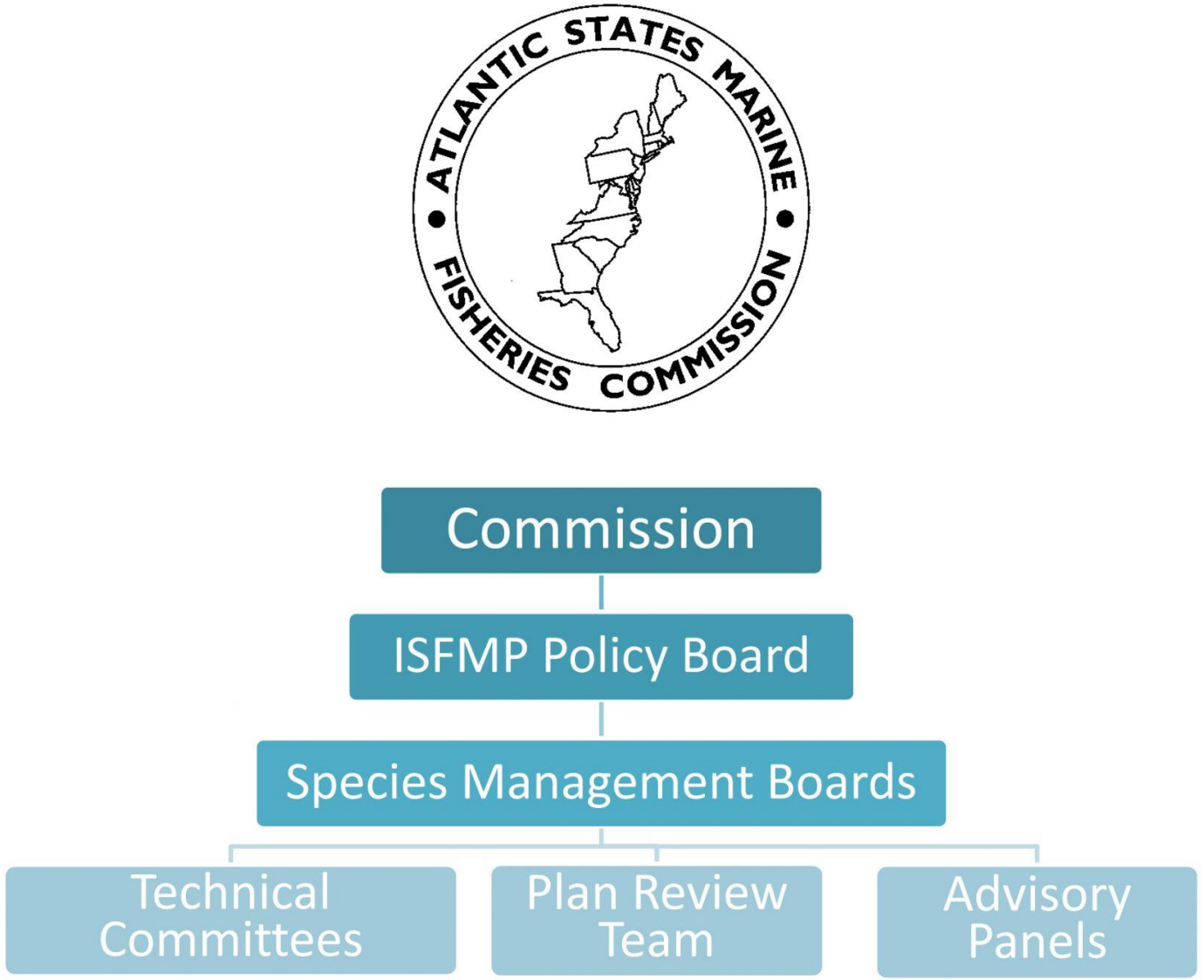
- Coordinate management of shared Atlantic coastal fishery resources

Commission membership:

- State fishery director
- State legislative representative
- Governor's appointee
- Federal partners (NMFS & USFWS)

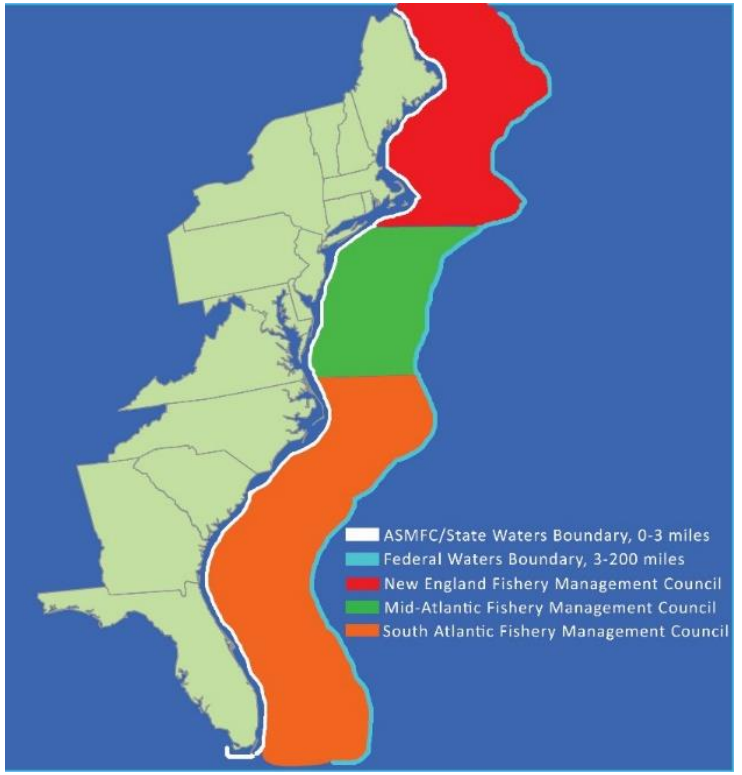
Structure and process:

- One state, one vote
- States implement actions

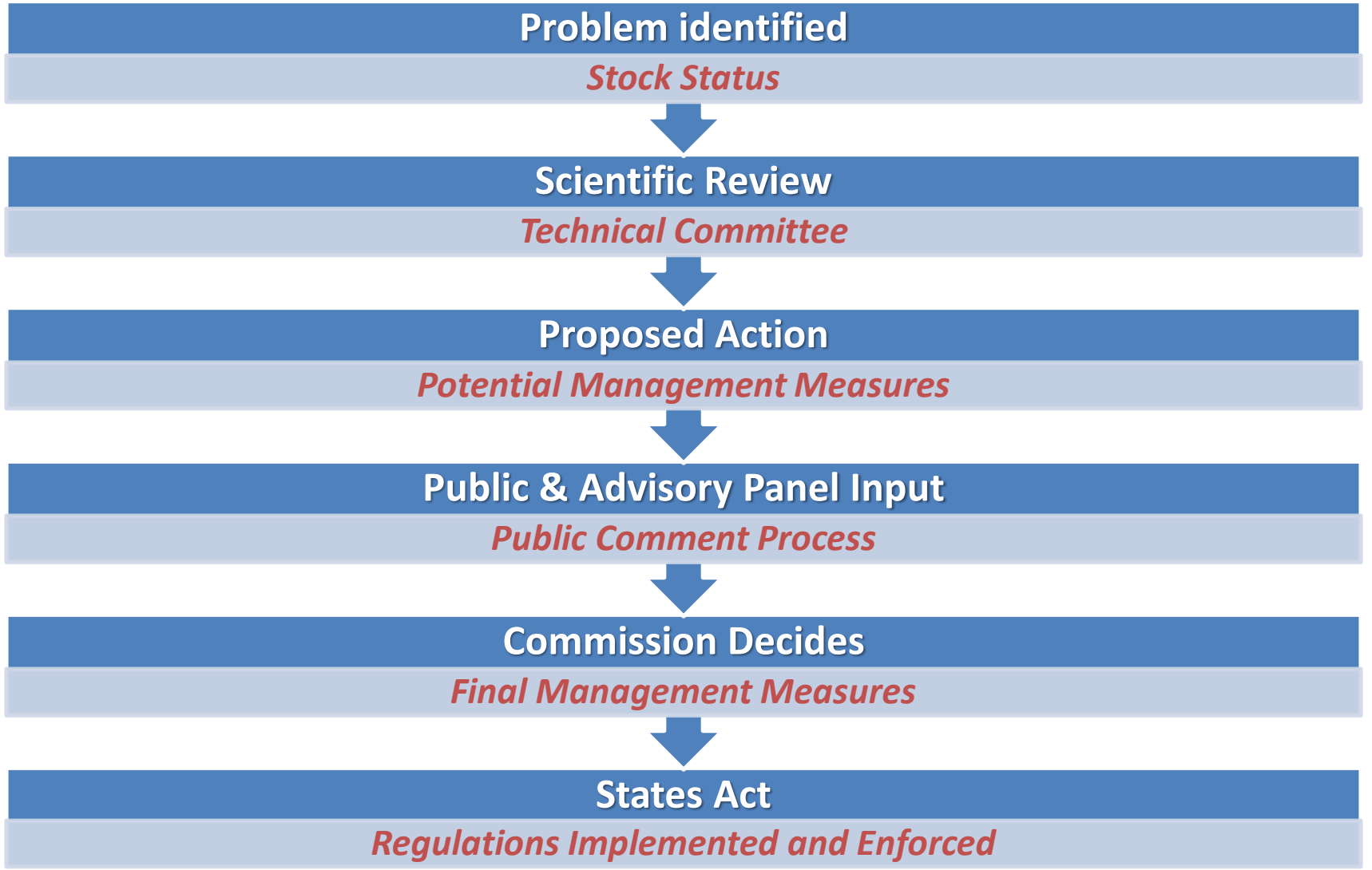


Interstate Fisheries Management

- 27 species/species groups
- Some managed solely by Commission
  - Atlantic menhaden, striped bass, Atlantic cobia
- Others managed jointly/ cooperatively with Regional Councils and NOAA Fisheries
  - Summer flounder, scup, black sea bass, Spanish mackerel



FMP Development at ASMFC



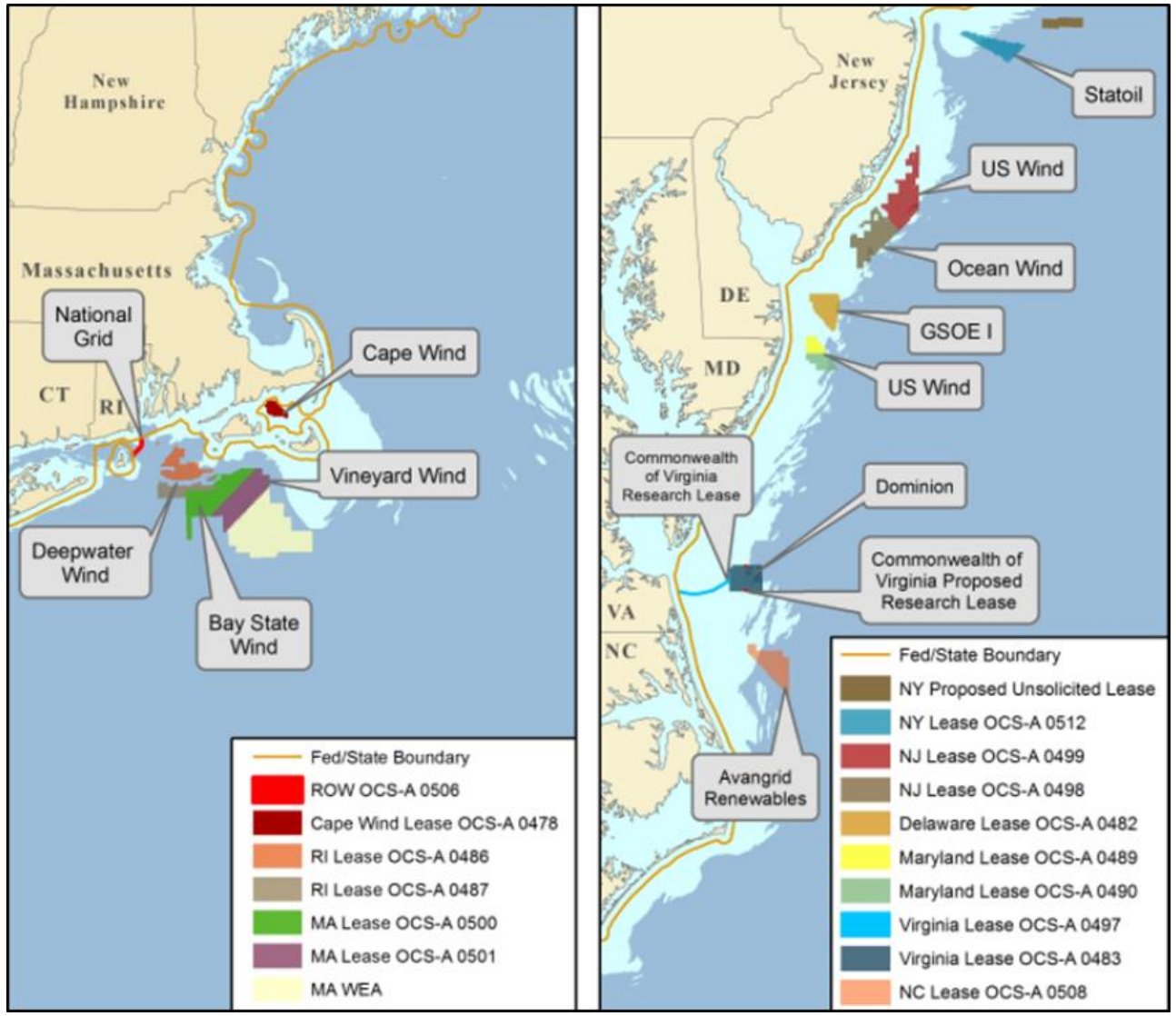
FMP/Amendment: 12 – 18 months

Addendum: 3 – 6 months

State Management

- **Marine Fisheries Advisory Commission**
  - Council-like process
  - Governor appointed industry reps
  - Commission must approve decisions
- **Public meetings and hearings**
  - Opportunity for public input
  - Can shape/change action
- **Petition for rulemaking**

Source: www. vineyardgazette.com



Fisheries management interactions with offshore wind development

NMFS Roles and Responsibilities Related to Offshore Wind

- BOEM is the lead Federal agency and primary decision-maker
- NMFS provides advice to BOEM
- NMFS advice limited to statutory mandates provided by Congress
    - Advice and comments (NEPA, MSA)
    - Incidental Take Authorization (MMPA)
    - Biological Opinion (ESA)
- BOEM is only required to consider our advice and comments

Environmental Process for Offshore Wind

- Administration issued Executive Order to streamline environmental reviews and improve collaboration during the review process for “major infrastructure projects”
- Establishes a two-year goal for completion of all environmental reviews under NEPA
- Creates a “One Federal Decision” policy that requires Federal agencies to rely on the same environmental documents

One Federal Decision (OFD) Process

- NOAA must serve as a NEPA cooperating agency if invited
- NOAA must provide written concurrence on three points during the NEPA process:

  purpose and need
  range of alternatives
  preferred alternative

- Concurrence under OFD: 'there is sufficient information to move to next step'
- Agencies have 10 business days to provide written concurrence
- Non-concurrence results in an internal elevation process

ESA Section 7 Consultation

- BOEM requests consultation and provides NMFS with a biological assessment
- NMFS reviews the assessment and determines if all necessary info is included to initiate consultation (30 days)
- NMFS has 135 days to respond to the biological assessment with a biological opinion (BiOp)
- BiOp should be completed prior to completing the NEPA process
- BiOp may include Incidental Take Statement with mandatory Reasonable and Prudent Measures and Terms and Conditions
- All federal actions are considered under the BiOp, including authorizations under the MMPA

EFH Consultation

- All consultations will be Expanded EFH Consultations
- We have 60 days to provide EFH conservation recommendations
- Federal agency has 30 days to respond in writing and describe measures proposed by the agency to avoid, minimize, or offset the impacts of the action on EFH
- If the response is inconsistent with the EFH conservation recommendations, the Federal agency must explain its reasons for not following our recommendations, including scientific justification for any disagreements.

Offshore wind partnerships – MAFMC and NEFMC

- Share information and updates
- Collaboratively draft comments to BOEM
  - Allows for coordinated messaging from both Councils
  - Shares the workload of reviewing materials and writing comments
  - Ensure that important issues aren't missed
  - Councils share offshore energy policies – these originated with MAFMC
- Maintain joint offshore wind webpage
  - Includes background information, links
  - Archive of Council comments
  - Notices to mariners

Council comments to BOEM

- MAFMC offshore energy policies 2016; NEFMC adopted these same policies in 2018 (link to policies)
- NEFMC will be considering whether updates are warranted given potential for floating offshore wind in the Gulf of Maine
- NEFMC has sent 13 comment letters related to renewable energy since 2011; 8 of these during 2018-2019 (link to letters)
- MAFMC has written 8 letters, including some jointly with NEFMC
- Staff work through Habitat Committee (NEFMC) or Ecosystem Ocean Planning Committee (MAFMC) and/or Council as timing allows

Offshore wind partnerships – Councils and NMFS

- NMFS wind team
  - Cross-disciplinary team of NMFS staff at GARFO and NEFSC
  - NEFMC and MAFMC staff participate to the extent possible given agency guidelines and ability to share information
  - Team briefings are critical for staying up to date on developments (monthly calls, email distribution list, internal website)
  - Divide and conquer approach to attending numerous wind-related meetings
  - Team approach is great for sharing concerns about projects and analytical approaches/workload

Offshore Wind Partnership - ASMFC

- Habitat Management Series
  - Focuses on habitat issues that are broadly applicable along the Atlantic seaboard for the siting, construction, and monitoring of wind facilities.
- Joint Energy Seminar
  - Fish and Energy Policy
  - Energy Impacts on Fish
  - Federal Energy Permitting and Regulation
  - State Energy Permitting and Regulation
  - Fish and Energy Industry
- Habitat Hotline (annual newsletter)
  - 2015 Issue focused on Impacts of Energy Development on Fish Habitat

Other fishery management partnerships for offshore wind

- RODA
  - Overlap in leadership and membership with Council and Commission
  - We share information about RODA initiatives via Council/Commission meetings and mailings
  - Staff can provide technical expertise to support RODA's efforts
- ROSA
  - Emerging initiative
  - Councils and ASMFC have seats on the Executive Council, and plan to be involved in technical committees
- Offshore wind developers
  - Distribute information via Council meetings and mailings
  - Provide updates at Habitat Committee and Council meetings
  - Informal staff to staff connections to stay up to date on projects

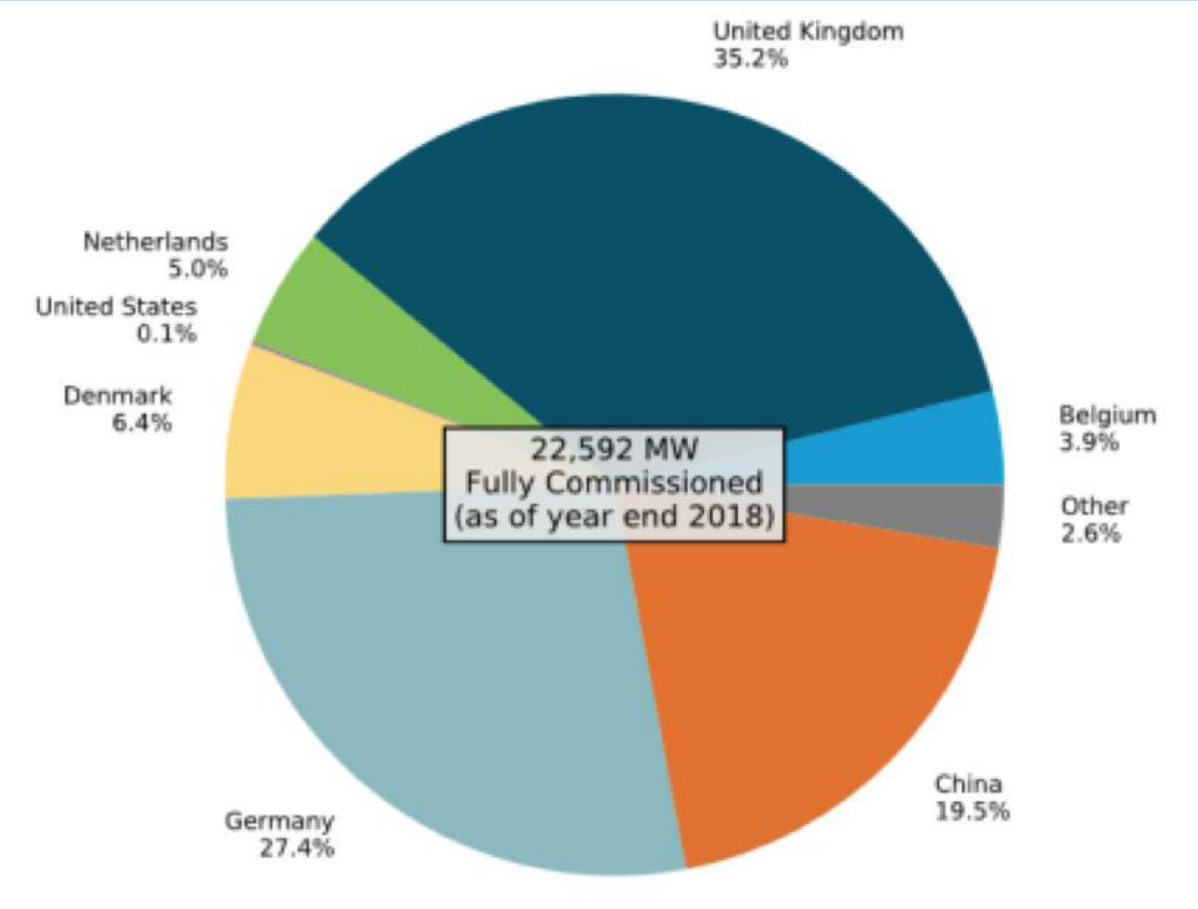
Offshore Wind 101

- **Erik Peckar**, General Manager, Vineyard Power
- **Doug Copeland**, Senior Manager, Offshore Wind, Atlantic Shores

Why offshore wind?

- Globally, industry installed a record 5,652 MW of offshore wind capacity in 2018.
- By the end of 2018, the global offshore wind installed capacity grew to 22,592 MW from 176 operating projects.

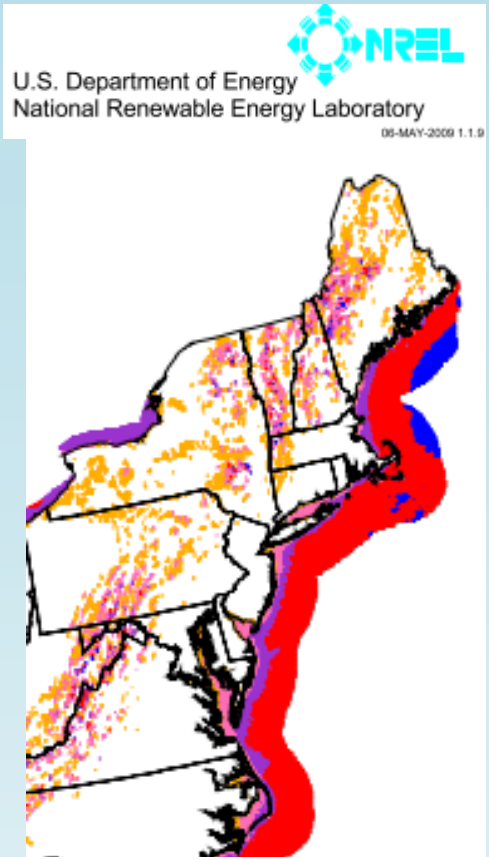
Global Progress



Offshore wind installed capacity by country

Source: 2018 Offshore Wind Technologies Market Report – U.S. Department of Energy

Why Offshore Wind On The East Coast?



Wind Power Classification

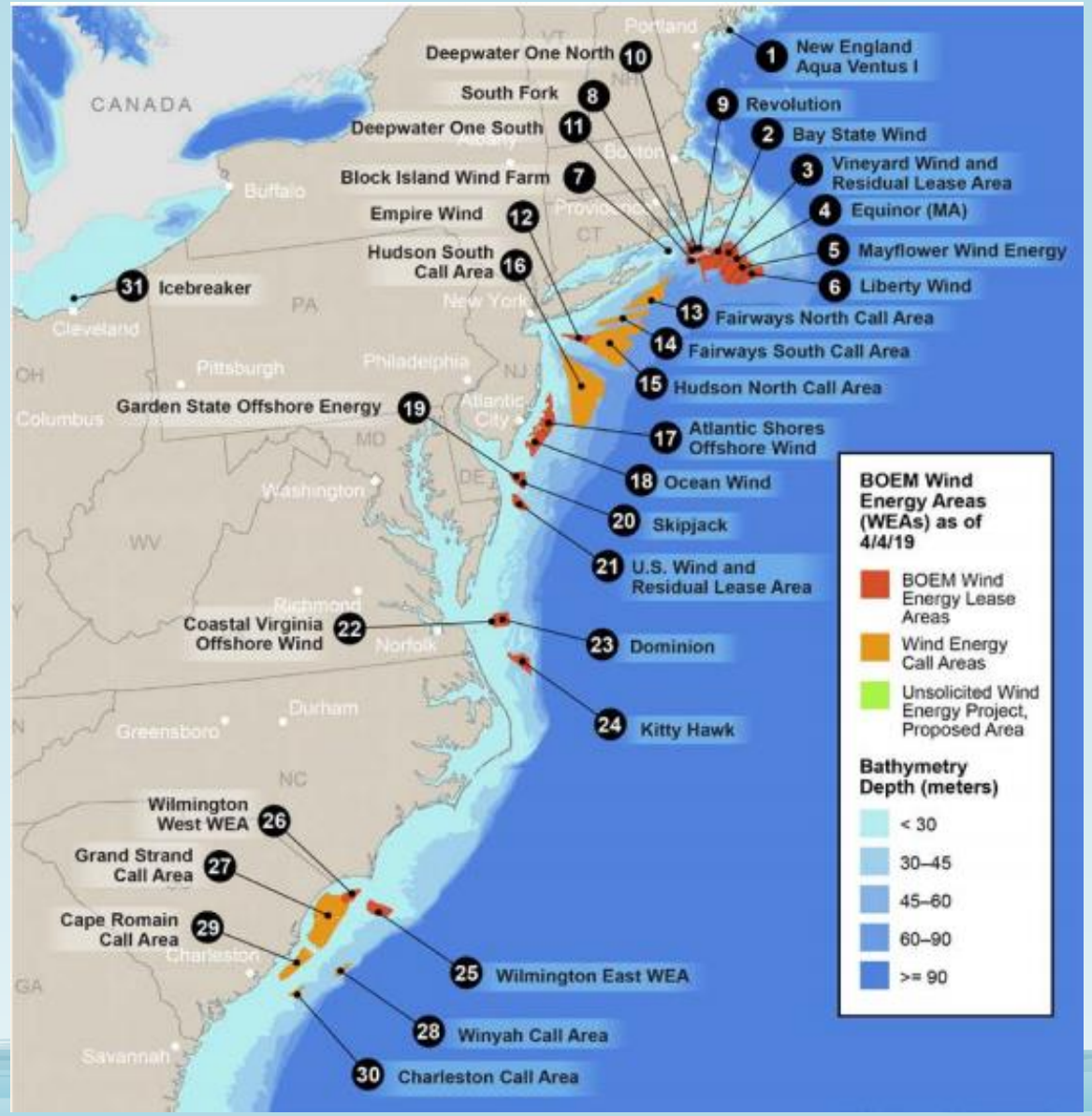
Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed[a] at 50 m m/s	Wind Speed[a] at 50 m mph
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

[a] Wind speeds are based on a Weibull k value of 2.0

Where Are We Now?

East Coast State Policies

- In 2018 and early 2019, new targets were established or upgraded:
  - New Jersey (3.5 GW)
  - Massachusetts (3.2 GW)
  - Maryland (1.6 G.W)
  - Connecticut (2.3 GW)
  - New York (9.0 GW)

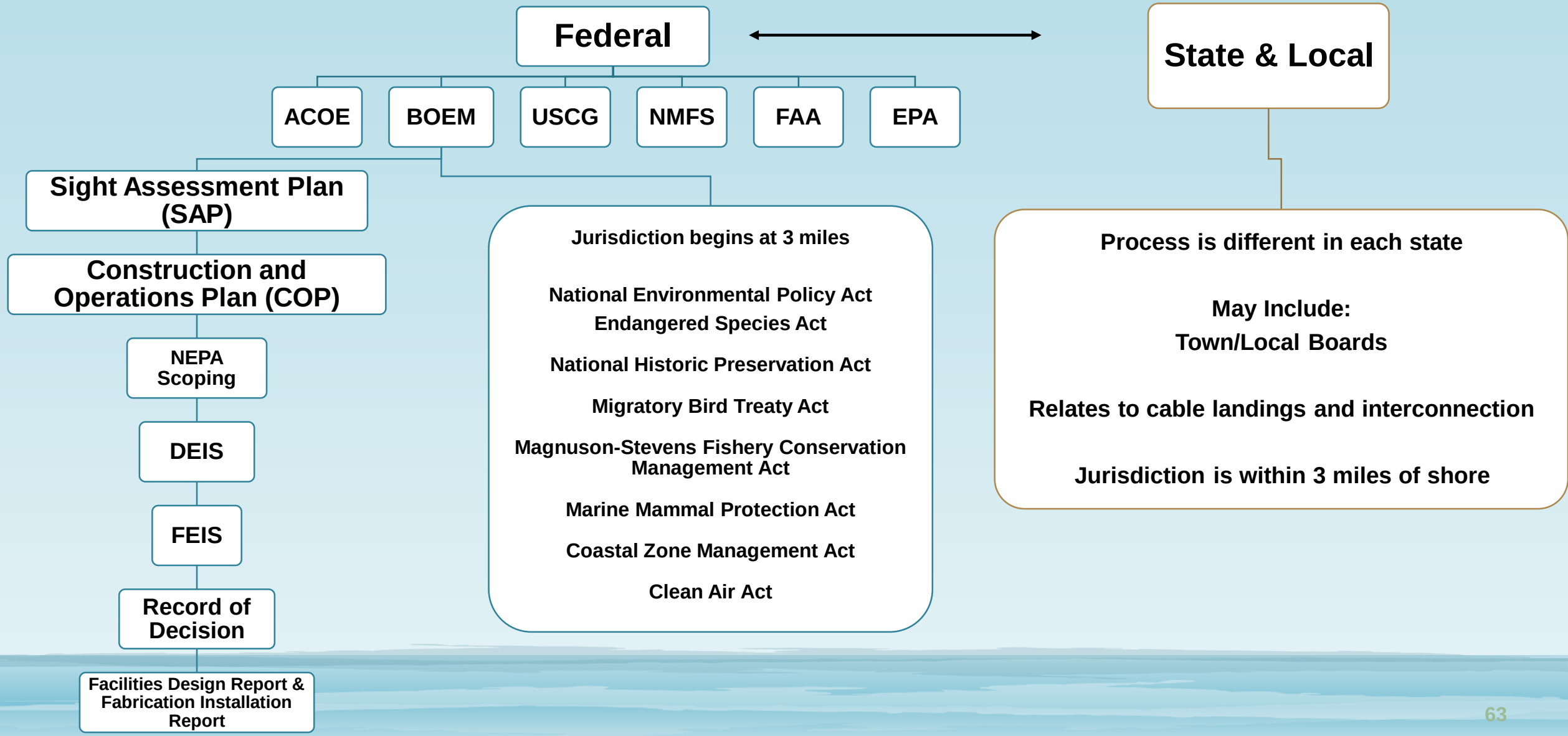


Source: 2018 Offshore Wind Technologies Market Report – U.S. Department of Energy

BOEM's Offshore Wind Development Phases

- Planning & Analysis
- Leasing
- Site Assessment
- Construction and Operations
- Decommissioning

Permitting Process: High Level Overview



Project Design Envelope, Planning & Decisions

- Allows developer the option to submit a reasonable range of design parameters within the permit application (COP)
  - Number of turbines
  - Foundation Type
  - Location of export cable route
  - Location of offshore substations
  - Construction methods and timing
- Allows flexibility
  - Able to adjust some design elements as project progress through permitting
  - Allows project to potentially incorporate newest technology as offshore wind technology often outpaces speed of permitting
- Allows permitting agency (BOEM) to analyze maximum impacts that could occur from the range of design parameters – “Maximum Design Scenario”
  - Assess potential impacts of key resources
    - Marine mammals, fish, benthic habitats, commercial fisheries

Offshore Wind Power Purchase Agreements (PPAs)

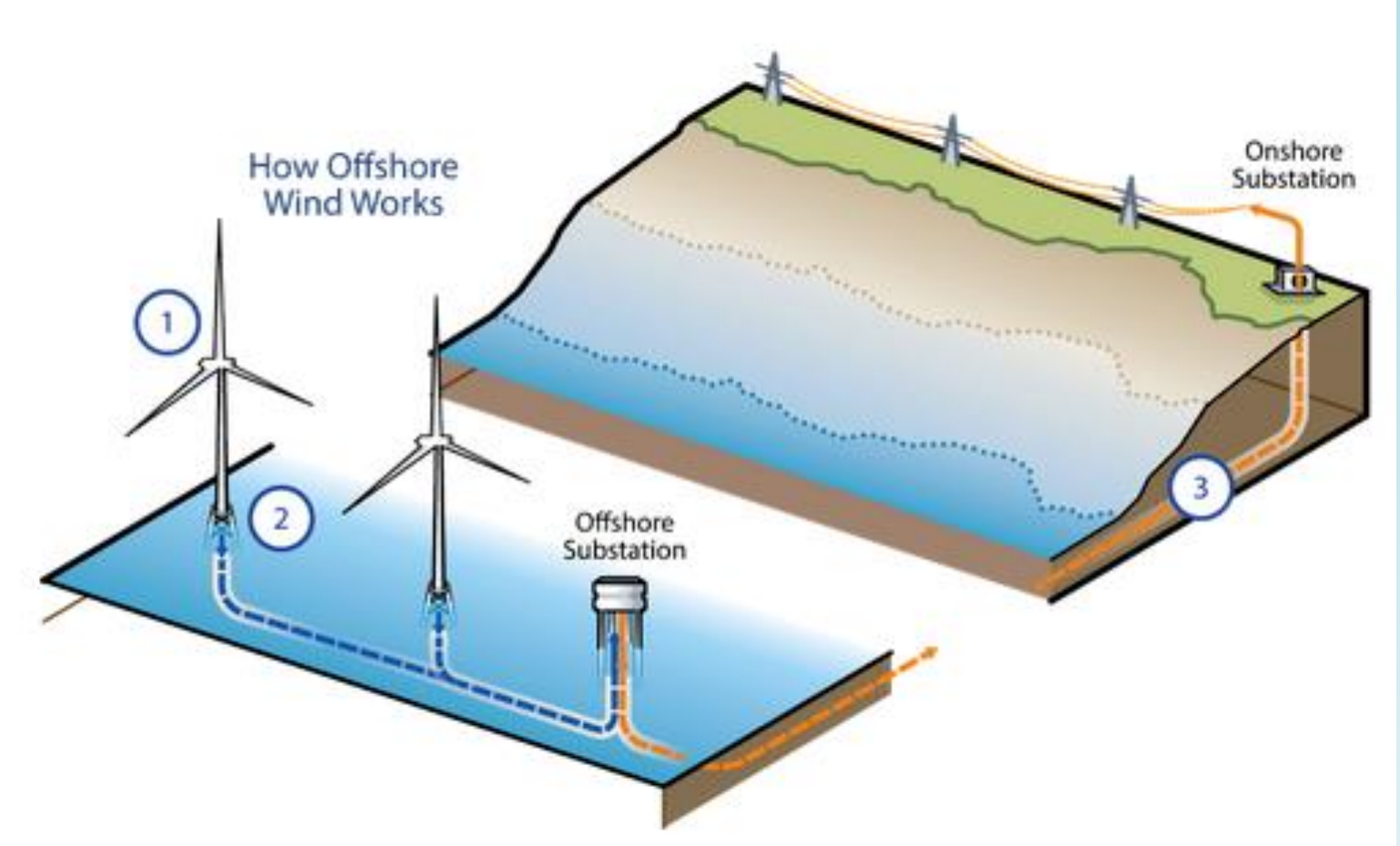
- Long-term power contract between developer and a buyer
  - PPA usually has a term of 15-25 years
  - Gives project a predictable revenue stream
- Utility Power Purchasers
  - Public utilities
    - Investor Owned Utilities
    - Municipal Utilities
  - Meeting state renewable portfolio standards (RPS)
    - Purchase of Renewable Energy Credits (RECS)
- Commercial, Industrial and Institutional (CI & I)
  - Corporations, Universities, Hospitals, Other non-utility buyer

How Offshore Wind Works

1. Offshore Turbines: Capture the wind's energy and generate electricity

2. Foundations: secure turbines to the ocean floor and cables transmit electricity to an offshore substation

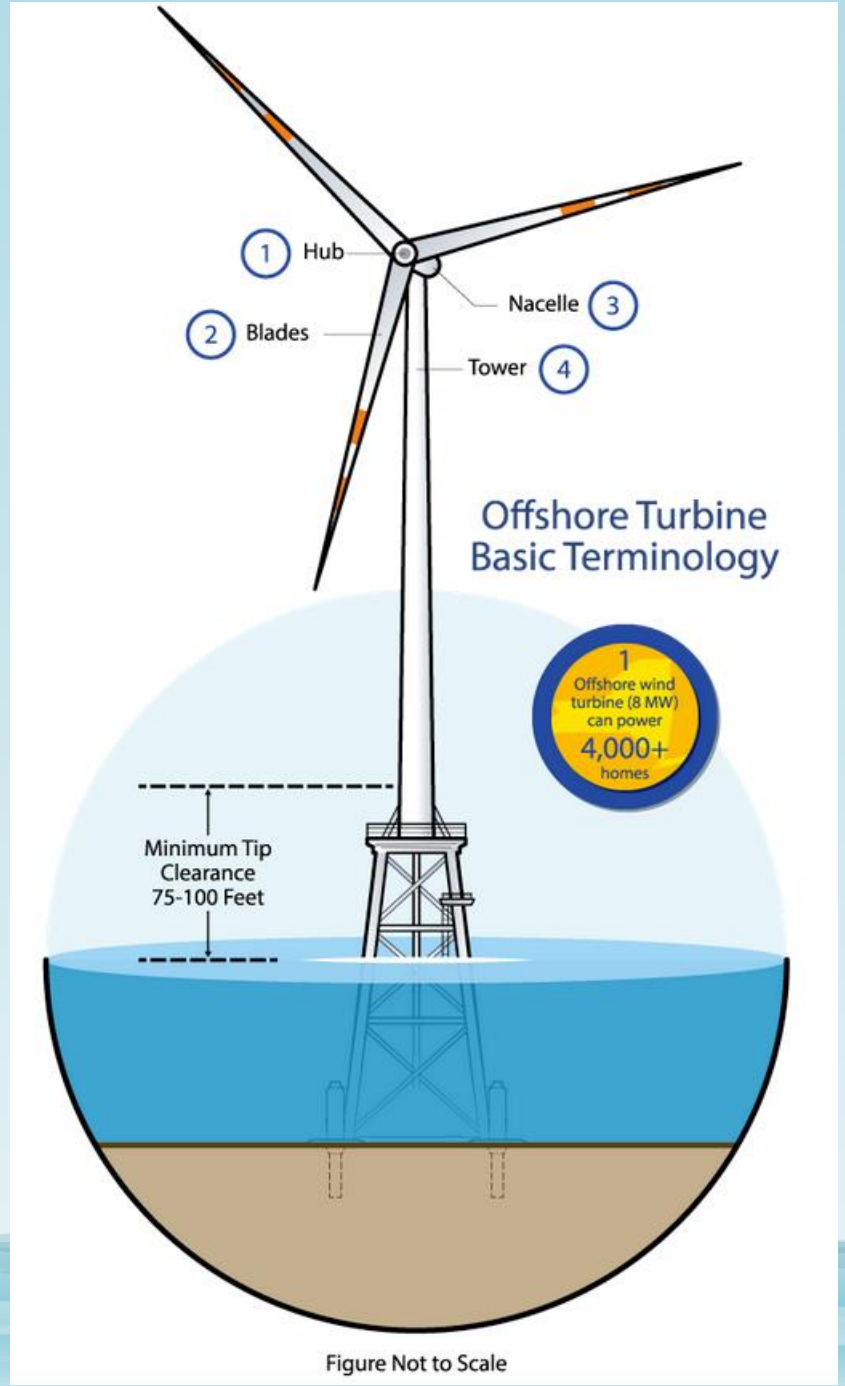
3. Electricity flows through a buried cable to an onshore substation and is transferred to the existing transmission network



Credit: NYSERDA

Offshore Turbines

1. Hub: Supports the blades
2. Blades: Capture the wind's energy and converts it into mechanical energy
3. Nacelle: Houses the components that convert mechanical energy to electrical energy
4. Tower: Supports the nacelle, hub and blades



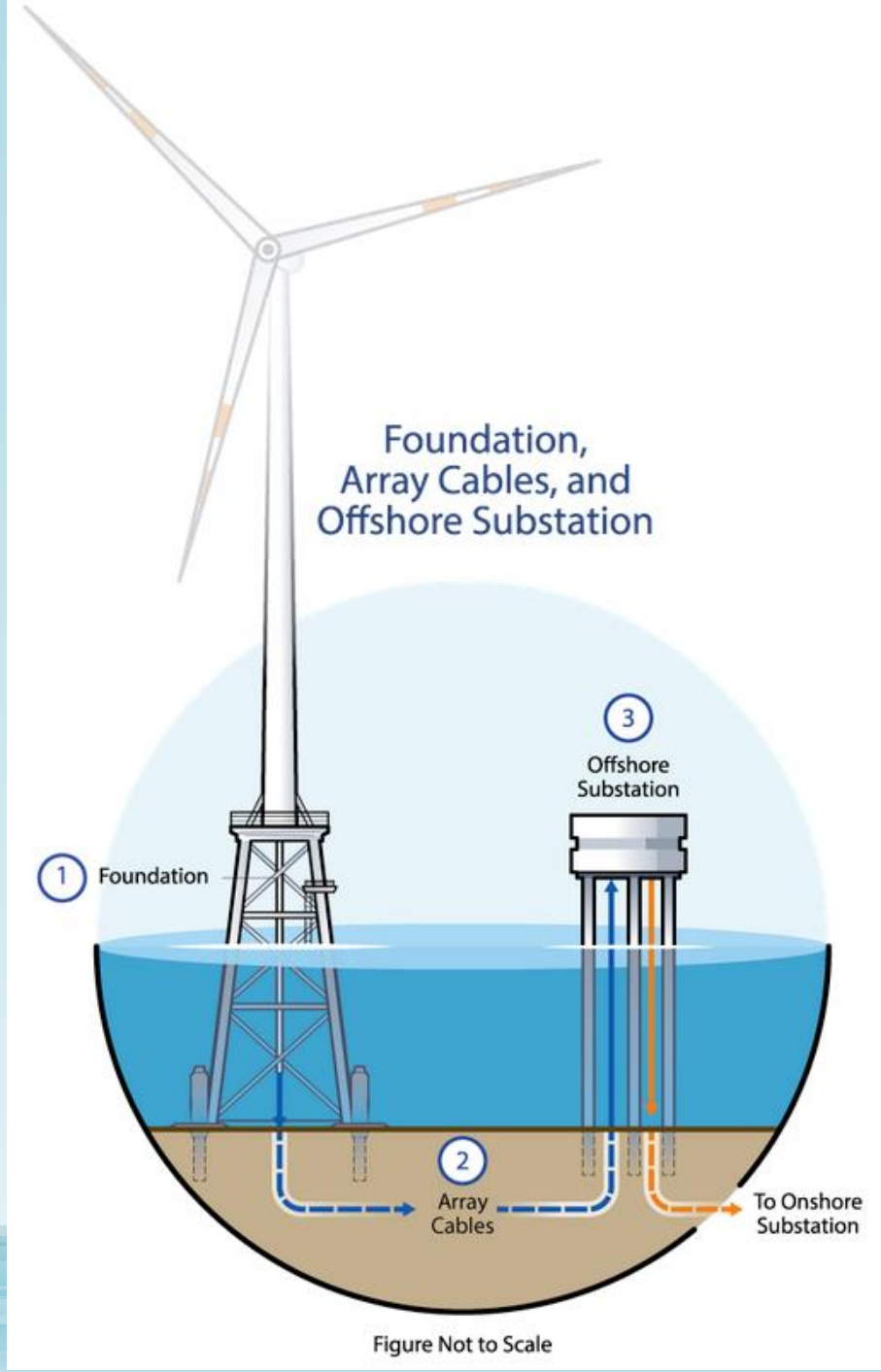
Credit: NYSERDA

Foundation, Array Cables and Offshore Substation

1. Foundation: Secures the tower above water line
    1. Jackets
    2. Monopiles
    3. Gravity
    4. Floating (future)

2. Array Cables: Link turbines together and deliver power from the turbines to the offshore substation.

3. Offshore Substation: Collects and stabilizes the power from the turbines preparing it for transmission to shore



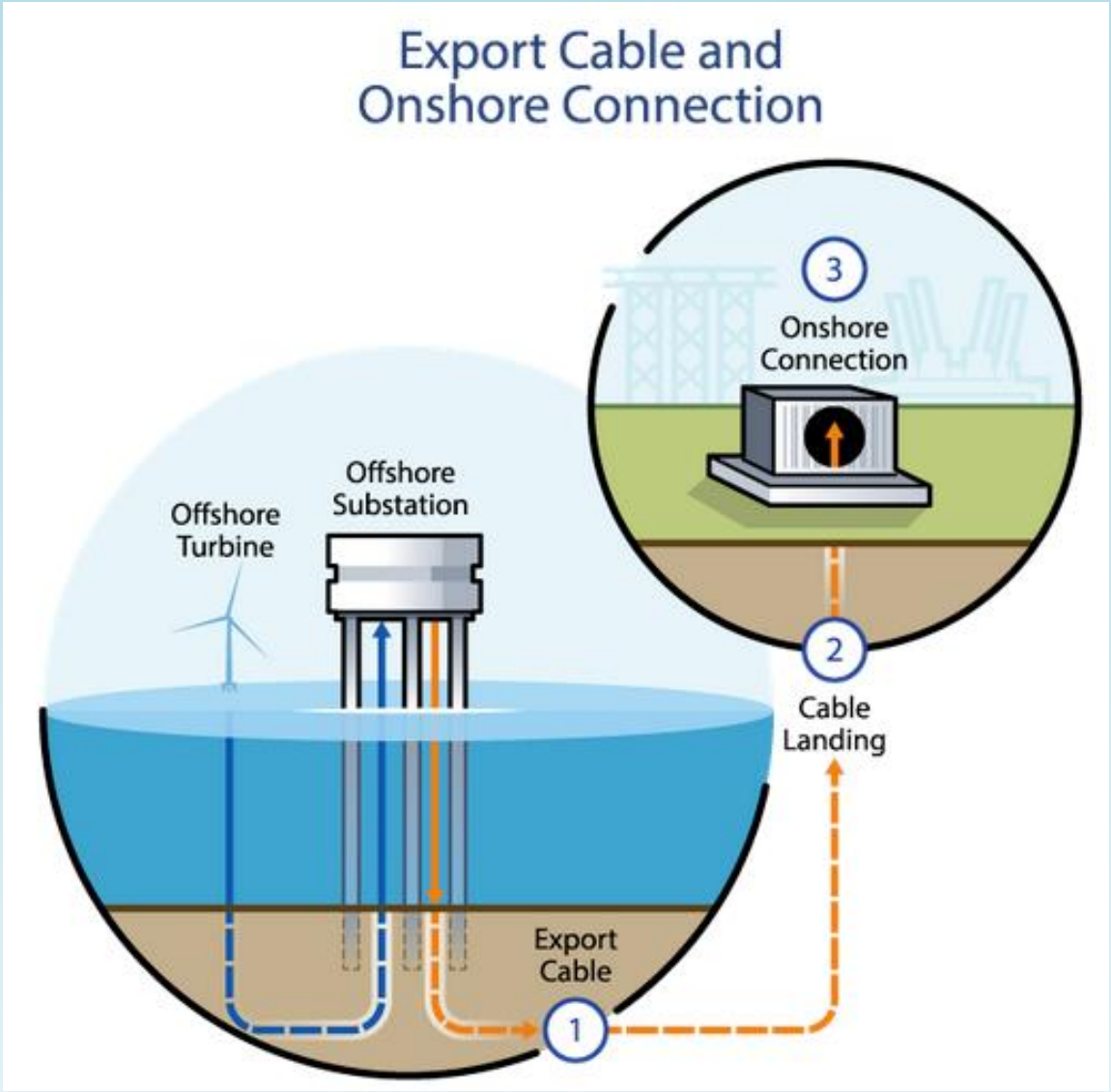
Credit: NYSERDA

Export Cable and Onshore Connection

1. Export Cable: buried deep enough to avoid disturbing ocean users and wildlife. Cable protection may be used if target burial depths may not be reached. Transmits power from offshore substation to onshore substation.

2. Cable landing: Horizontal directional drilling is typical method.

3. Onshore Connection: Where incoming electricity from wind farm is transferred to the existing transmission network



Credit: NYSERDA

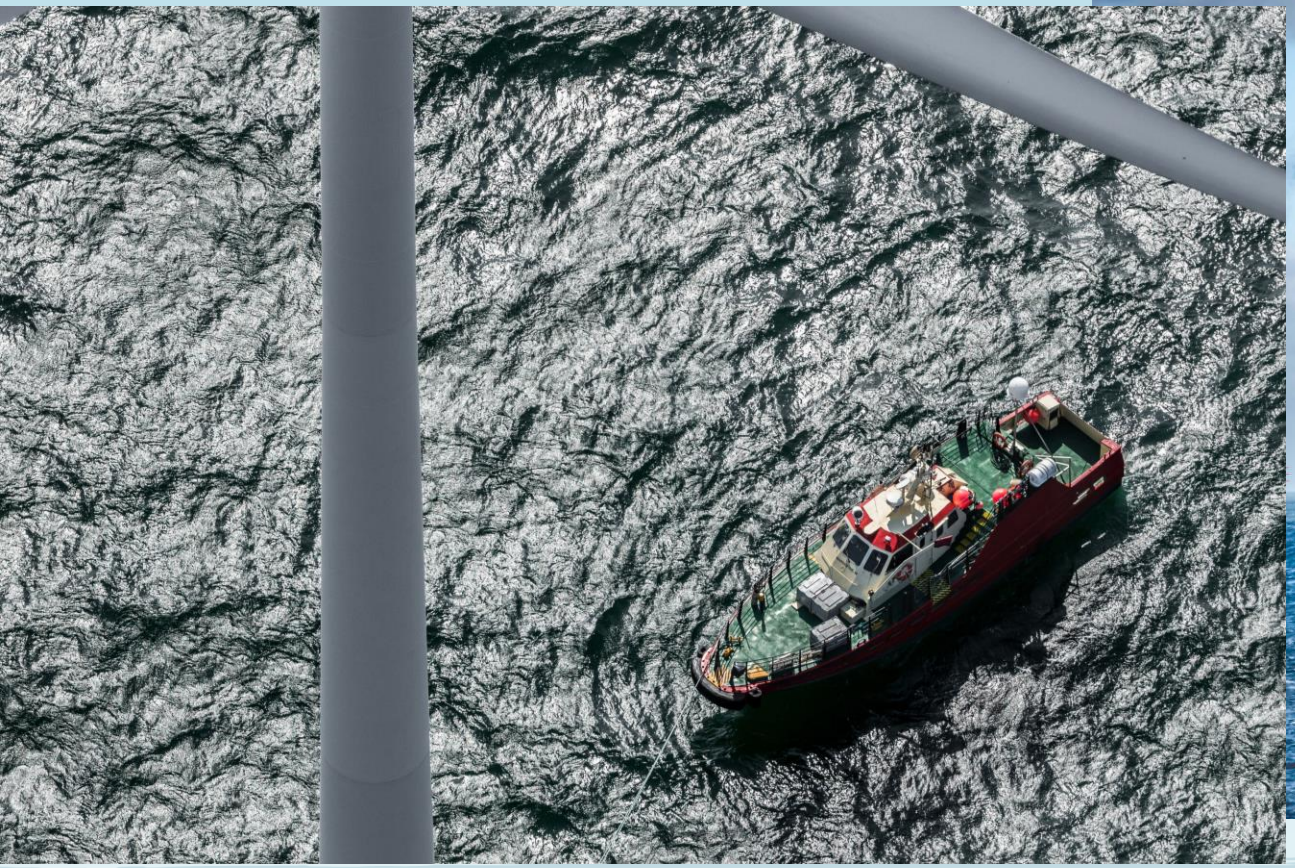
Construction

Esbjerg, Denmark – a North Sea hub for offshore wind

4 parallel projects out of the same terminal

Wind Turbine Generators (WTG)

- 8 – 12 MW WTG



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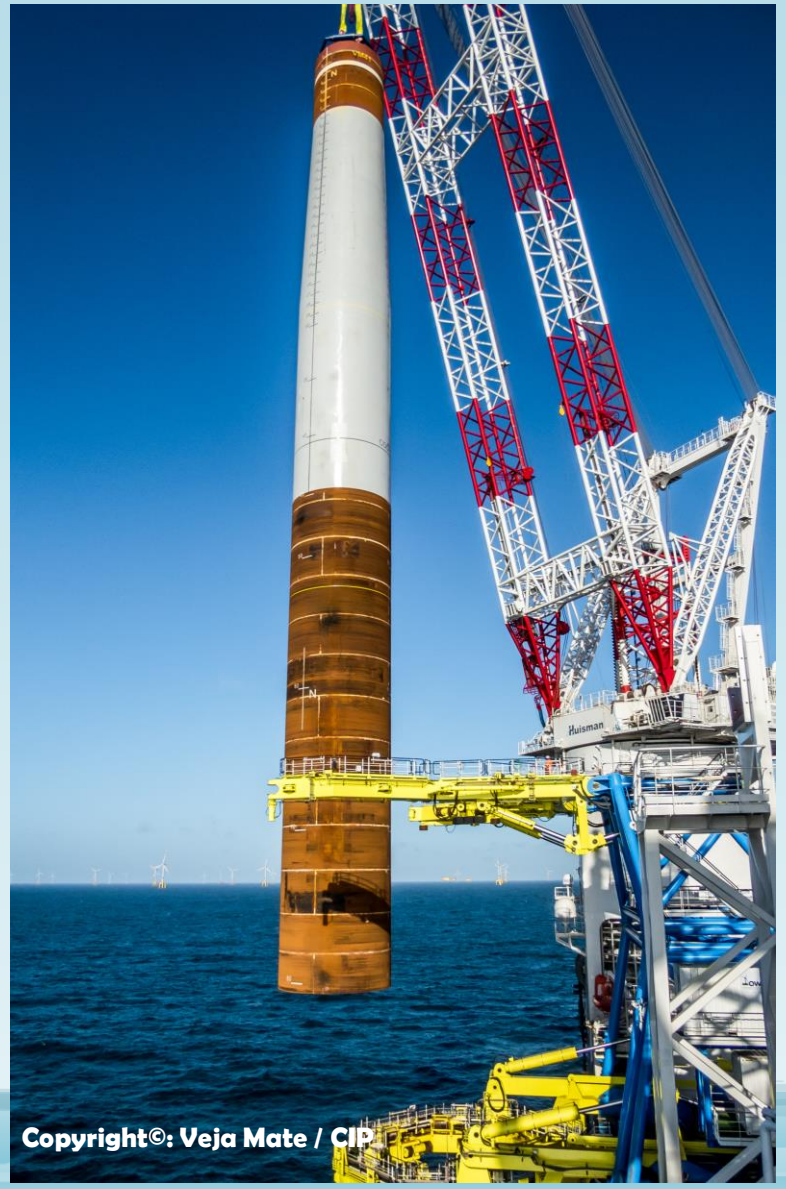
Foundations – Monopile and Transition Piece



Foundations Jacket

Tower Installation

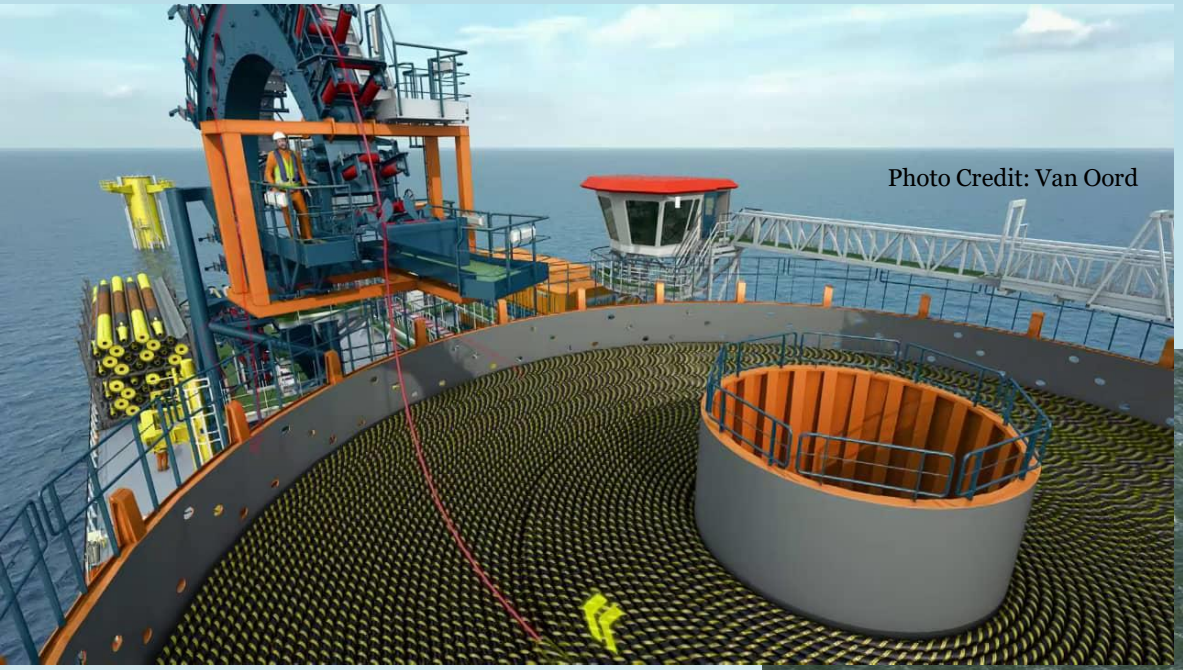
Blade Installation

Offshore Substation: Electric Service Platform

Copyright©; Veja Mate / CIP

Courtesy of Beatrice Wind Farm

Cable Installation Vessel



Typical Cable Burial Methods

Special equipment is required to lay cables in different soil conditions

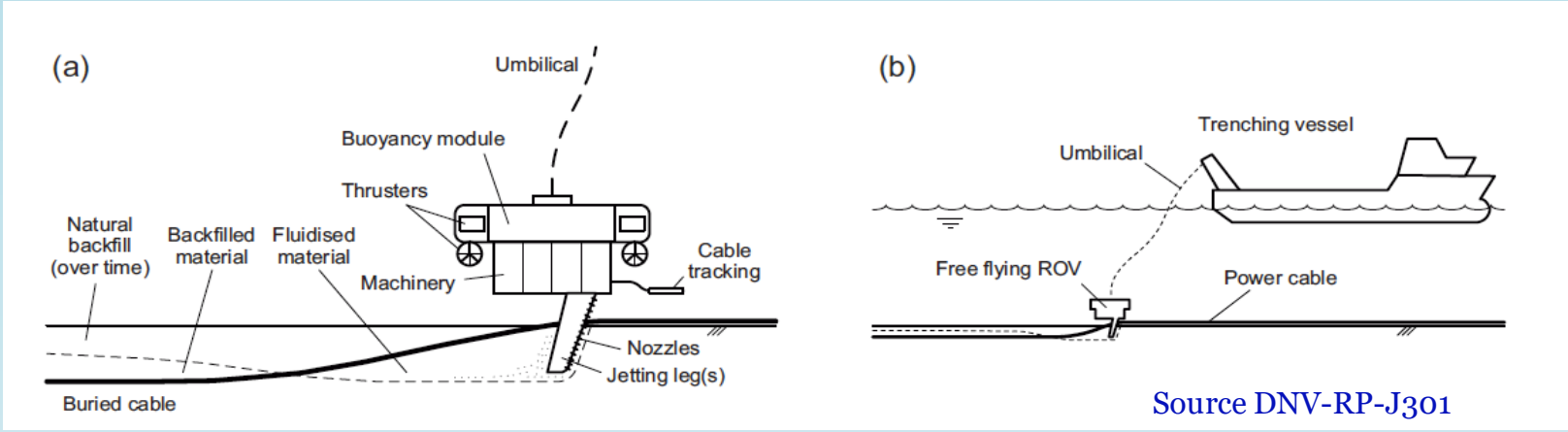
Main trenching methods include:

<u>Jetting</u>

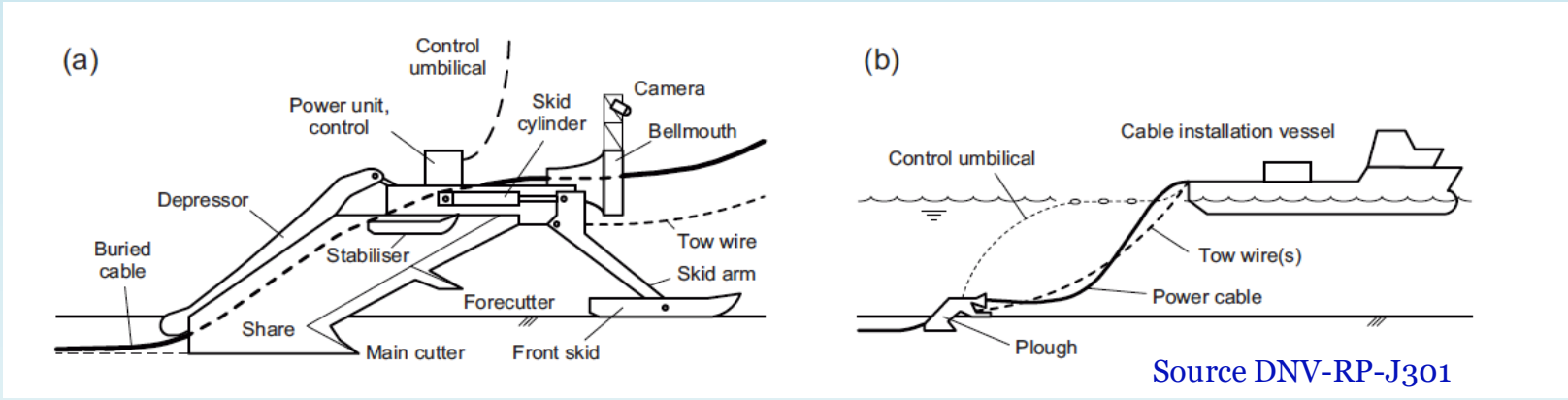
- Pumps high pressure water to fluidize soil
- ROV

<u>Ploughing</u>

- May include jetting system for sand
- Limited maneuverability



Source DNV-RP-J301



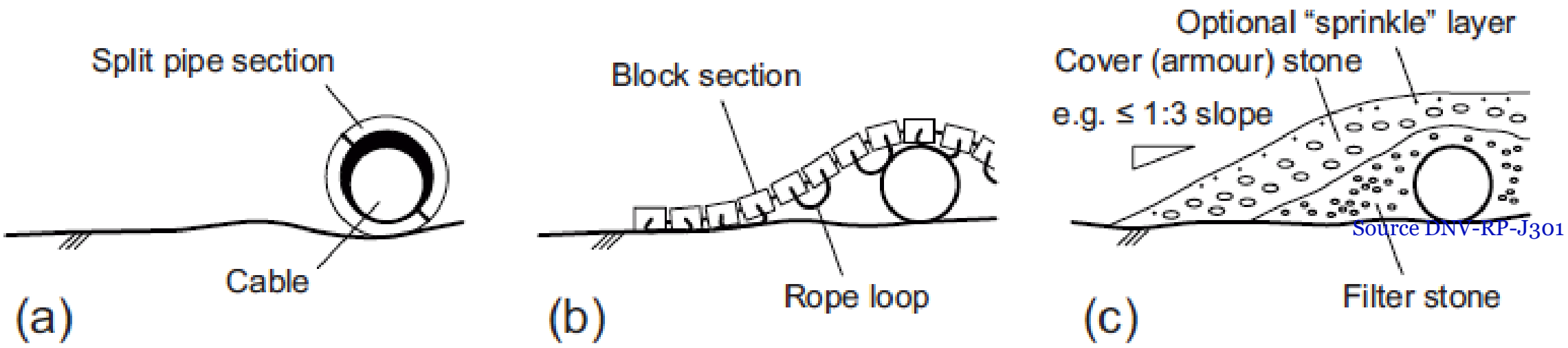
Source DNV-RP-J301

Typical Cable Protection

Tubular Protection
- Protective sleeve made up of polyurethane or iron
- Can be used in combination with mattresses and rock piles

Mattress
- Lattices of segmented, blocks of concrete
- Laid over cable to stabilize and shield it

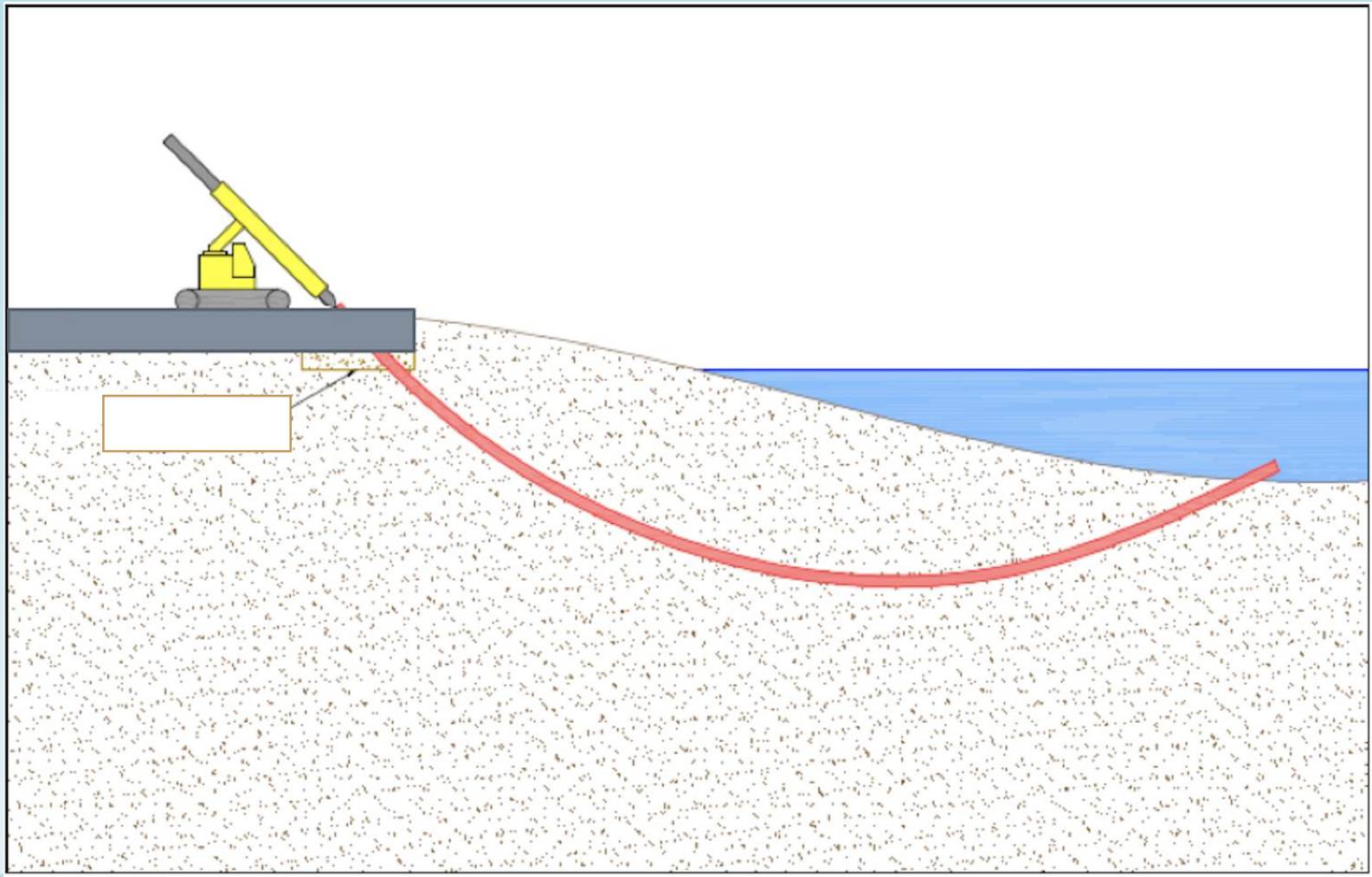
Rock Placement
- Crushed stones of various sizes



Source DNV-RP-J301

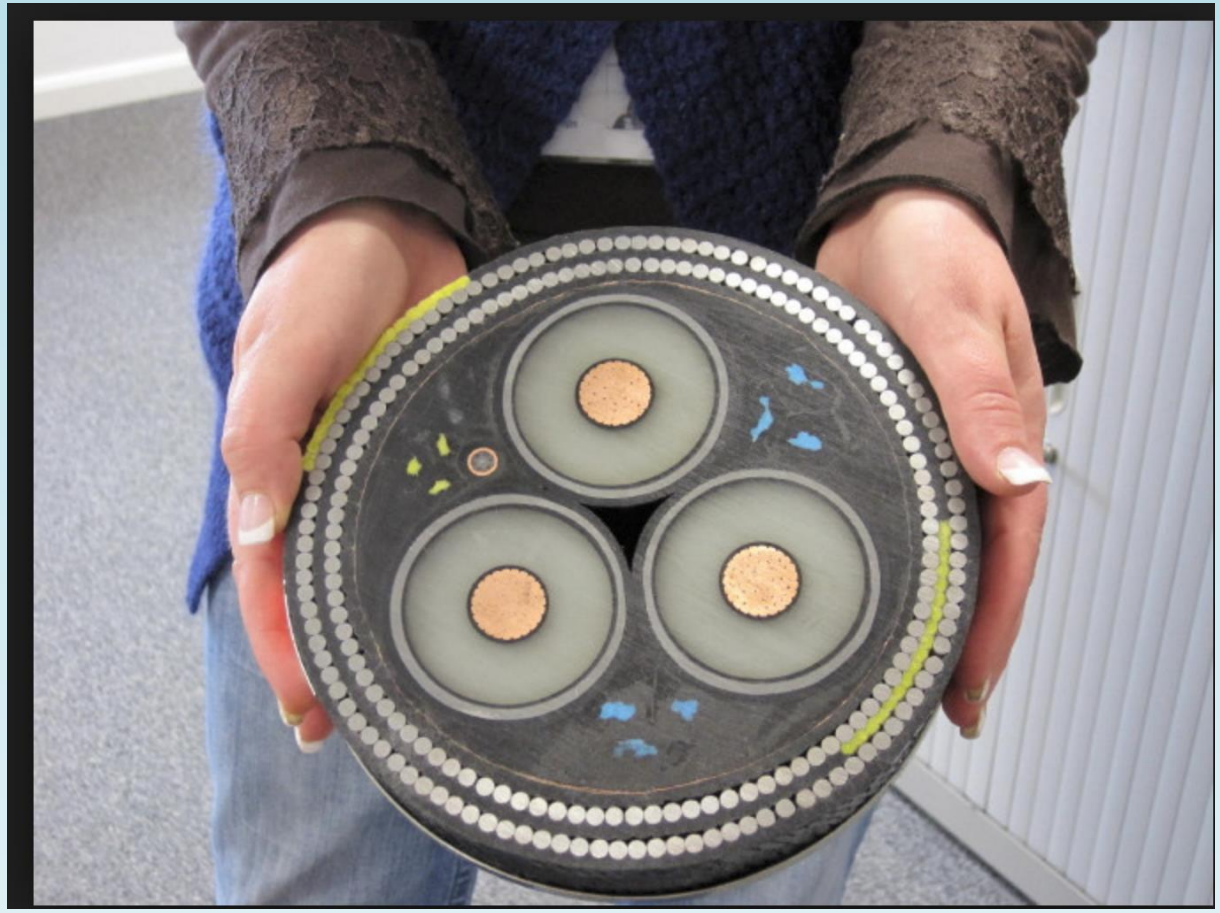
Horizontal Directional Drilling (HDD)

- Proven and common installation method
- Cable depth under beach ~ 30 feet at tideline
- HDD length ~1000 feet
- Offshore, cable is buried to target depth of 6-8 feet below seabed



Schematic of typical land-based HDD setup and trajectory
Not to scale

Offshore Cable



Onshore Cable (In-road)

Offshore Wind 101

- **Crista Bank**, Fisheries Liaison, Vineyard Wind
- **Rodney Avila**, Fisheries Liaison, Orsted

Q & A Session with All Presenters

Assessing & Surveying: Offshore Wind Geophysical & Geotechnical Surveys

- **Rachel Pachter, VP of Permitting, Vineyard Wind**

Why are Marine Geophysical, Geotechnical (G&G), and Archaeology Surveys Conducted?

- To obtain data about the seafloor, geologic conditions, and water depths to help inform decisions about siting offshore energy structures;
- To map the seafloor and shallow subsurface to characterize the types of surface and deeper geology (such as sand, sand waves, hard bottom, boulders, depth to bedrock, and changes in sediment type);
- To identify resources such as sensitive seafloor habitats and shipwrecks, as well as possible obstructions, which may need to be avoided or further assessed;
- G&G surveys are designed using BOEM guidance.

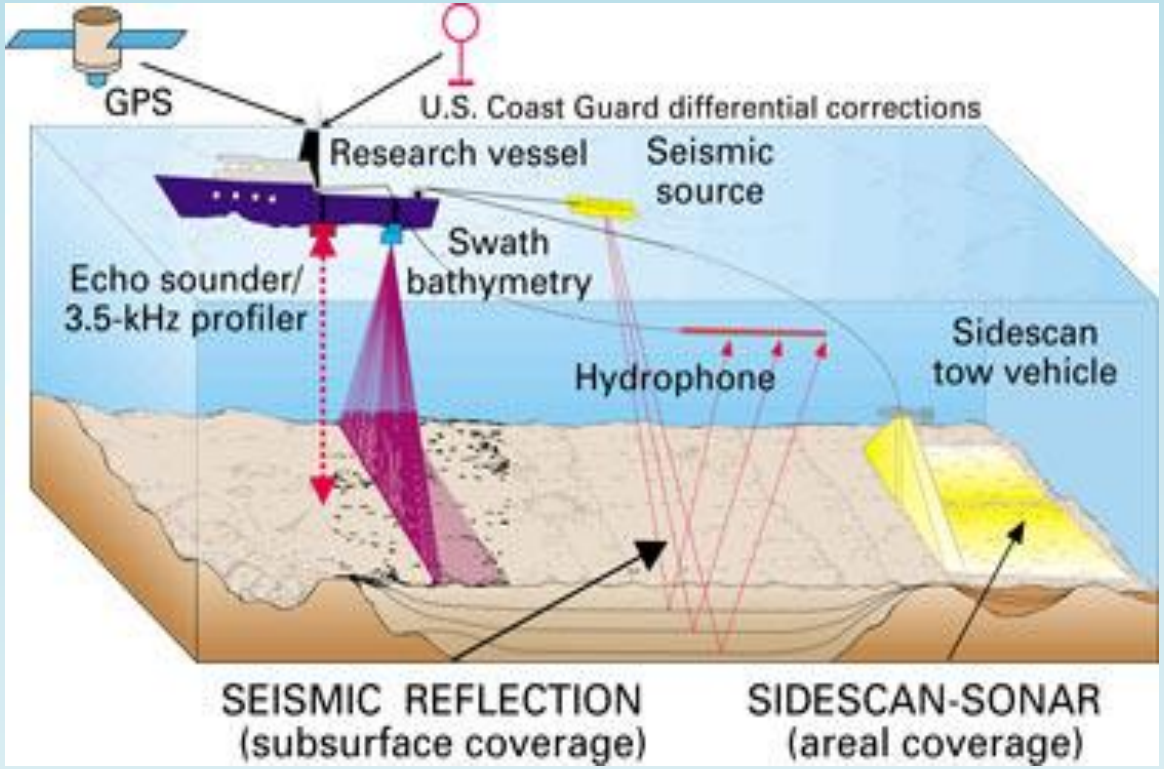
BOEM Guidelines

- Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP)
  - *Key requirement: Detailed G&G at each turbine location*
- Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585
  - *Key requirement: Survey at 150m line spacing*
- Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585 (Section 106 of NHPA and NEPA)
  - *Key requirement: Survey at 30m line spacing*
- Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585

Geophysical Surveys

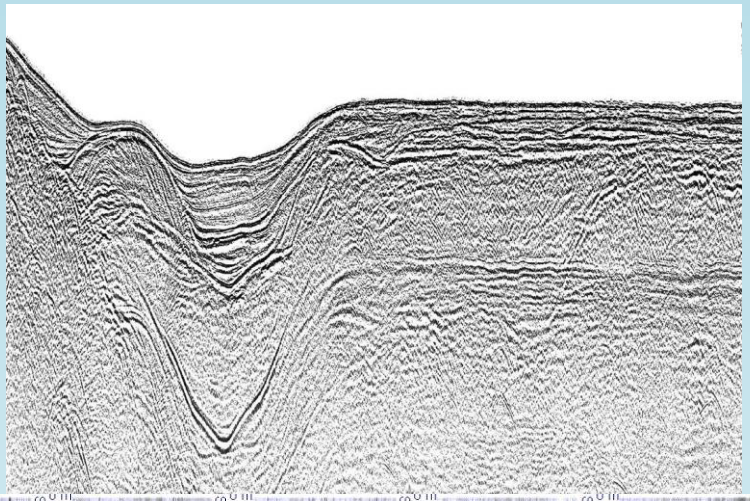
- A marine geophysical survey for a renewable energy project typically uses high resolution geophysical (HRG) equipment, run along parallel and intersecting “track lines” spaced at specific intervals in a study area;
- HRG equipment types include side scan sonar, multi-beam echo sounders, and sub-bottom profilers as well as a magnetometer;
- During a geophysical field program, highly specialized vessels carry or tow the array of remote sensing equipment along the track lines;
- The acoustic waves reflect off different subsea surfaces at characteristic speeds and the return speeds (travel time) of the reflected waves are measured and processed by on-board computers and specialists to provide detailed data about bottom and sub-bottom conditions.

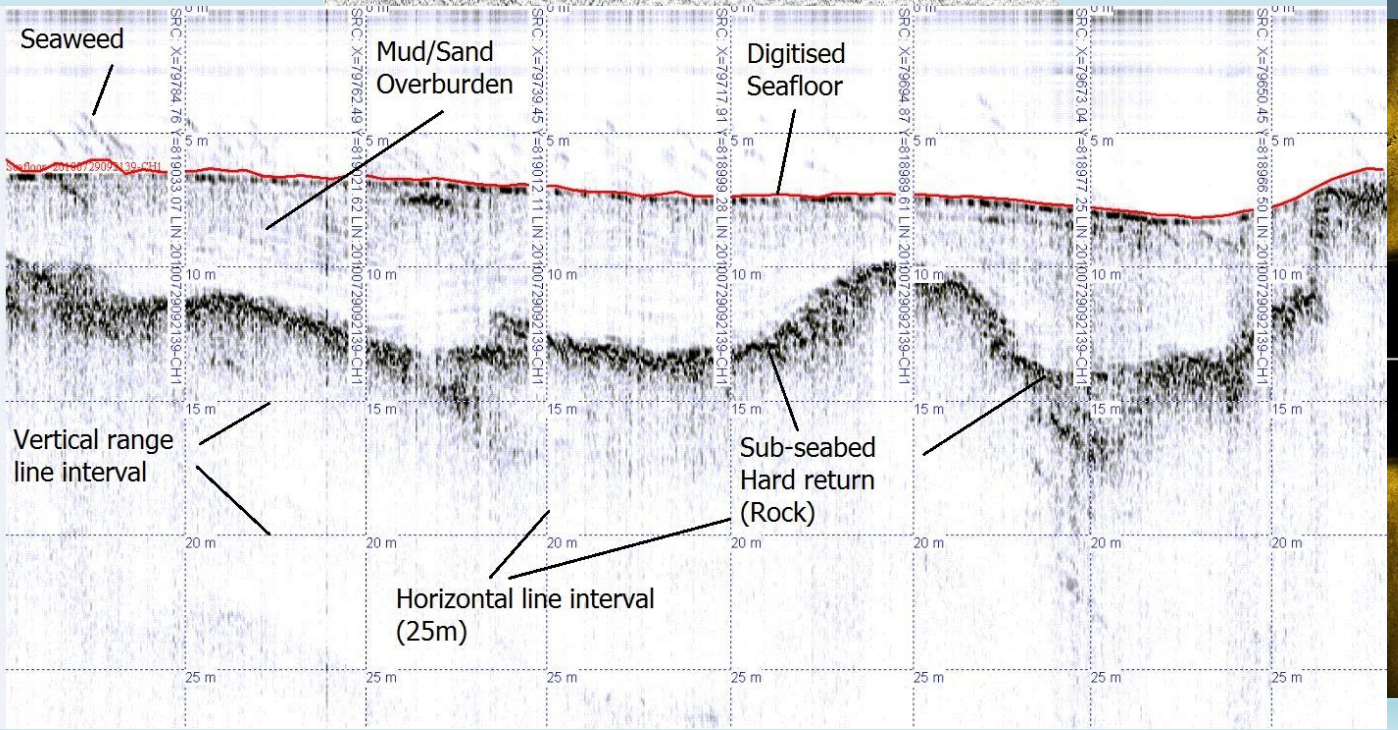
Geophysical Survey Suite

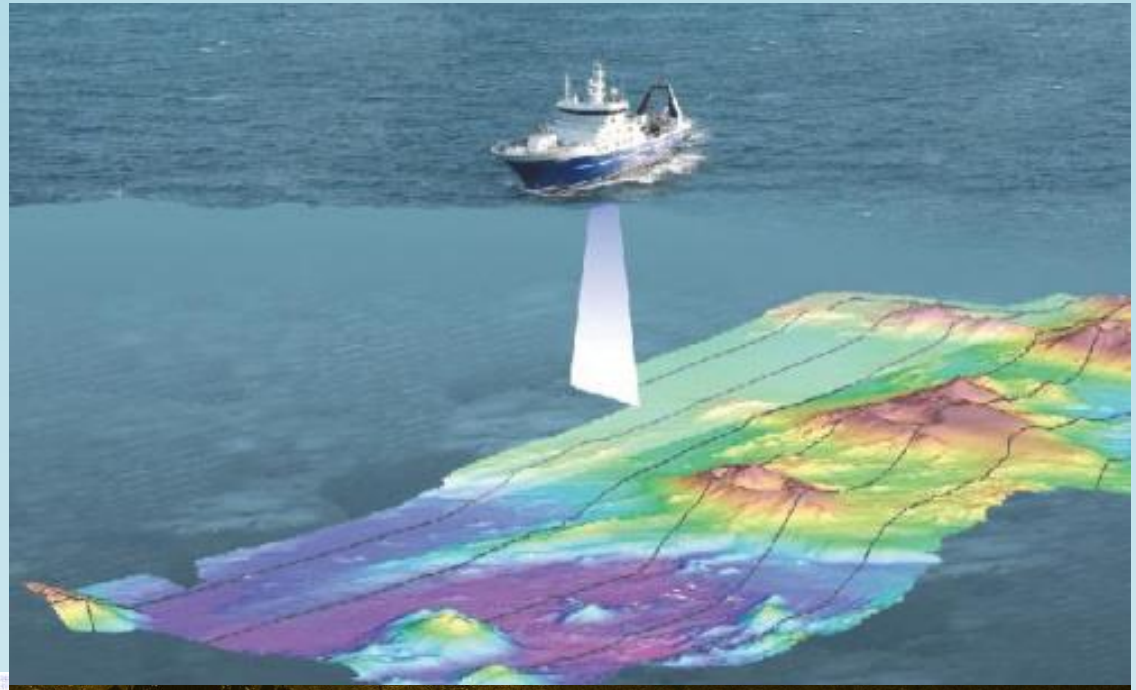


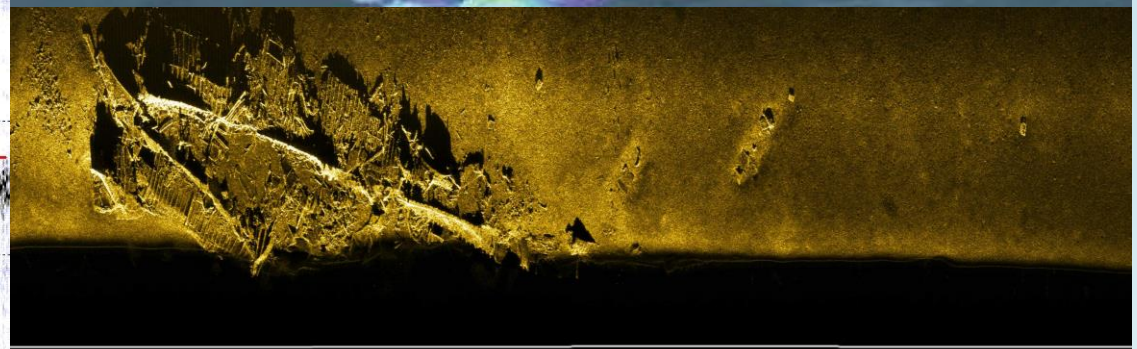
Marine Magnetometer

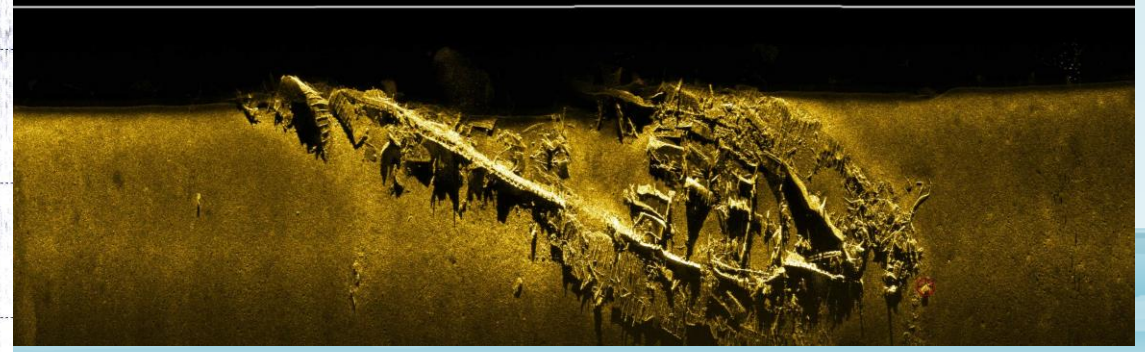
Survey Results







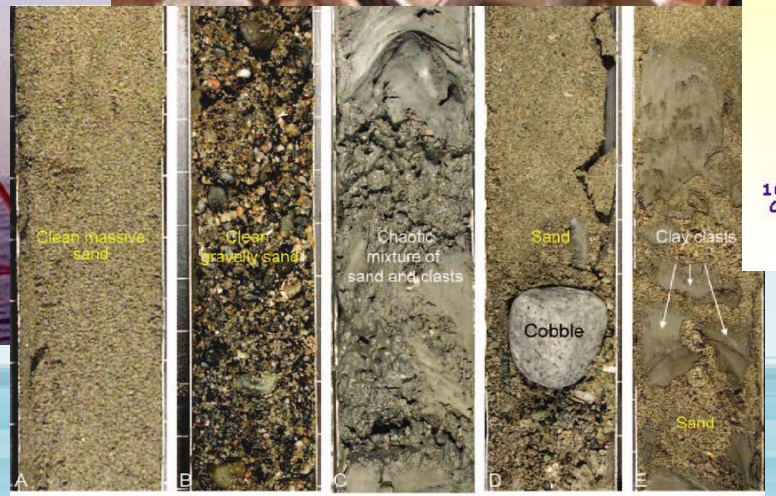


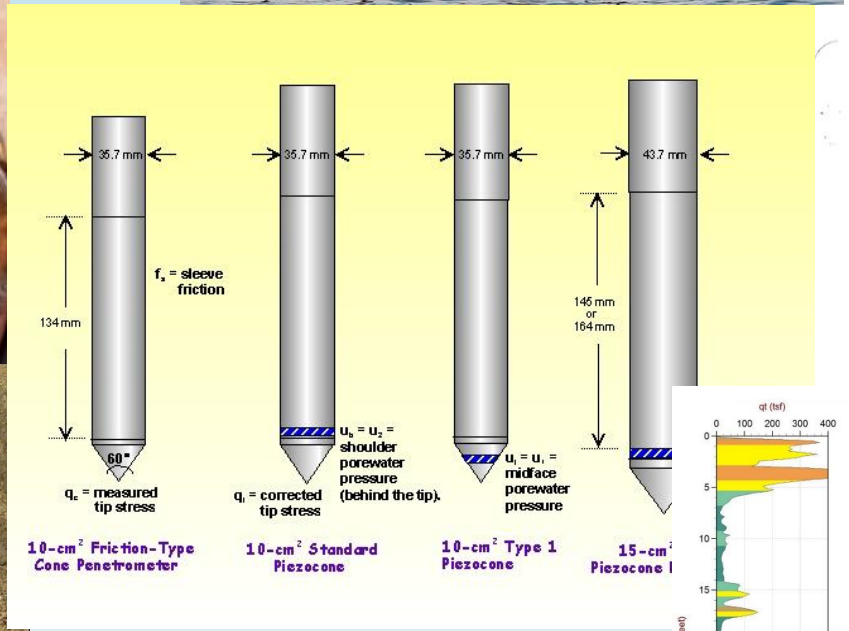


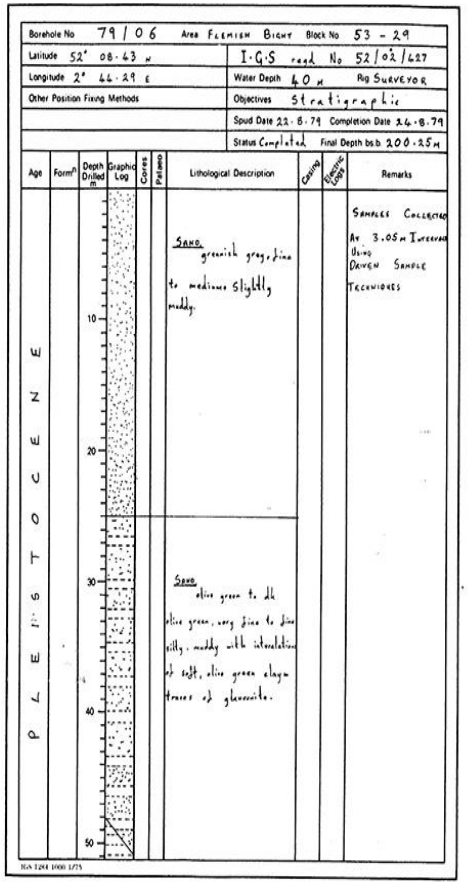
Geotechnical Surveys

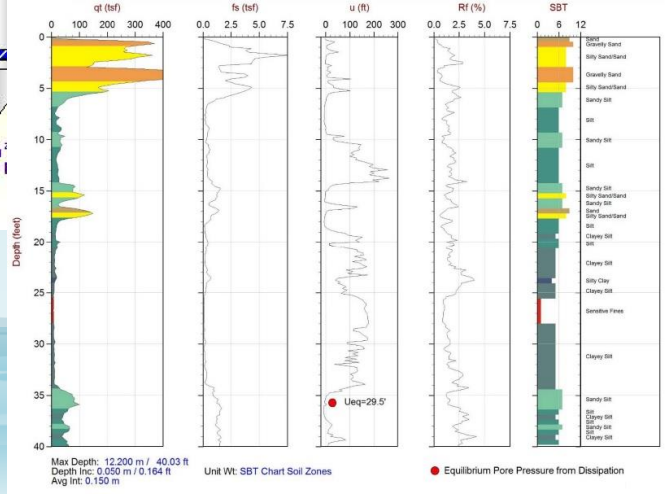
- Geotechnical field surveys typically include collection and analysis of:
  - Shallow grab samples, Vibracores, Cone penetrometer tests (CPT), & Deep borings
- Samples of surface sediment are analyzed under a microscope to identify types and counts of benthic and other organisms; Sediment characteristics and grain size information are also compiled;
- This information helps to 1) characterize the marine ecology of a study area; 2) ground-truth geophysical mapping interpretations; 3) provide geotechnical information to engineers
- Deep borings are/or CPTs are advanced at each WTG location;
- The information, including sediment composition, density and competency testing, sediment types and changes, depth to bedrock and many other geotechnical and engineering parameters are utilized in final design engineering, to ensure each structure will be stable and operate properly.

Geotechnical Surveys









Using the Data

Habitat/Biology	Marine Archaeology	Cable Routing	Foundation Design
Bathymetry	Bathymetry	Bathymetry	Bathymetry
Side Scan Sonar	Side Scan Sonar	Side Scan Sonar	Side Scan Sonar
Benthic Grabs	Magnetometer	Magnetometer	Sub-bottom profiler
Imaging (video, etc.)	Sub-bottom profiler	Sub-bottom profiler	CPT
Vibracores	Vibracores	CPT	Borings
	Borings	Archaeology results	

Assessing & Surveying: Offshore Wind Resource Assessment & Surveys

- **Cristina Zwissler, Meteorologist, Shell New Energies**

Wind Resource Assessment & Surveys

CRISTINA ZWISSLER
METEOROLOGIST
SHELL NEW ENERGIES

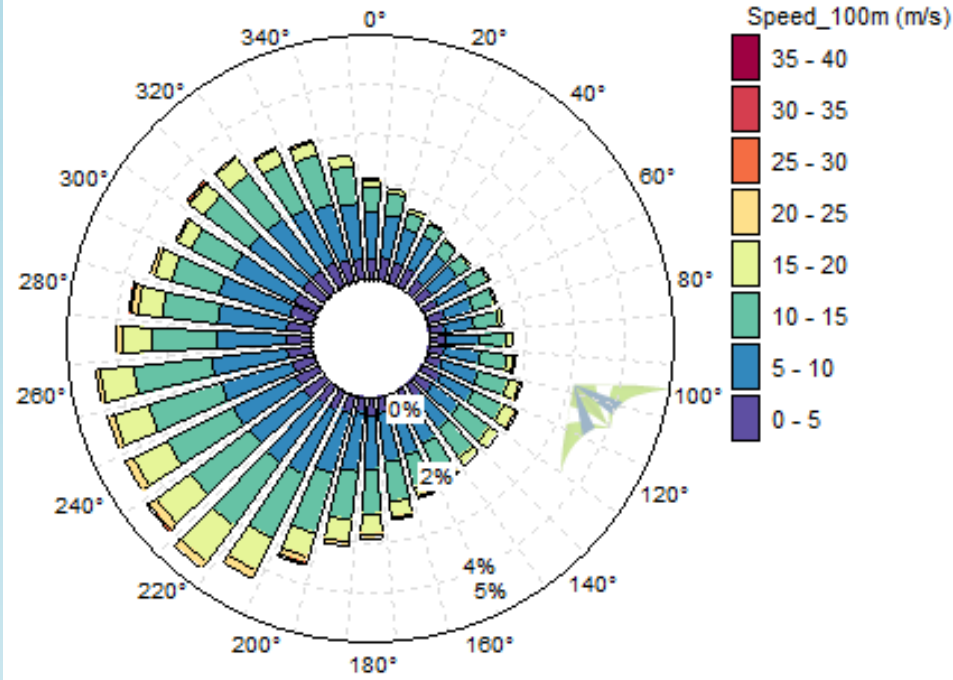
Measurements

- Measure the meteorological and oceanographic conditions
- Measurement campaign design varies per site (size, wind speed changes across site)

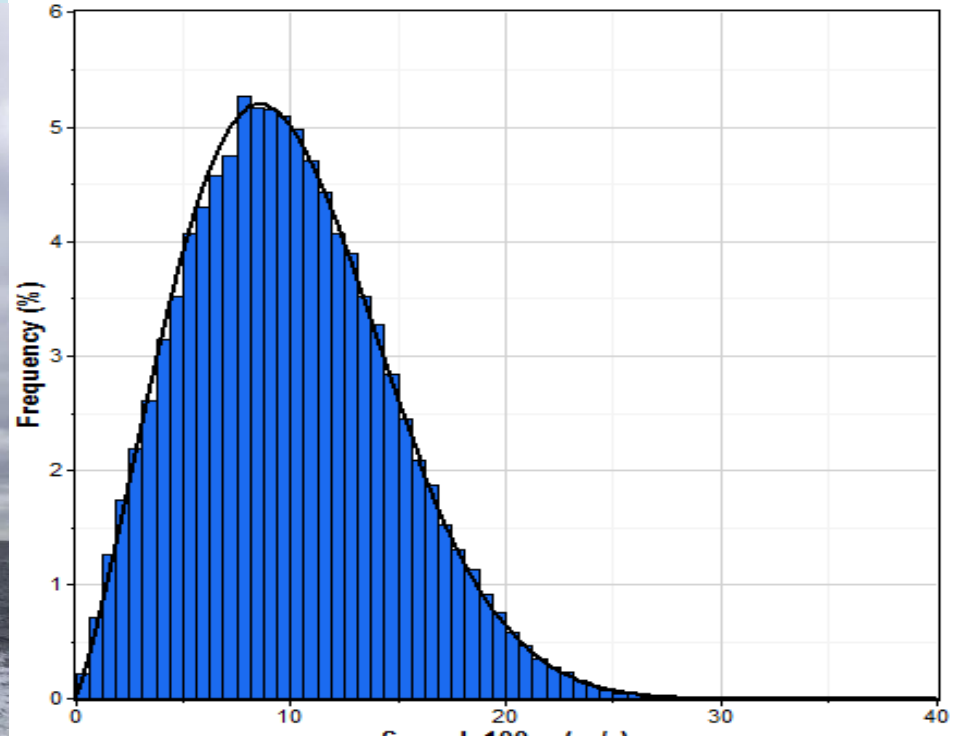
Wind Climate

How does modelling compare?

- Wind speed frequency in each wind speed and directional bin.
- Input for: Power curve, wake effects, layout design



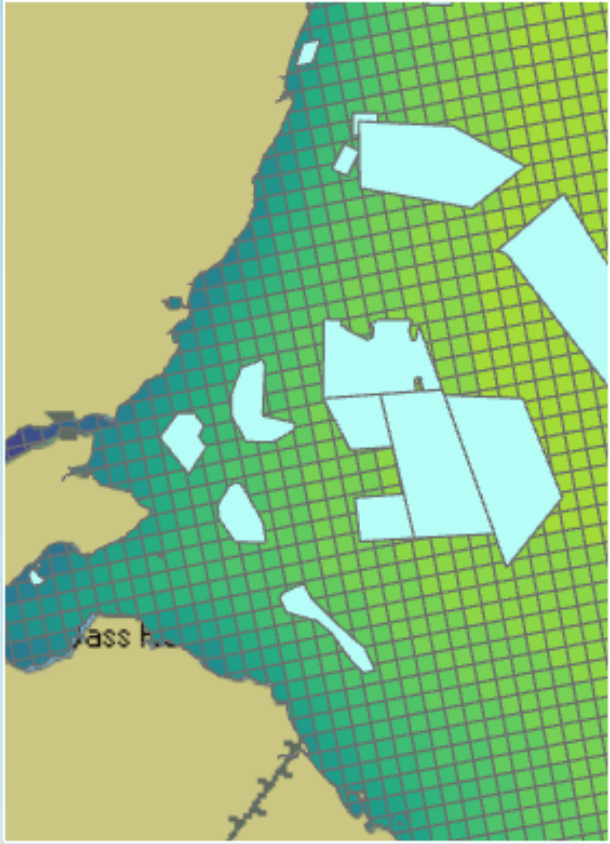
Hub Height

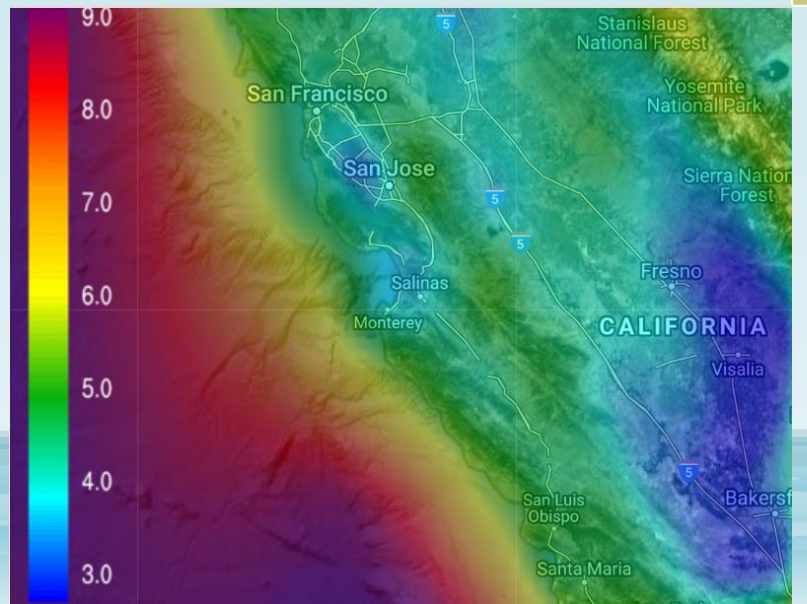


Spatial Modelling

What is going on around the site?

- Wind speed frequency in each wind speed and directional bin.
- Input for: Power curve, wake effects, layout design





Power Curves/ How Much Power Can We Produce?

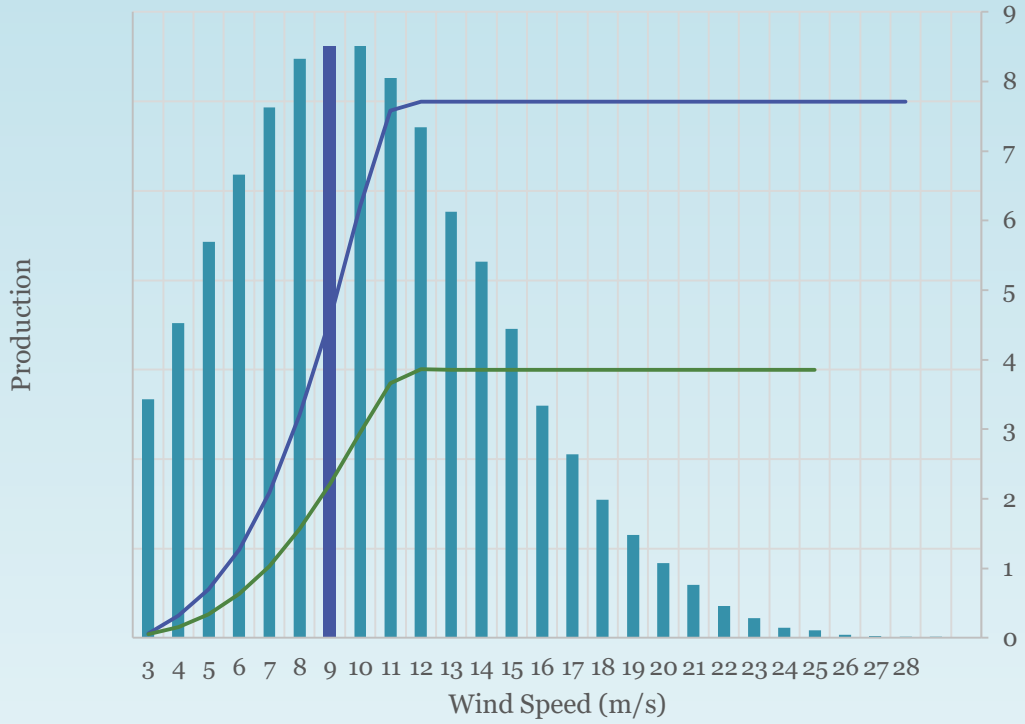
- Wind speed at “hub height”
- Power curve
  - Power produced at each wind speed bin
- Cut in/out wind speed
- Rated wind speed
- P50 wind speed

Turbine Selection

Which turbine should I use?

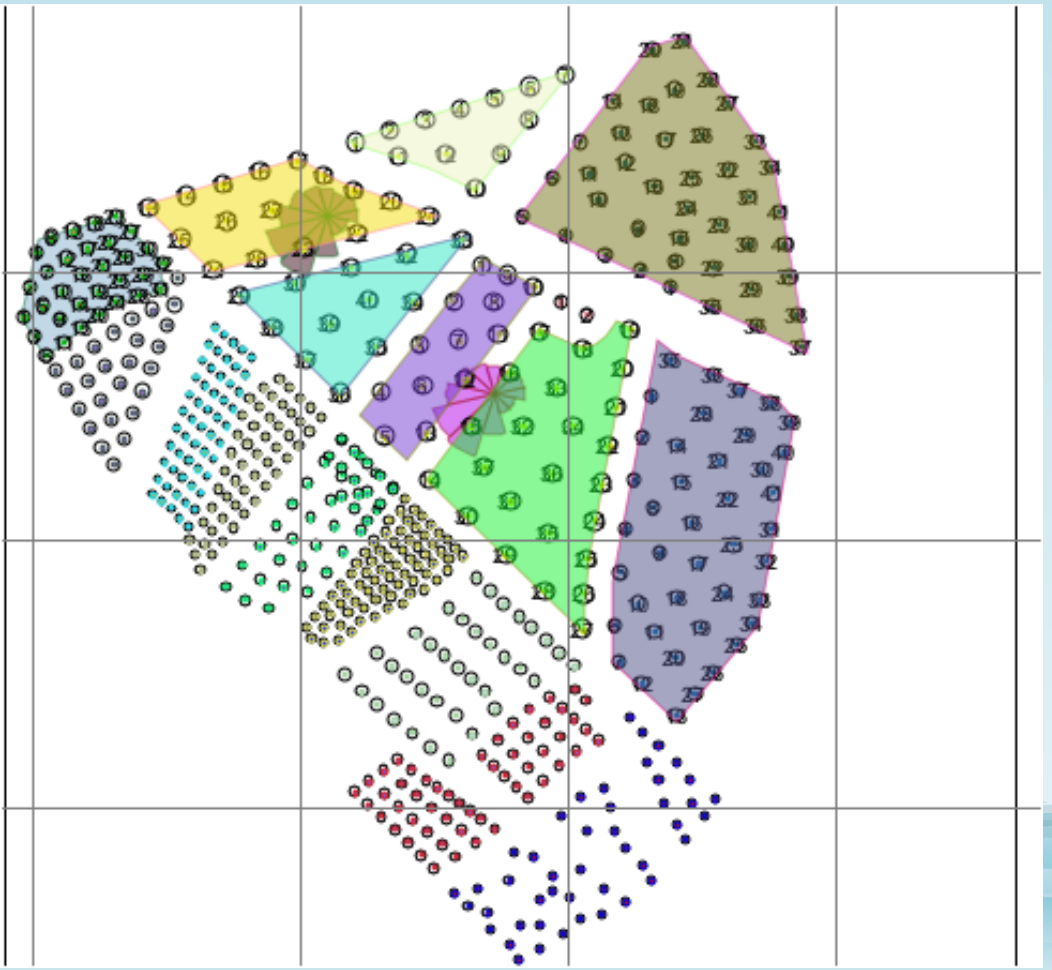
- Maximum capacity of site
- Area of site
- Water depth/foundations
- Multiple layouts

Power curve vs Wind Speed Frequency



Layout Design

Affected Parties



Consider All the Constraints

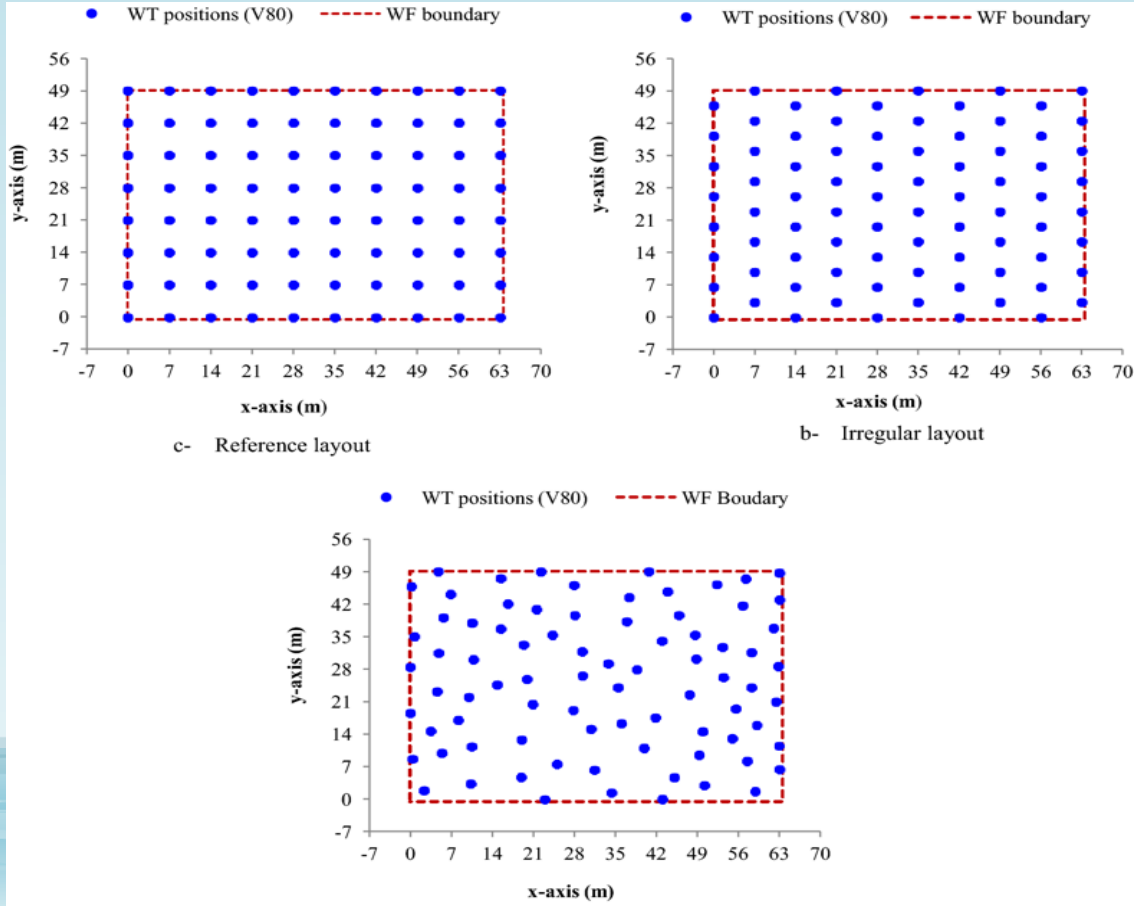
- Neighboring sites
- UXO
- Archaeological
- Cables & pipeline maintenance zones
- Environmental
- Back-up locations

Layout Optimization

Wake Effects In and Outside of Projects?

- Turbine size
- Wind direction
- Site capacity
- Site boundaries
- Constraints

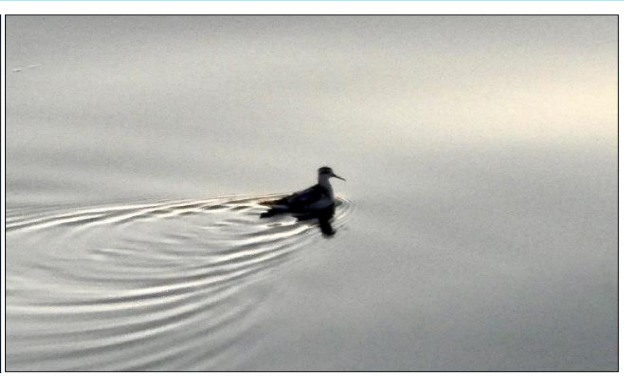
Layout Configuration



Learning from Stakeholders

Fishing methods

Marine life migration

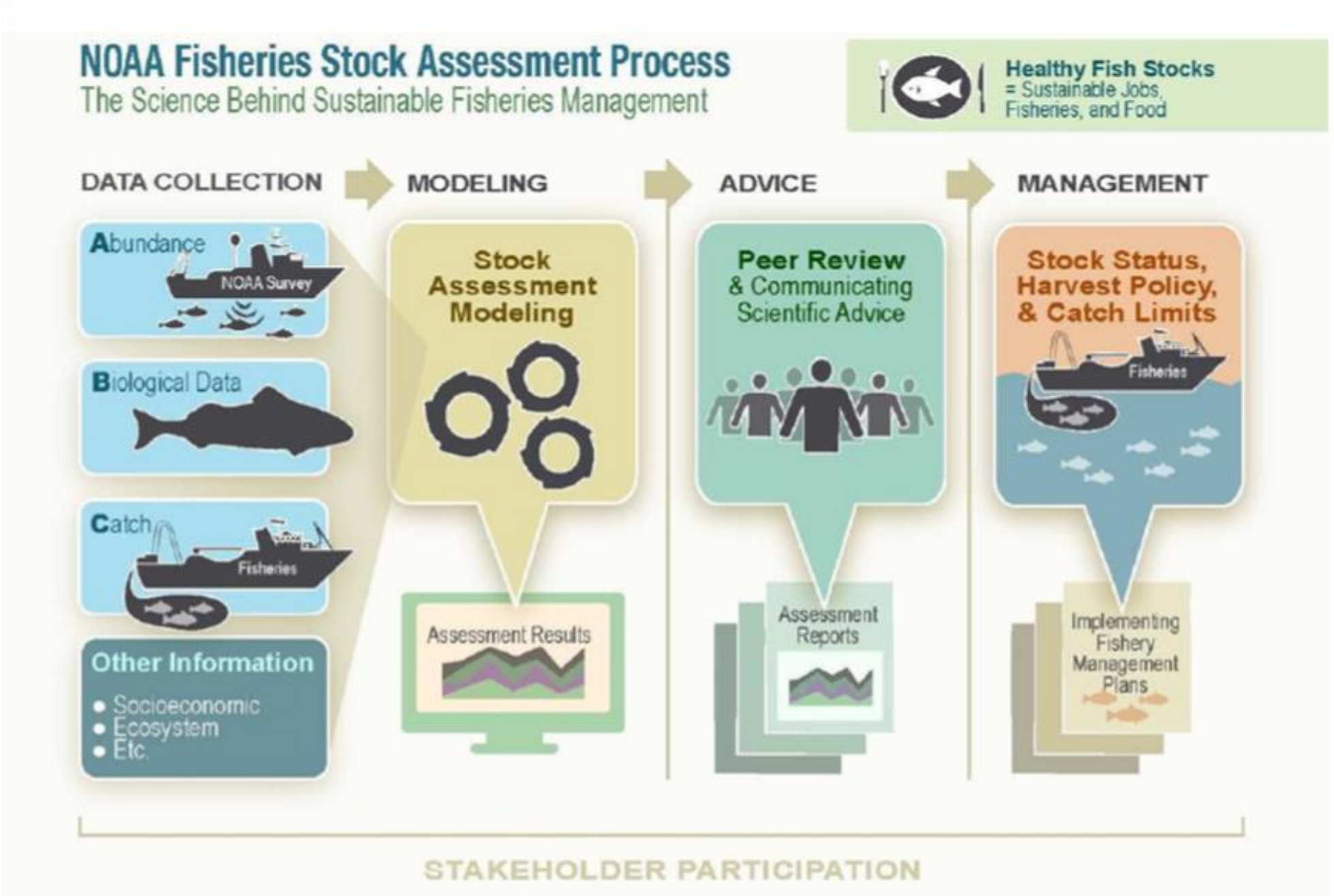


Fisheries Stock Assessment Process and Methodology

- **Jon Hare, Ph.D., Science & Research Director, NOAA Northeast Fisheries Science Center**

Stock Assessment 101

Jon Hare, NOAA Fisheries



https://spo.nmfs.noaa.gov/sites/default/files/TMSPO184.pdf

Stock Assessment 101

Different “types” or “levels” of stock assessments:

Level 0 - data poor; record of catch

Level 1 - time series of abundance index, measures of absolute abundance

Level 2 - simple model - catch curve

Level 3 - intermediate model -

Level 4 - age or length structured model

Level 5 - assessment models incorporating ecosystem considerations or spatial dynamics

Level 1 “Empirical” Assessments

Use surveys to estimate number of fish and scale up to stock area

10 fish in one trawl

100 m2 sampled in a trawl (0.0001 km2)

1000 km2 stock area

100,000,000 fish

Level 1 “Empirical” Assessments

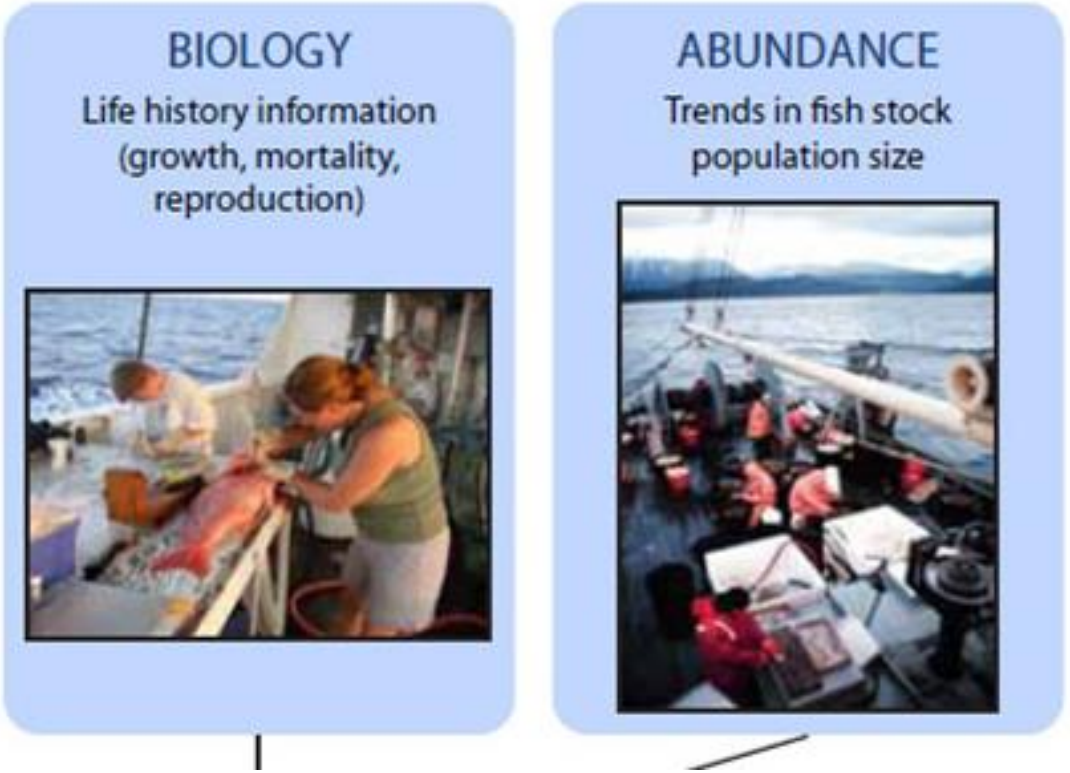
Use surveys to estimate number of fish and scale up to stock area

10 fish in one trawl (5 or which are mature)

100 m2 sampled in a trawl (0.0001 km2)

1000 km2 stock area

50,000,000 mature fish

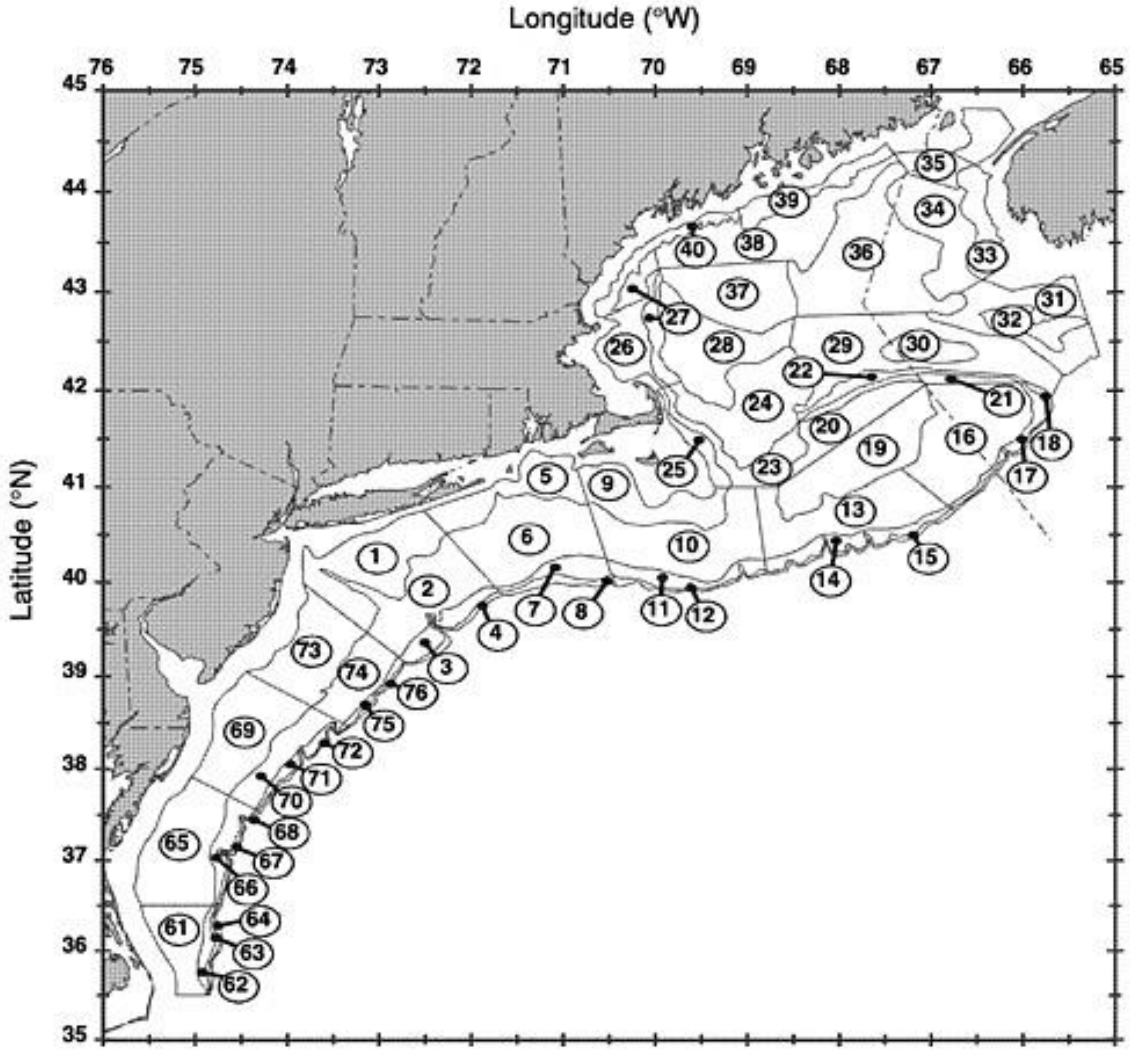


Level 1 “Empirical” Assessments

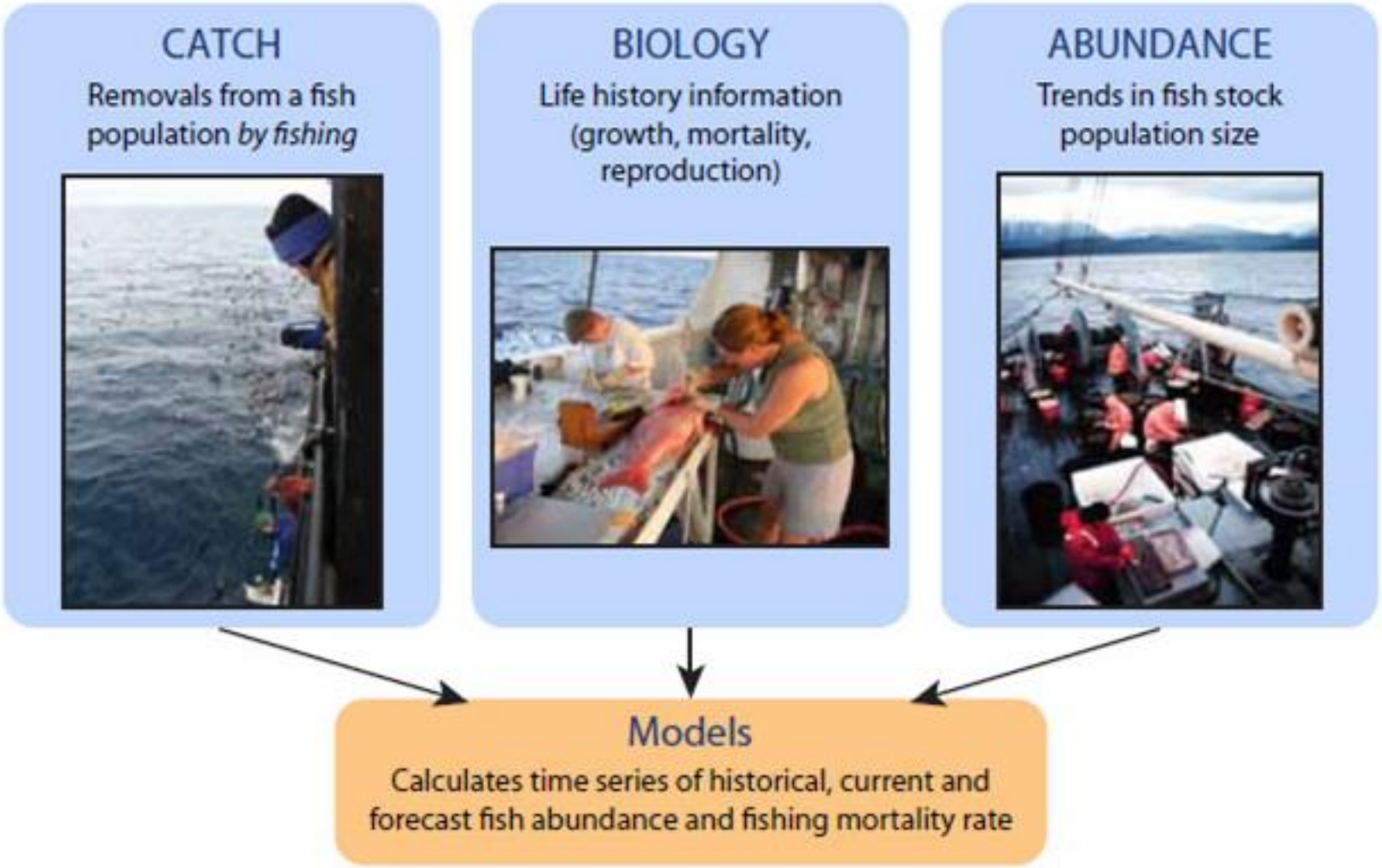
Calculations for each strata and then add up

Based on random-stratified sampling design

In recent years, use catchability from experiments on industry vessels



Level 4 “Analytical (Model-Based)” Assessments



Level 4 “Analytical (Model-Based)” Assessments

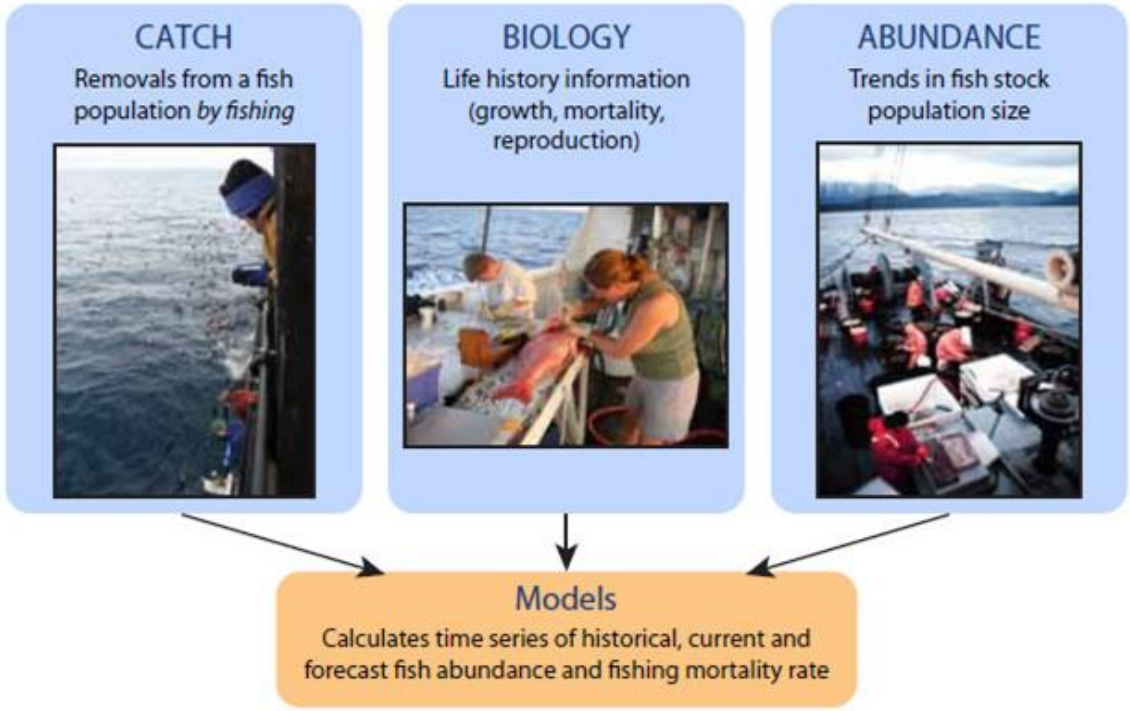
A simplification

Bank balance = spawning stock biomass (SSB)

Withdrawals = catches

Interest = growth and recruitment

Bank charges = natural mortality

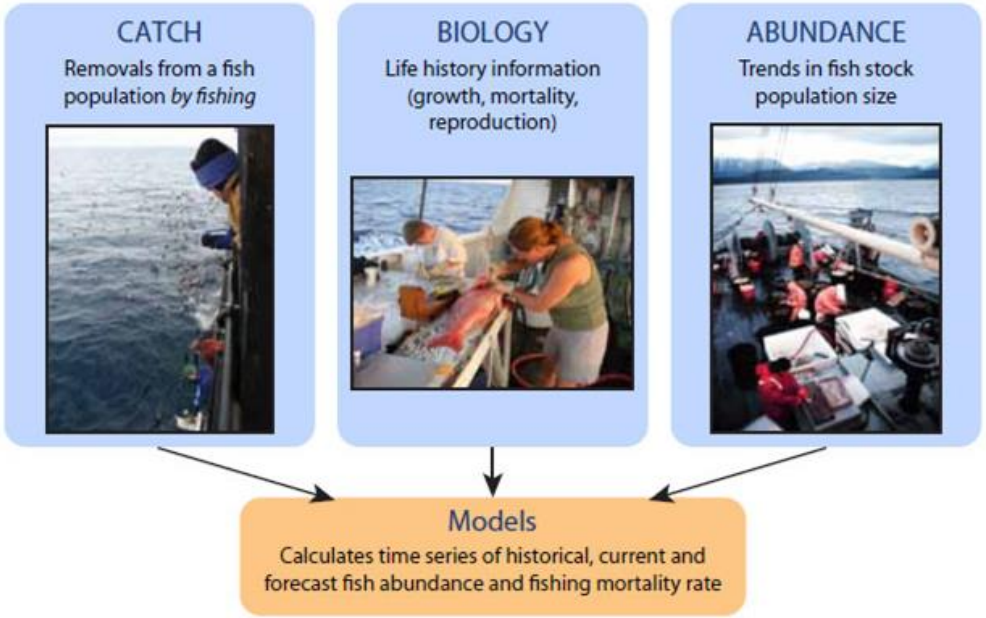


http://www.marineconservationalliance.org/wp-content/uploads/2010/09/Assessment-101.pdf

Level 4 “Analytical (Model-Based)” Assessments

Balance (next year) = Balance (this year) + interest - withdrawals - bank changes

Biomass (next year) = Biomass (this year) + growth + recruitment - catch - natural mortality



http://www.marineconservationalliance.org/wp-content/uploads/2010/09/Assessment-101.pdf

Level 4 “Analytical (Model-Based)” Assessments

Consider you have a bank account and you take $50 (y) out on Monday. You want to know your balance so you phone the bank and ask but they say all they can tell you is that you have 210 credits (z) before the withdrawal and 105 credits (x) after the withdrawal?

$50 is catch; 210 and 105 is survey

Can you work out your balance?

Initial balance = $z \cdot y$ / [z-x]

Initial balance = $210 \cdot 50$ / [210-105] = 100

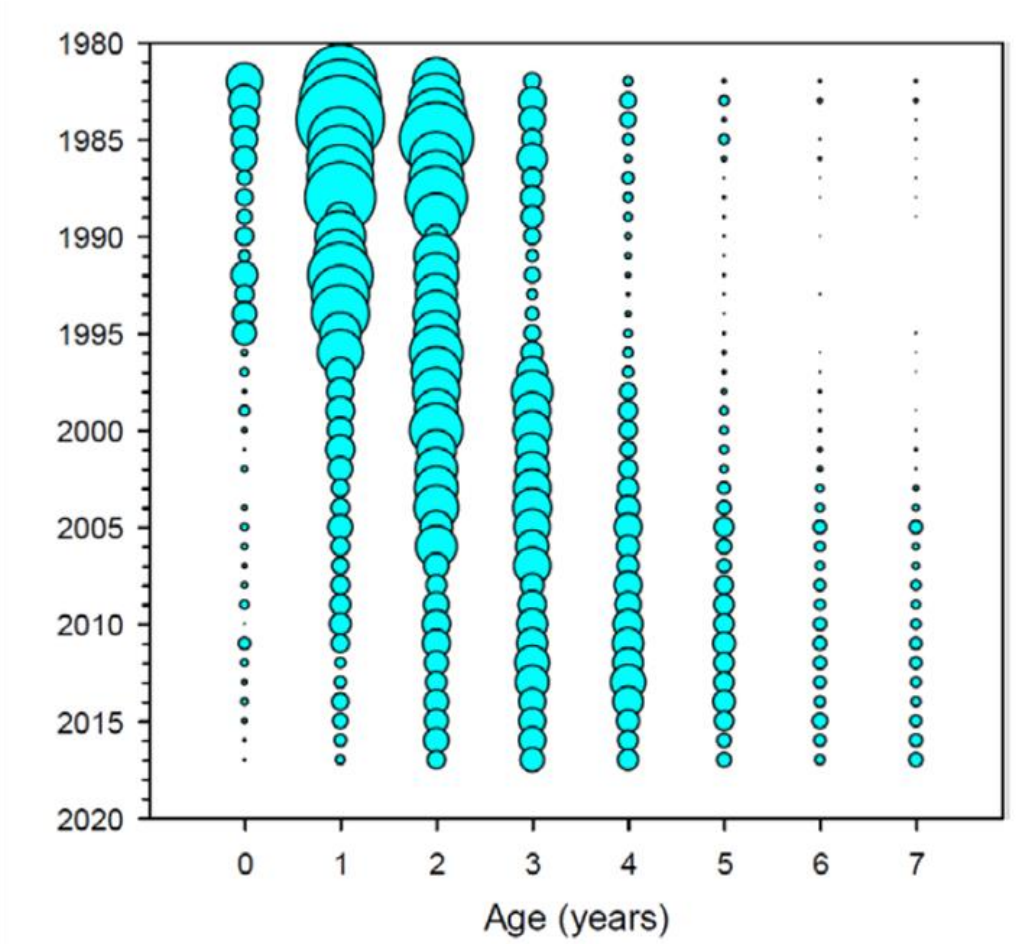
Catch = scale

Survey = trend

http://www.marineconservationalliance.org/wp-content/uploads/2010/09/Assessment-101.pdf

Level 4 “Analytical (Model-Based)” Assessments

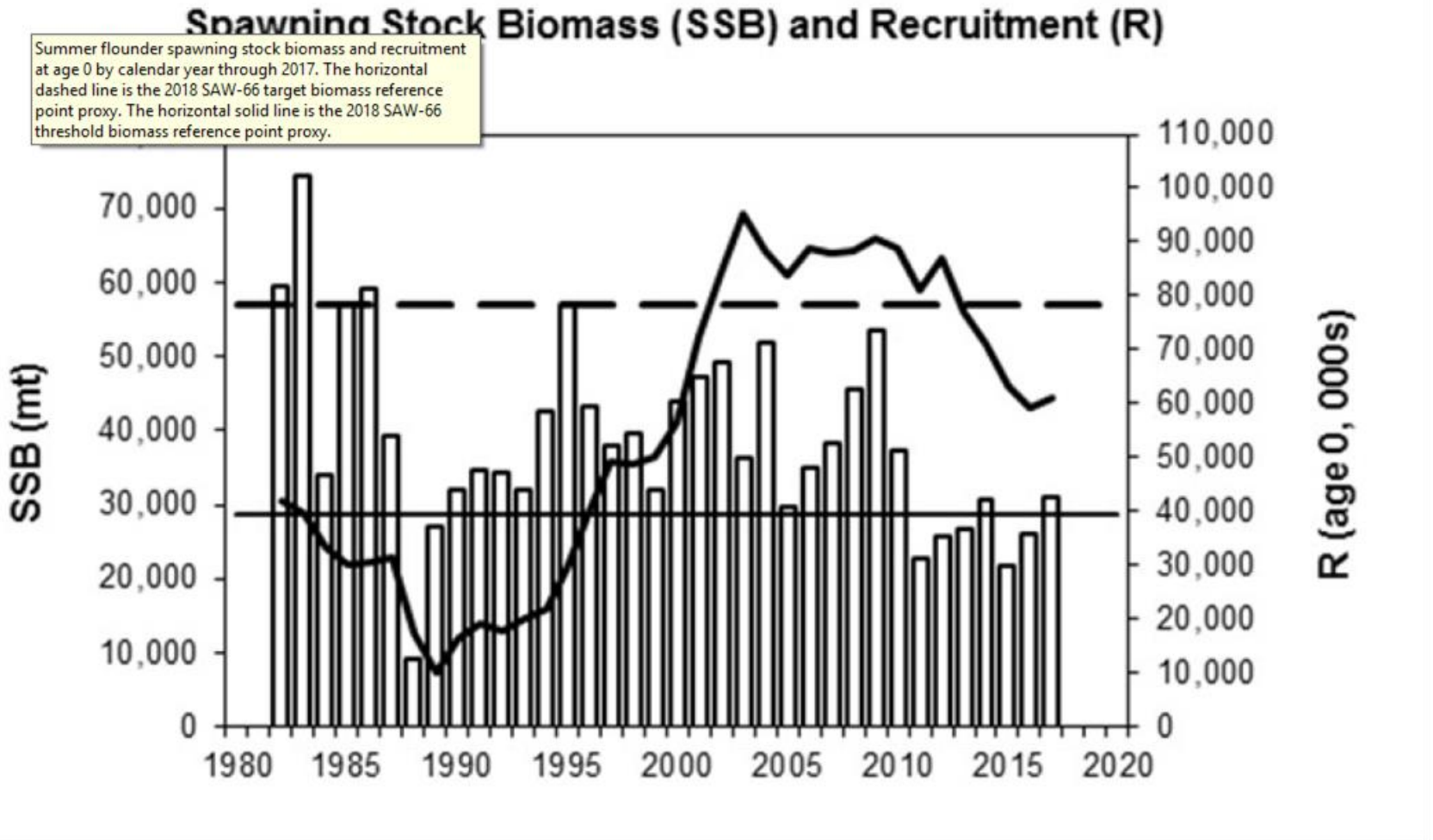
Model fit multiple ages / lengths



https://www.nefsc.noaa.gov/publications/crd/crd1901/crd1901.pdf

Level 4 “Analytical (Model-Based)” Assessments

SSB and recruitment are model estimates based on all data



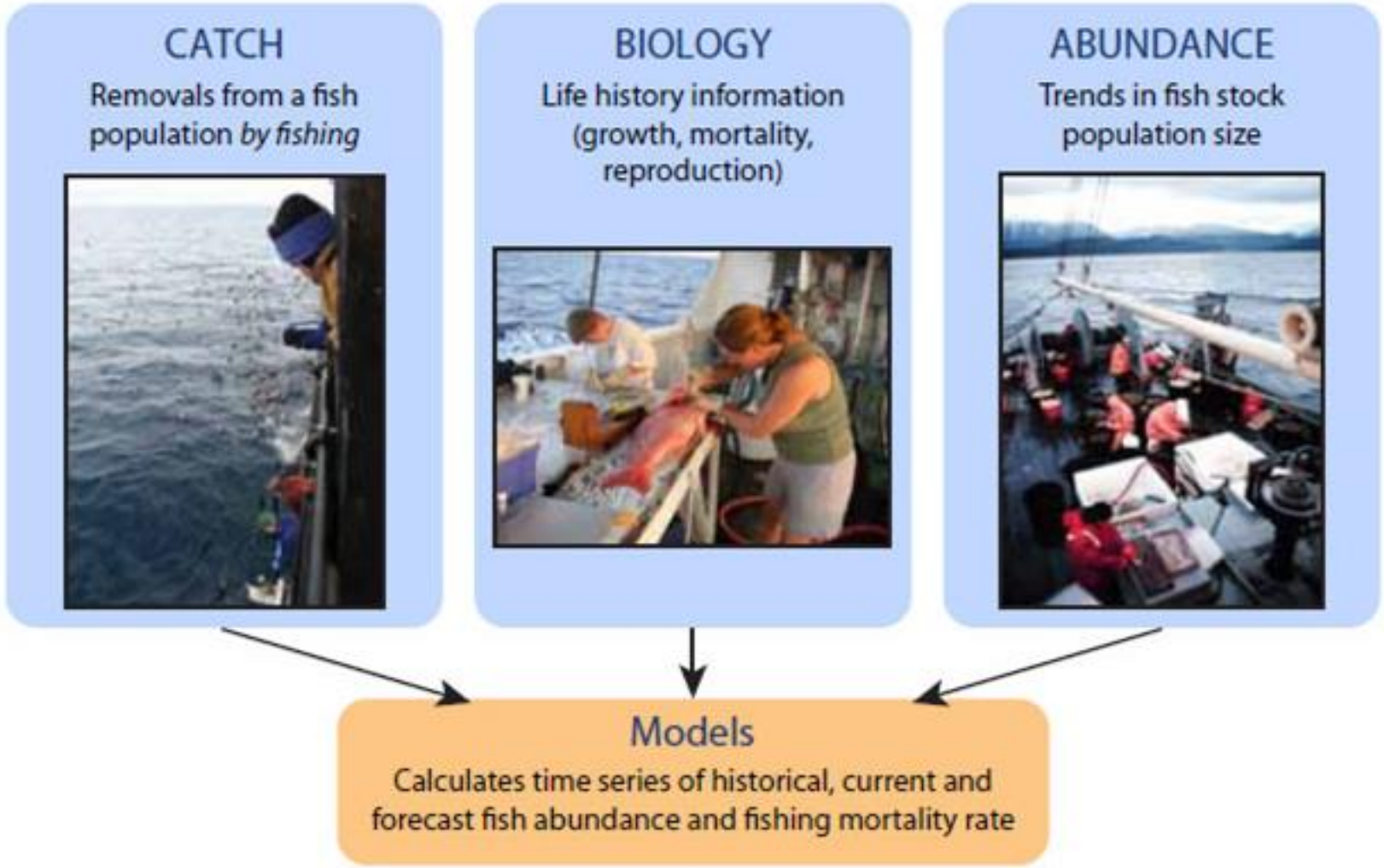
https://www.nefsc.noaa.gov/publications/crd/crd1901/crd1901.pdf

Stock Assessment Process

Past

Present

Future



Stock Assessment Process

Explain stock in the past

Use data to understand past

empirically (Level 1) or to develop model (Level 2-4)

Evaluate model fit to data

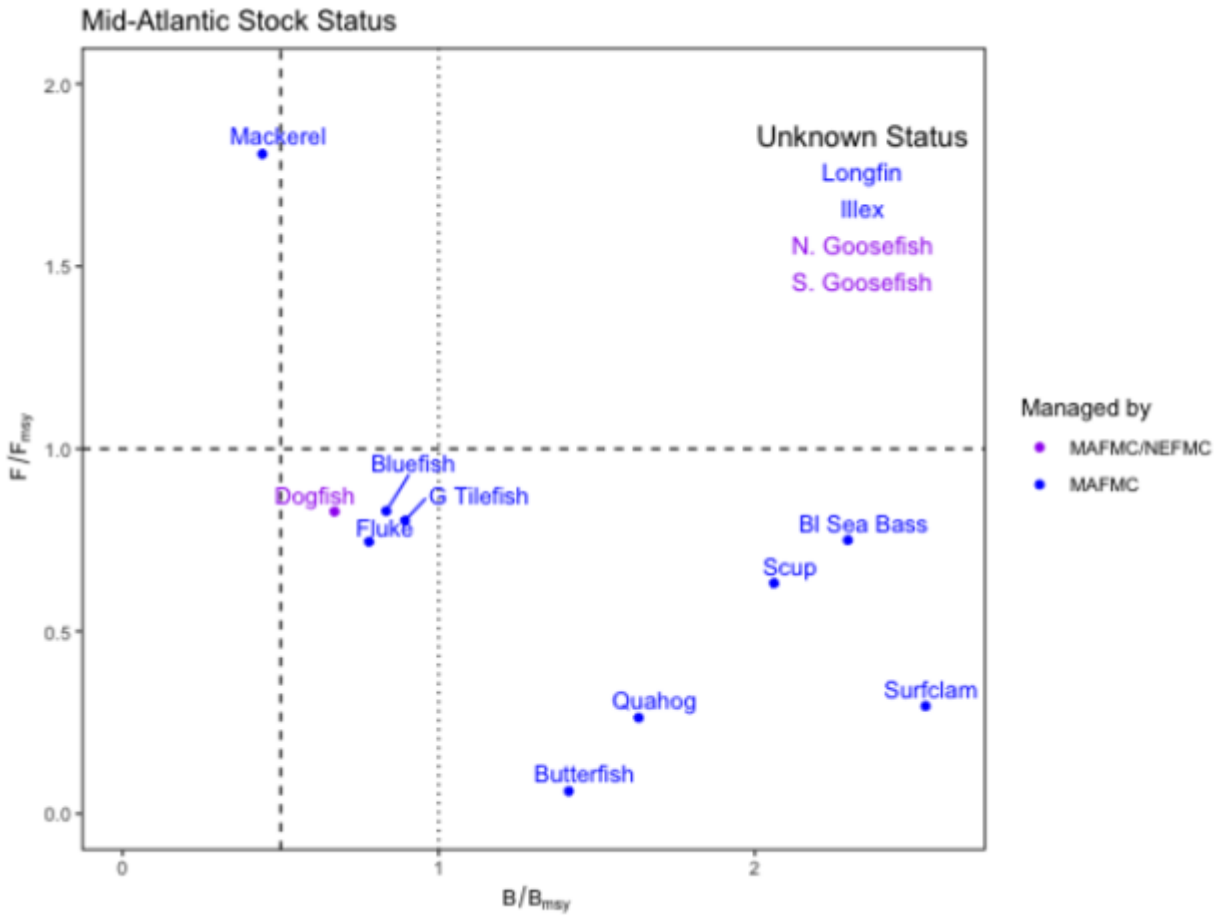
Stock Assessment Process

Determine Current Status

Compare current status to biological reference points

Overfished - estimated biomass lower than biomass reference point (B/Bmsy)

Overfishing - estimated fishing higher than fishing reference point (F/Fmsy)

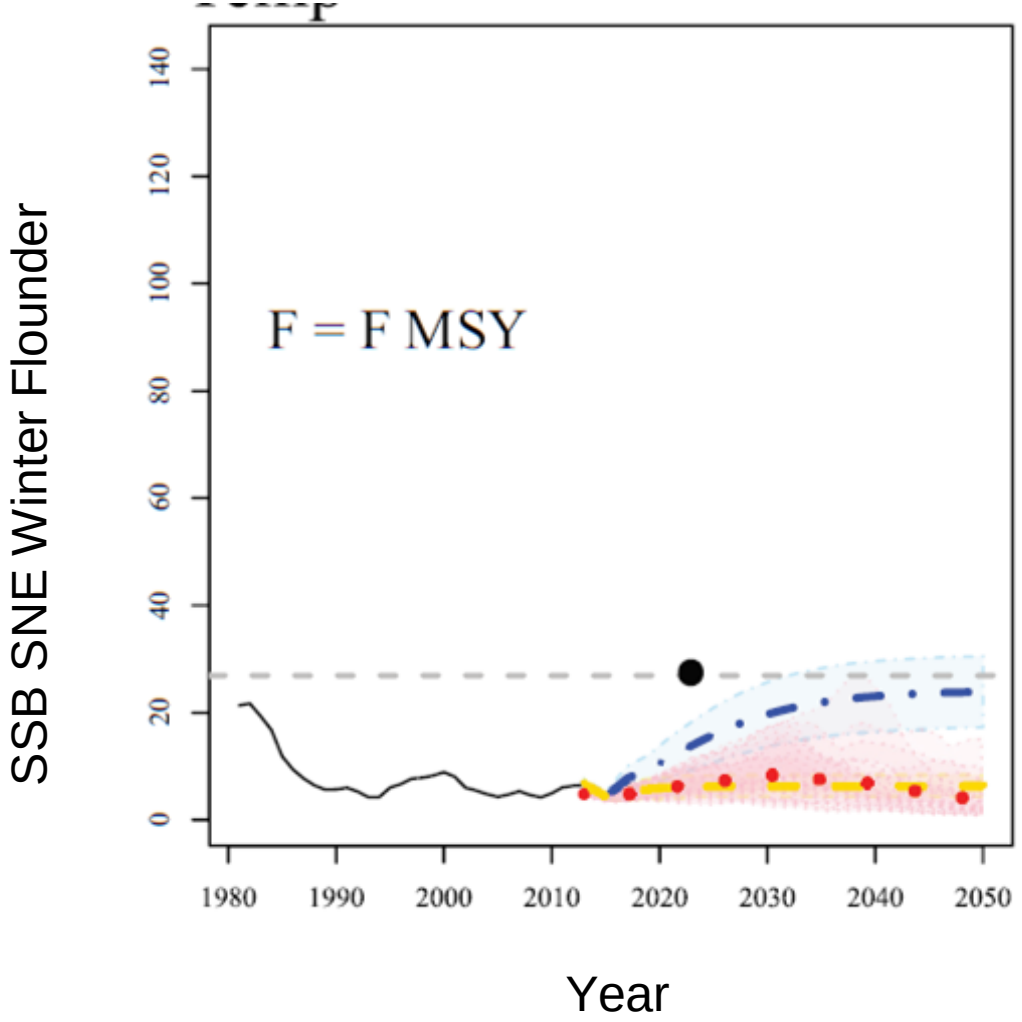


http://www.mafmc.org/s/Pres_State-of-the-Ecosystem_.pdf

Stock Assessment Process

Use model to estimate population abundance in future

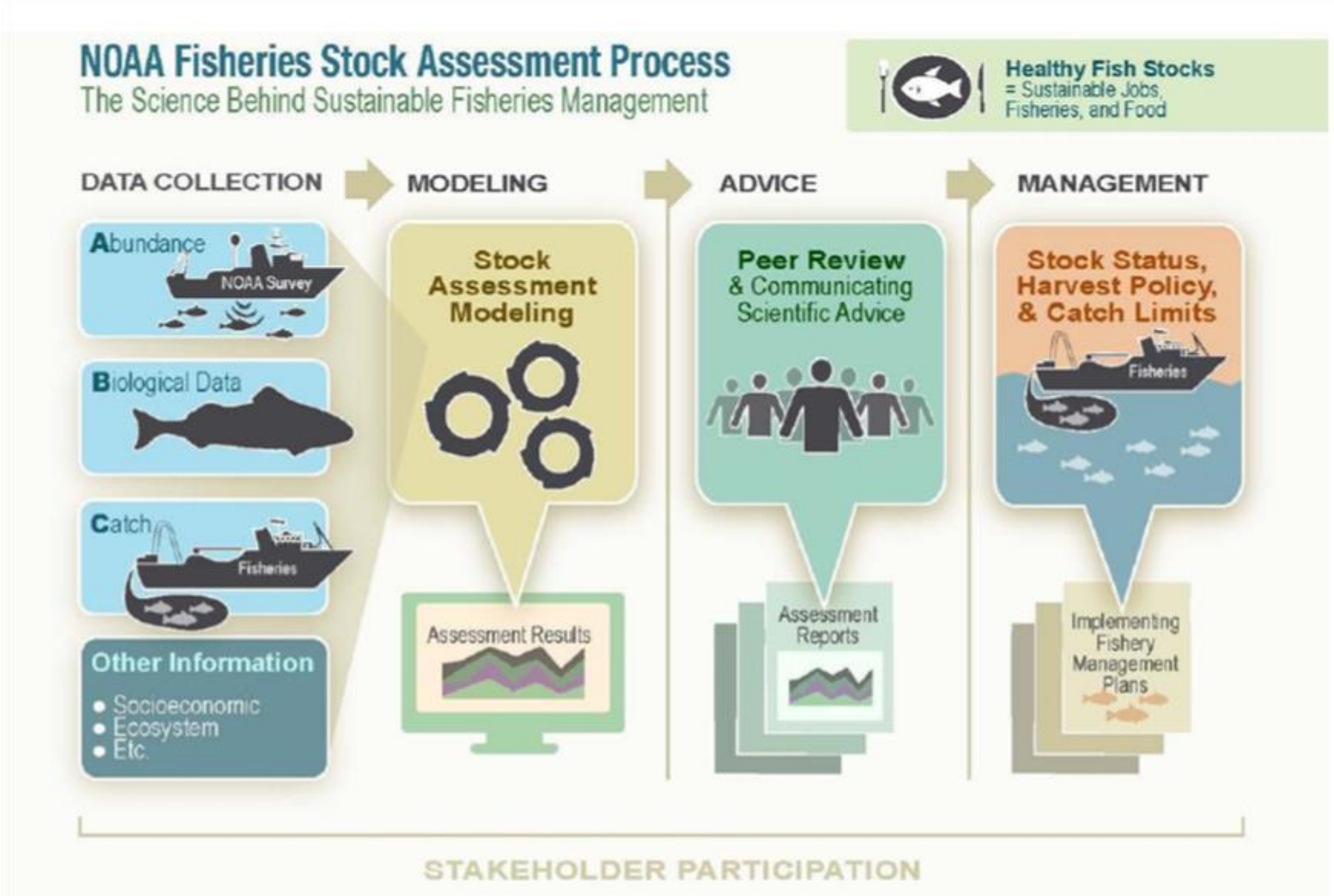
- Setting catch
- Rebuilding plans



No environment

Environment

https://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2017-0085#.XabdyJJJGM8



https://spo.nmfs.noaa.gov/sites/default/files/TMSPO184.pdf

Stock Assessment Process

Northeast Regional Coordinating Council Assessment Process

Data Update - direct delivery to Council

Direct Delivery - assessment updated - delivered to SSC

Expedited Review - small-to-moderate changes to assessment - short peer review - delivered to SSC

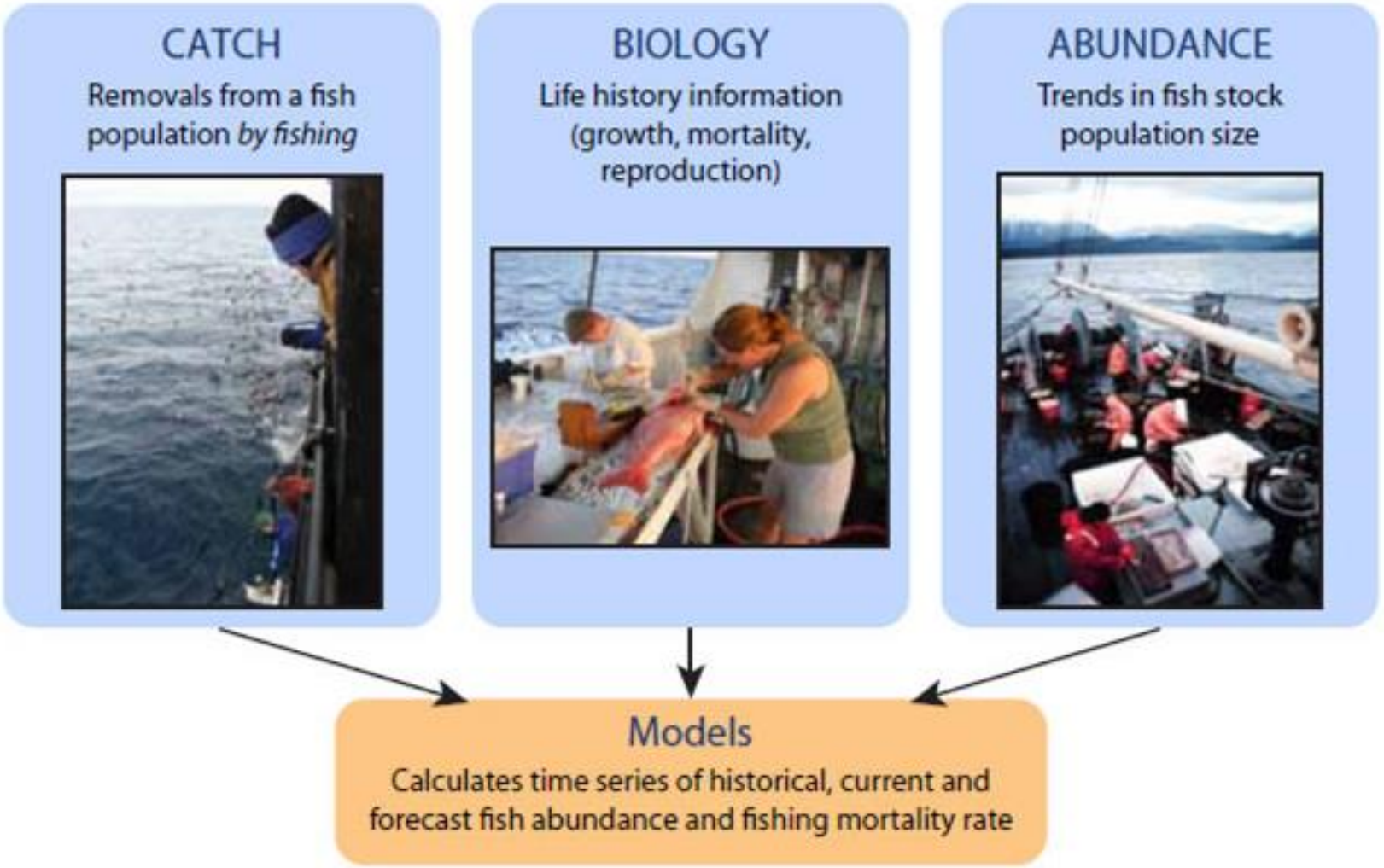
Enhanced Review - moderate-to-large changes to assessment - moderate peer review - delivered to SSC

Research Track Assessment - evaluation of whole assessment - extensive peer-review - delivered to SSV

NMFS Data Collection: Surveys, Fishery-Dependent and Fishery-Independent Data

- **Jon Hare, Ph.D., Science & Research Director, NOAA Northeast Fisheries Science Center**

Data


CATCH
Removals from a fish population *by fishing*
BIOLOGY
Life history information (growth, mortality, reproduction)
ABUNDANCE
Trends in fish stock population size
Models
Calculates time series of historical, current and forecast fish abundance and fishing mortality rate

Catch Data

Landings - Dealer

Discards - Observers

Biological Data - Port Samplers

Biological Data - Observers

Landings / Discards - ER/EM

Catch Data

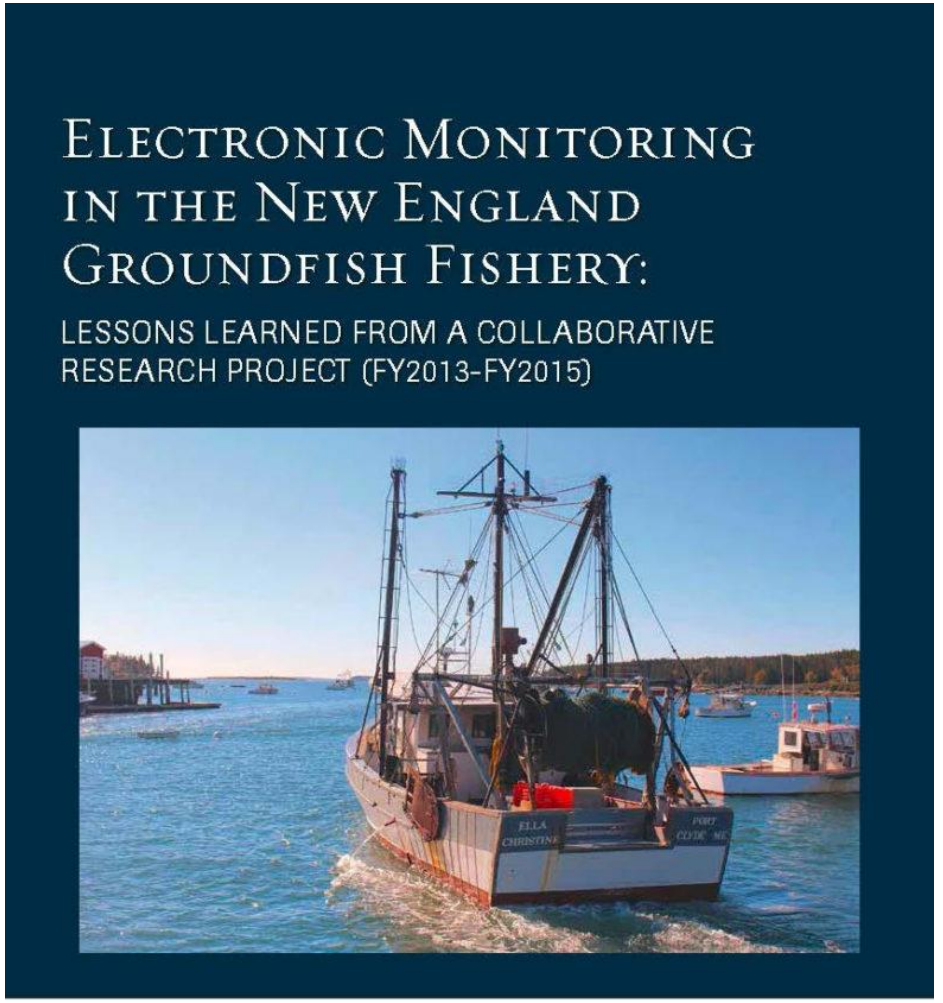
Landings - Dealer

Discards - Observers

Biological Data - Port Samplers

Biological Data - Observers

Landings / Discards - ER/EM



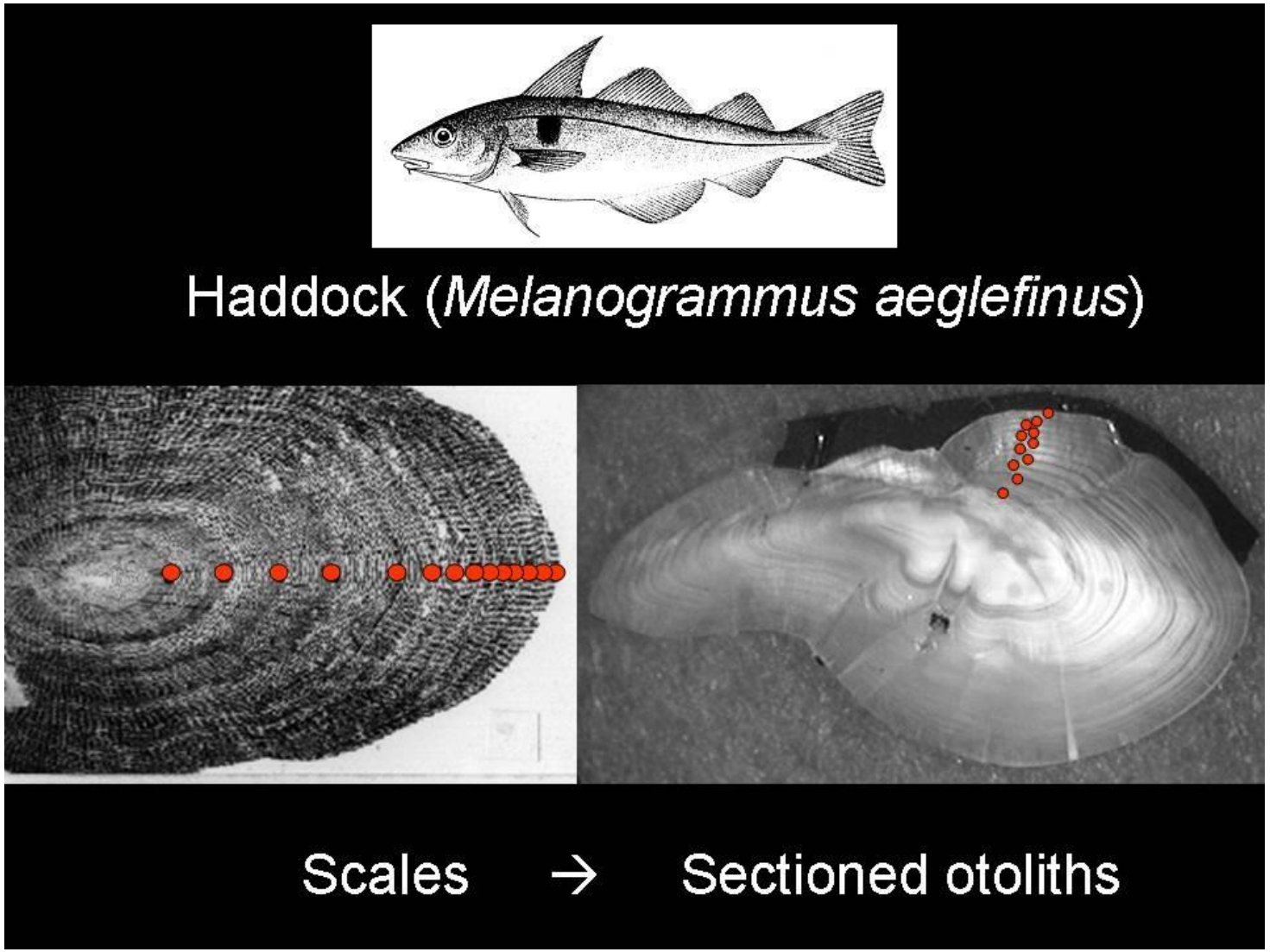
Biological Data

Age - otoliths, vertebrae

Length / Weight

Reproduction / Maturity

Food Habits



https://www.nefsc.noaa.gov/press_release/2008/SciSpot/ss0808/Haddock%20age%20samples.JPG

Biological Data

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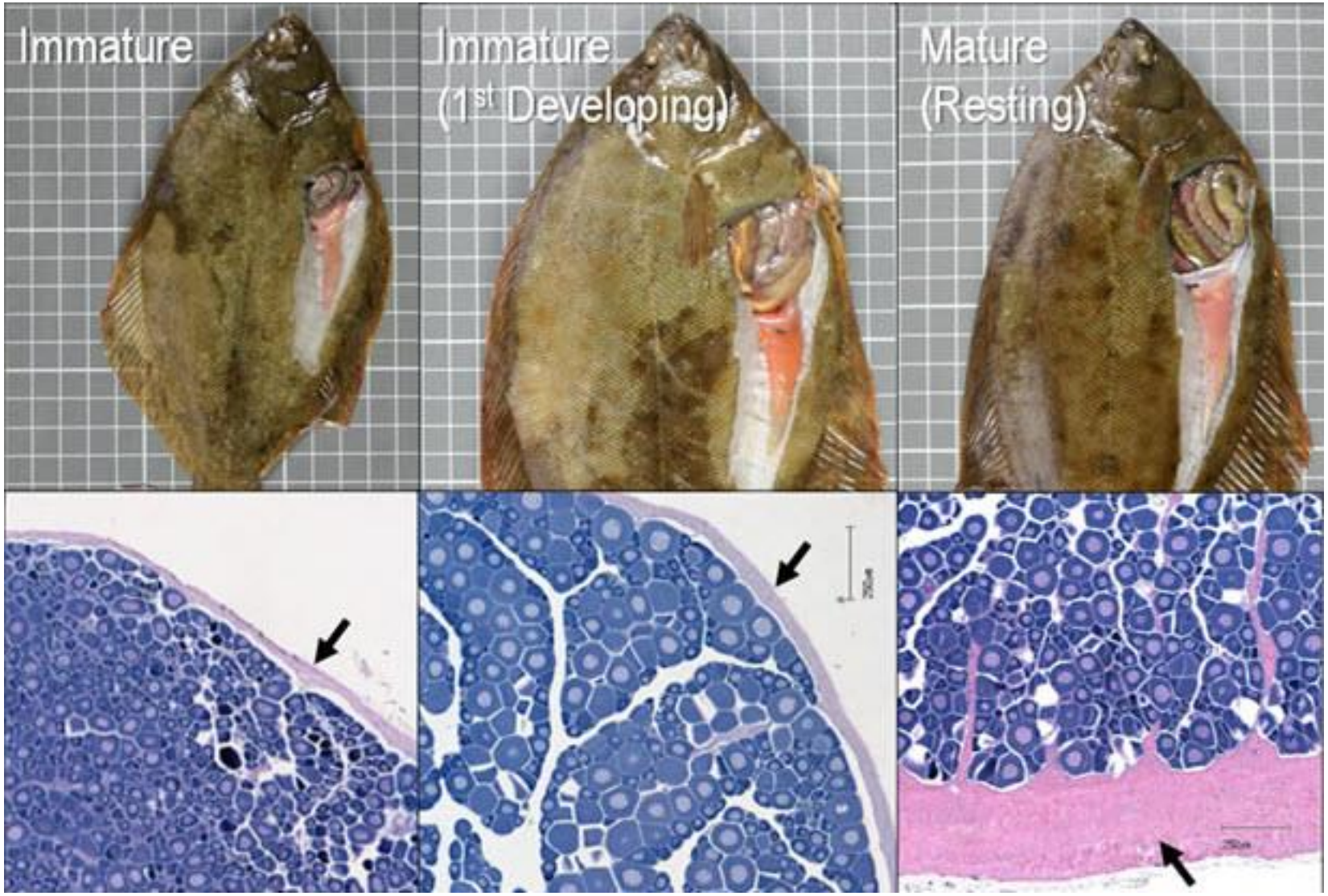


https://www.nefsc.noaa.gov/fbp/reproduction/images/threepix.jpg

Biological Data

Age - otoliths, vertebrae

Length / Weight

Reproduction / Maturity

Food Habits

https://www.nefsc.noaa.gov/femad/pbb/fwdp/images/bsmith_samp.jpg
https://www.nefsc.noaa.gov/nefsc/Narragansett/sharks/img/sbarevertbrian.jpg

Biological Data

Sources:

Surveys

Observers

Port Samplers

Biosampling Program

https://www.nefsc.noaa.gov/femad/ecosurvey/mainpage/images/sorting-fish.jpg

Abundance Data

Federal Surveys

State Surveys

Industry-based surveys

CPUE

https://www.nefsc.noaa.gov/femad/ecosurvey/mainpage/images/bigelow_deck.jpg

Abundance Data

Federal Surveys

State Surveys

Industry-based surveys

CPUE

https://web.uri.edu/gso/files/14313035538_065373bd3f_z.jpg

Abundance Data

Federal Surveys

State Surveys

Industry-based surveys

CPUE

https://www.nefsc.noaa.gov/press_release/pr2017/features/crp-longline-survey/spring16_longlinesurvey-52_ca.jpg

Abundance Data

Federal Surveys

State Surveys

Industry-based surveys

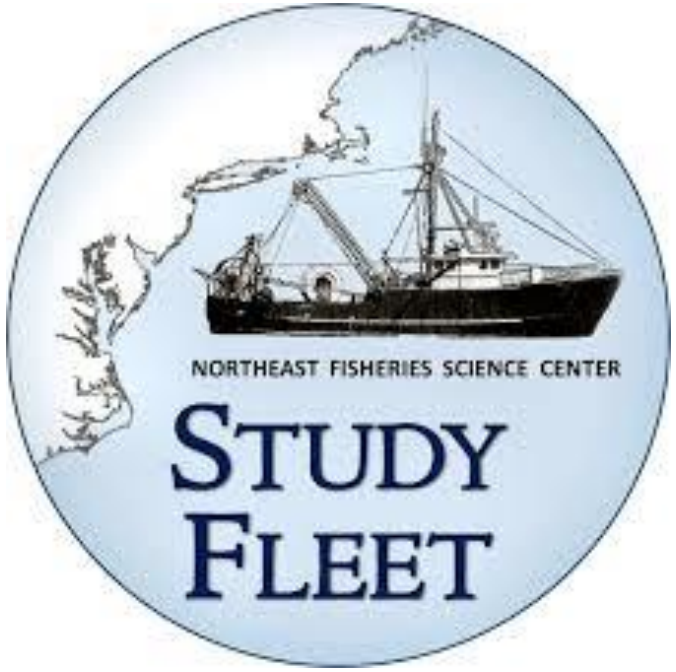
CPUE

Fishery Data for Stock Assessment Working Group Report

November 19, 2018

Working Group: Steve Cadrin (Chair, SMAST), Robin Frede (NEFMC), Emily Keiley (GARFO), Brian Linton (NEFSC), Jean-Jacques Maguire (SSC), Paul Rago (NEFSC retired), Rich Bell (TNC), Vito Giacalone (NESC), Chad Demarest (NEFSC), Chris Brown (FV Proud Mary) and Mark Gibson (RIDEM retired)

Other Contributors: Cate O'Keefe (MADMF), Greg DeCelles (MADMF), Brooke Wright (SMAST), Alex Hansell (SMAST), Chris McGuire (TNC), Dan Hennen (NEFSC)



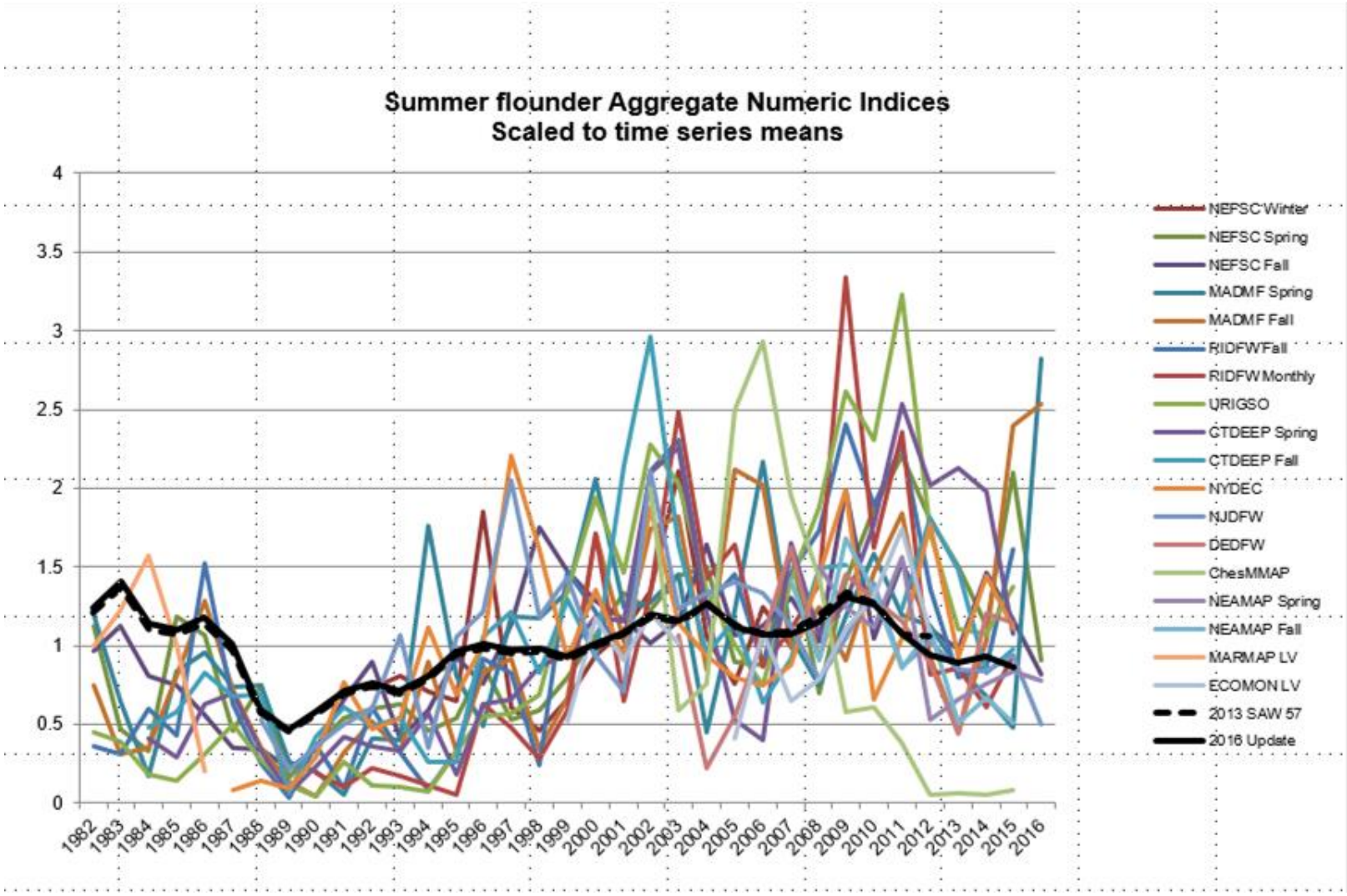
https://s3.amazonaws.com/nefmc.org/6b.-181119_Draft_Fishery-Data-for-Stock-Assessment-Working-Group-report-with-appendices.pdf

Abundance Data

Indices of abundance

Indices of trend

Consistency over time



New Approaches to Data Collection

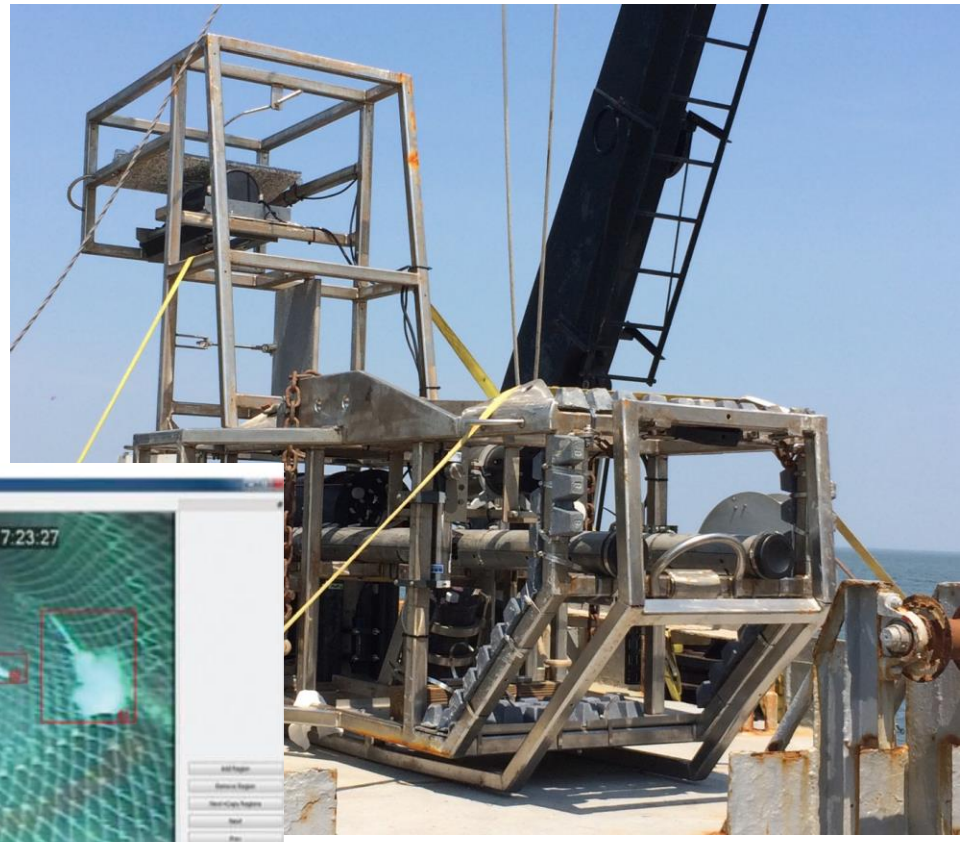
HabCam

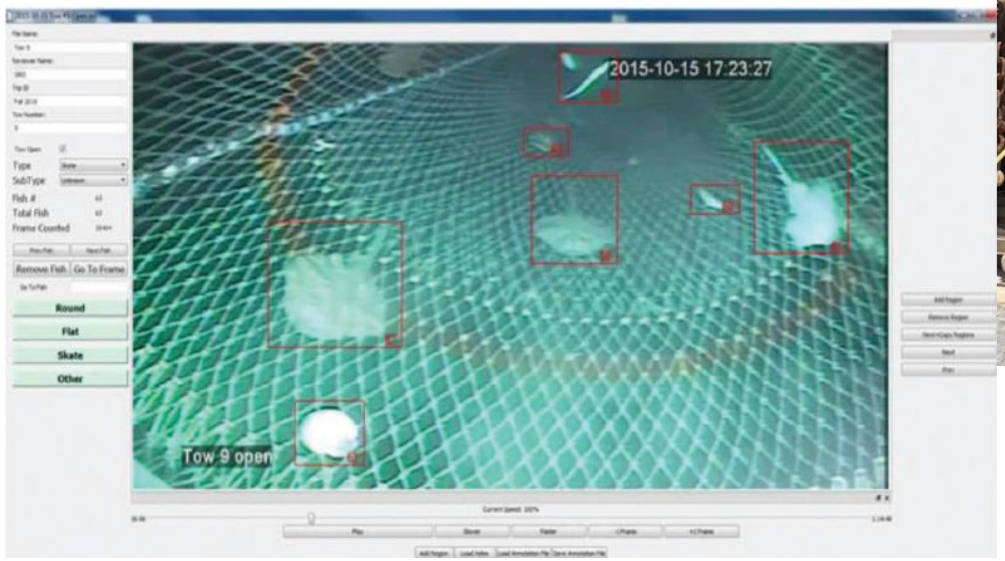
Acoustics

VAST Geospatial Modeling

Video trawl system

Genomics





https://afspubs.onlinelibrary.wiley.com/doi/10.1080/00028487.2017.1282888

New Approaches to Data Collection

Wind energy development is going to affect fish stocks and data collection

Need to develop new approaches to data collection to continue to support stock assessment process

Collaborative research on effects on fish, fishing, and science

http://dwwind.com/wp-content/uploads/2016/10/sunrise-59-550x375.jpeg

Data Collection: What Are Developers Required to Collect & Submit?

- **Ruth Perry, Ph.D., Marine Scientist & Regulatory Policy Specialist, Mayflower Wind**

Offshore Wind Regulatory Authority

Outer-Continental Shelf Lands Act, as amended by the Energy Policy Act 2005; 30 C.F.R. Part 585

- Authorizes DOI to issue leases, easements, or ROWs on the OCS for activities that produce energy from sources other than oil and gas.

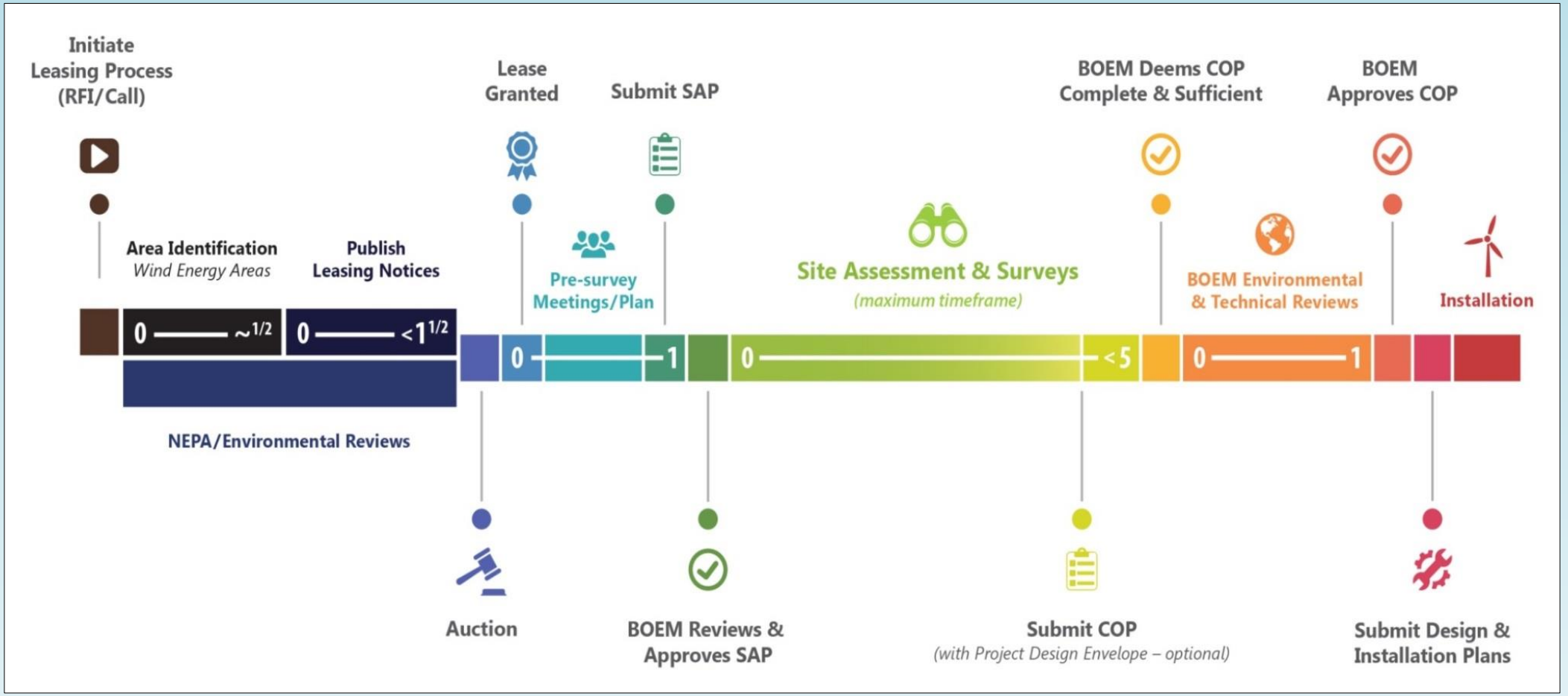
Lessees submit a Construction and Operations Plan (COP) per 30 C.F.R. Part 585

- COP must provide a description of all proposed activities, planned facilities, as well as project easements that a developer intends to construct and use

Lessees must collect environmental data to support BOEM's analysis under National Environmental Policy Act (NEPA, 42 U.S.C. §§ 4321 et seq.; 40 C.F.R. Part 1500)

- NEPA requires federal agencies to assess environmental effects of lessees' proposed actions (Environmental Impact Statements)

Offshore Wind Regulatory Timeline



Offshore Wind Regulatory Framework

Offshore Wind projects are reviewed and permitted 10 federal entities working under the jurisdiction of approximately 17 federal laws (not to mention state/local laws). This does not include state or local entities, which are specific to the project's location.

BOEM
Bureau of Ocean Energy Management

United States Environmental Protection Agency

BSEE
Bureau of Safety and Environmental Enforcement

United States Coast Guard 1790

Federal Aviation Administration

National Oceanic and Atmospheric Administration
NOAA
U.S. Department of Commerce

U.S. Fish & Wildlife Service
Department of the Interior

Department of Defense
United States of America

Each requires combination of studies (assessments) and/or surveys (data collection) specific to a project's proposed design envelope.

Offshore Wind Constructions & Operations Plan

- **Overall, your COP should describe resources, conditions & activities that may be affected by your proposed activities & should also include environmental conditions that could affect the activities proposed**
  - **Environmental**
    - Baseline data – studies (desktop) & surveys (field data)
    - Monitoring plans – Pre-construction, construction, operations & decommissioning
    - Impact-producing factors – scaled for proposed design envelope, information for BOEM to comply NEPA (e.g. generate Environmental Impact Statement/EIS)
  - **Technical**
    - General structural & project design, fabrication, & installation
    - Location, design, & installation methods
    - Descriptions of deployment activities, operating procedures, & decommissioning procedures

Offshore Wind Constructions & Operations Plan

- Guidance on information requirements for each resource, condition, and/or activity identified in 30 CFR 585.627(a).
  - COP should include baseline data & information on impact-producing factors
  - Discussion of environmental resources & impacting factors is informative rather than analytical
  - Level of detail ultimately depends on geographic extent of activities, the duration or intensity of impacting factors, & sensitivity of resources in project area
  - Sufficient detail to support environmental analyses required by NEPA
  - Environmental protection measures & monitoring activities must be included

COP Requirements (Surveys & Studies)

Credits: State of Massachusetts (mass.gov), New England Aquarium (neaq.com)

COP Requirements (Surveys & Studies)

Information	Descriptions & Details
Anthropogenic Conditions & Hazards	Fisheries, marine sanctuaries, protected species, cables/pipelines, hydrocarbon exploration, restricted areas, hazards (shipwrecks, anchorage zones, rock outcrops, etc.) & territorial claims
Environmental Conditions & Hazards	Oceanography, geology, bathymetry, geomorphology, seafloor conditions, seismic & volcanic activity, sediment transport, meteorology, navigational warnings & restricted locations and/or time periods
Biological Resources	Results of biological surveys used to determine the presence of live bottoms, hard bottoms, and topographic features, and surveys of other marine resources such as fish populations (including migratory populations), marine mammals, sea turtles, and sea birds.
Archaeological resources	A description of the historic and prehistoric archaeological resources, as required by the NHPA (16 U.S.C. 470 et. seq.), as amended. Provide detailed information regarding nature and location of historic properties to assist BOEM in reviewing COP under NEPA & Section 106 of NHPA
Seafloor Habitats; Sensitive Biological Resources or Habitats	Identify & characterize potentially sensitive seafloor habitats & features; Shielding to control EMR fields; reduce scouring; avoid use of explosives; minimize disturbance & sediment dispersion during cable installation. Describe nature and extent of sensitive biological resources or habitats that may be affected by activities proposed in COP.
Water Quality	Report typical metrics for water quality including the following: dissolved oxygen, chlorophyll, nutrient content, seasonal variations in algae or bacterial content, upwelling conditions, presence or absence of contaminants in water or sediment; turbidity or water visibility states & variation

Note that site investigation (geological, geophysical, and geotechnical studies and surveys) not included in this section.

COP Requirements (Continued)

Information	Descriptions & Details
Marine Mammals & Sea Turtles	Evaluate marine mammal use, minimize and mitigate potential impacts. Amount of data required determined on project basis.
Fisheries (Species, Resources, & Habitats)	Conduct pre-siting surveys (may use existing data) to identify important, sensitive, and unique habitats in project areas. Work cooperatively with commercial/recreational fishing entities & interests to ensure C & O will minimize potential conflicts.
Avian Resources	Evaluate avian use in the project area & design project to minimize or mitigate potential for bird strikes & habitat loss. Amount of data required determined on project basis.
Coastal Habitats	Identify hard-bottom habitats and avoid seagrass & kelp beds, where practicable; Restore any damage to these communities
Visual Resources	Address key design elements, including visual uniformity, use of tubular towers, and proportion & color of turbines
Social & Economic Resources	Identify major coastal industries (onshore & offshore), describe an economic modeling, describe commercial & recreational fisheries, recreational use patterns, demographic patterns
Coastal & Marine Uses	Describe how C & O take account of, are able to co-occur with, or do not interfere with any other authorized use of the OCS

Note that site investigation (geological, geophysical, and geotechnical studies and surveys) not included in this section.

Cooperative Research: Engaging Fishermen to Advance Science & Sustainability

- **Anna Mercer, Ph.D., Chief, Cooperative Research Branch, Northeast Fisheries Science Center, NOAA Fisheries**

NOAA FISHERIES

NEFSC

Cooperative Research: Engaging Fishermen to Advance Science and Sustainability

Anna Mercer, PhD

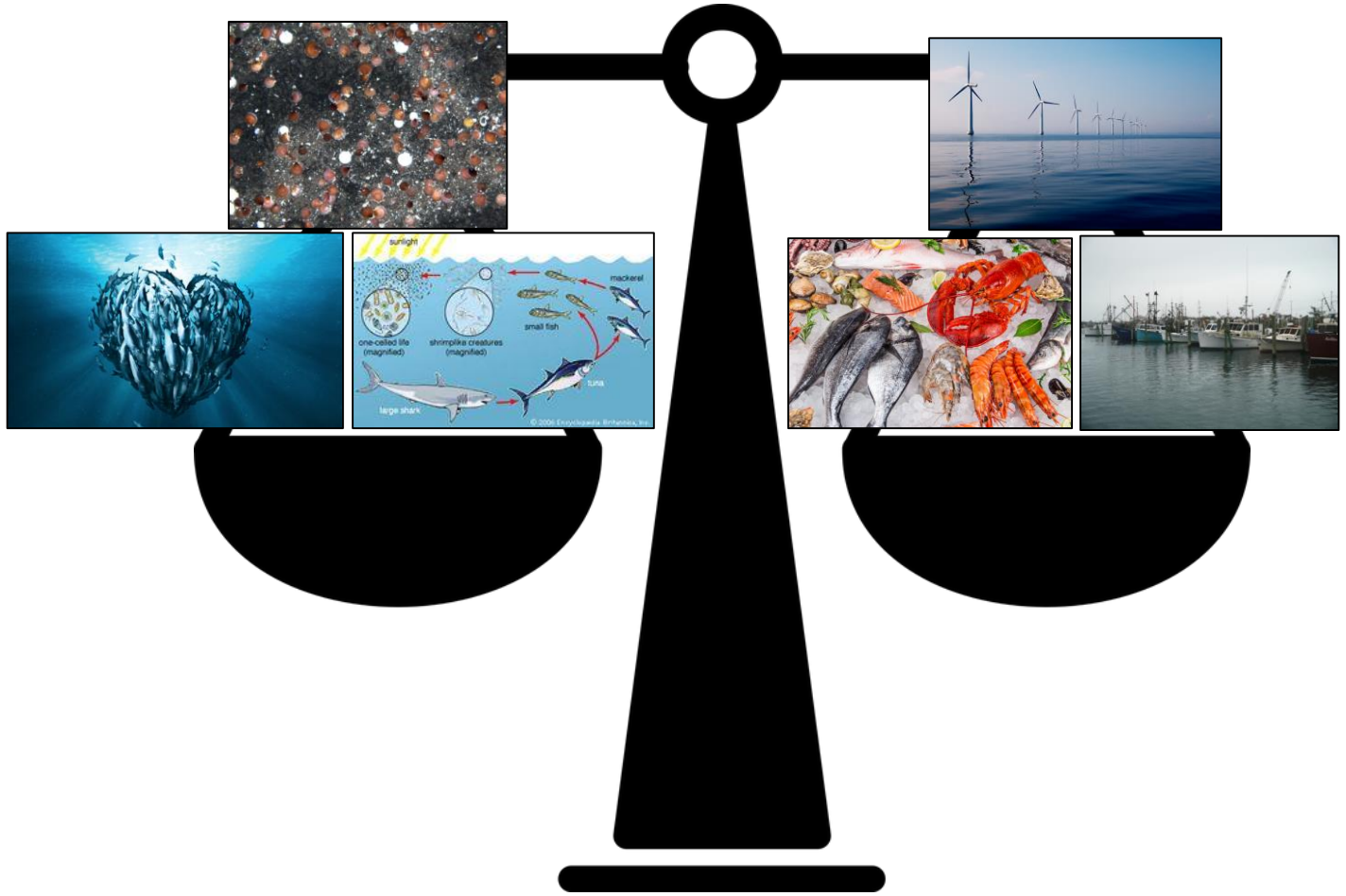
Chief, Cooperative Research Branch

Northeast Fisheries Science Center

NOAA Fisheries

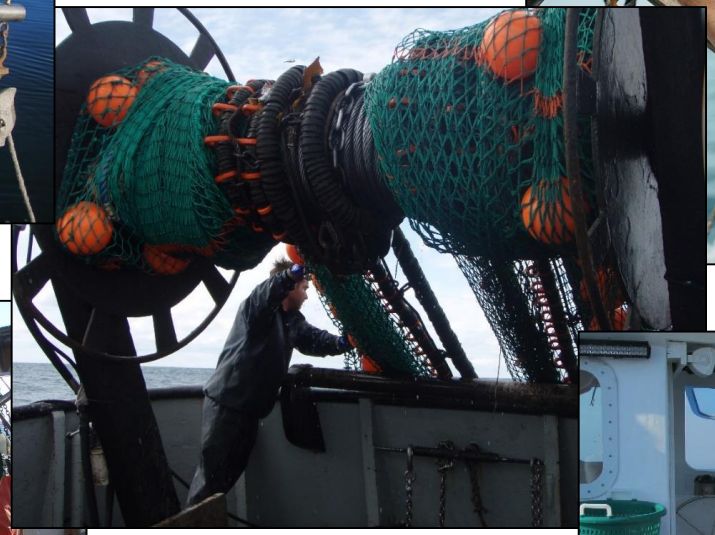
October 16, 2019

The Scales of Fisheries Science

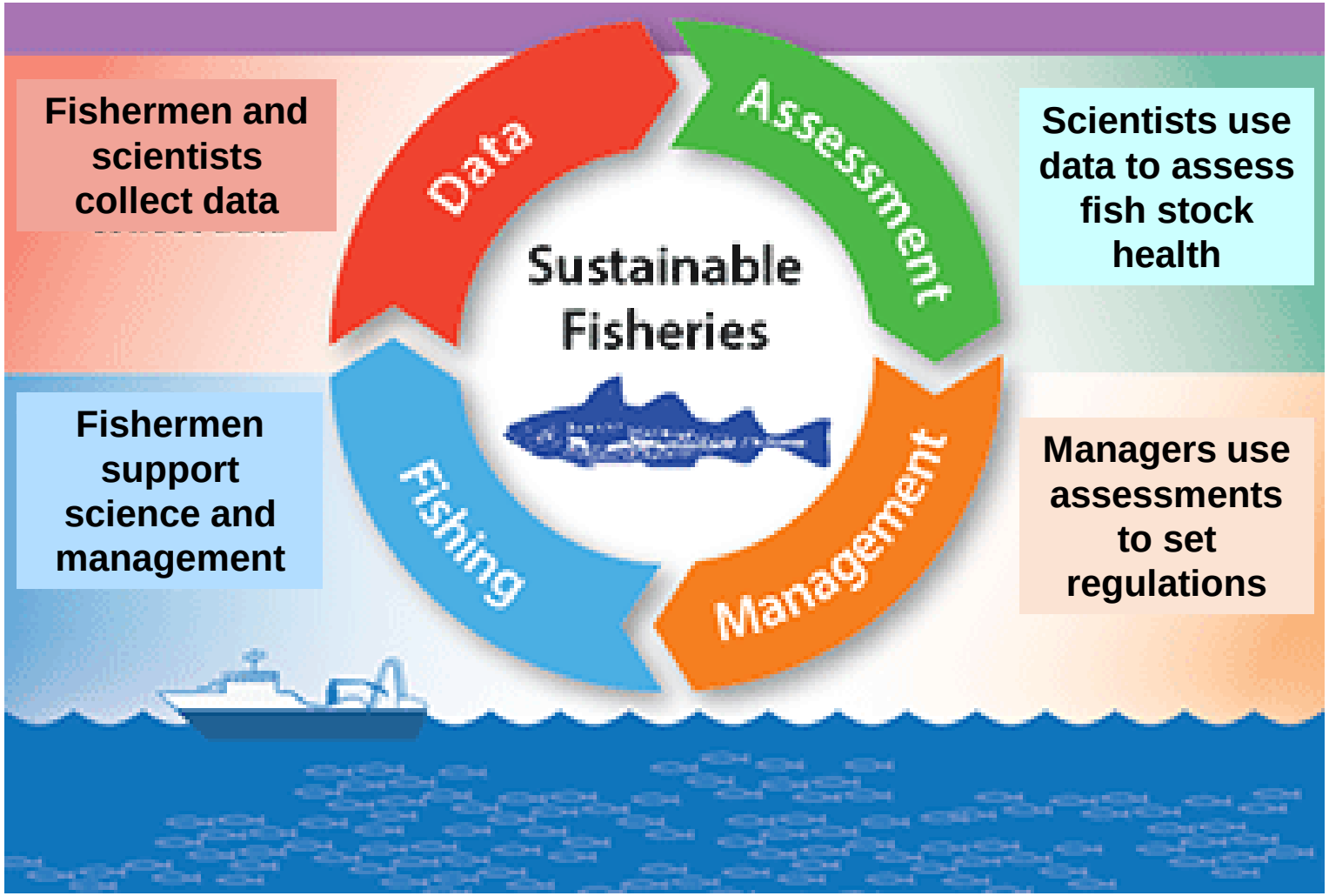


How do we achieve healthy ocean ecosystems, prosperous fishing communities, global food security, AND clean energy?

Solution: Partner with the Experts!



Cooperative Fisheries Science & Management



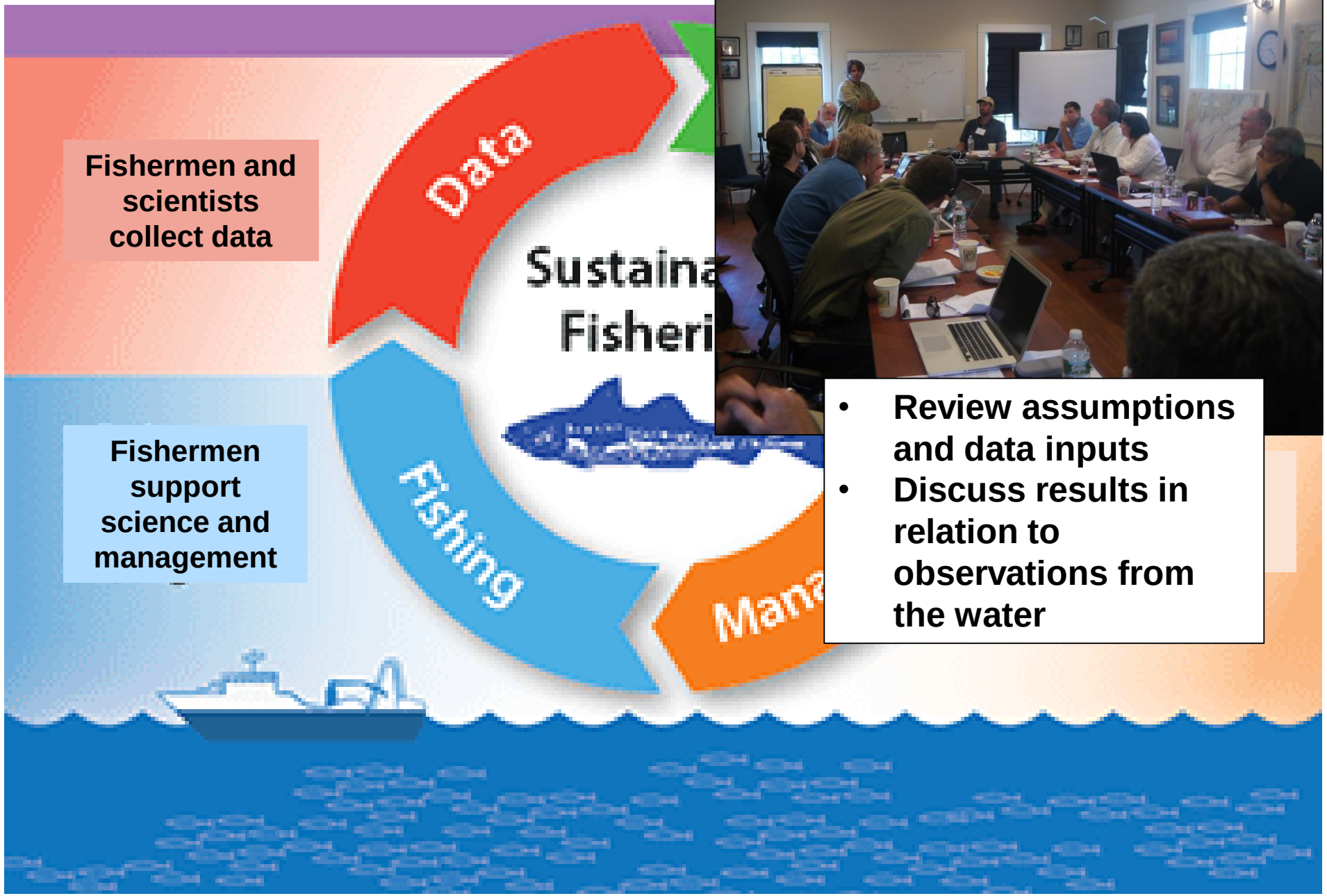
- High resolution catch and effort data collection
- Real time environmental data collection
- Electronic monitoring

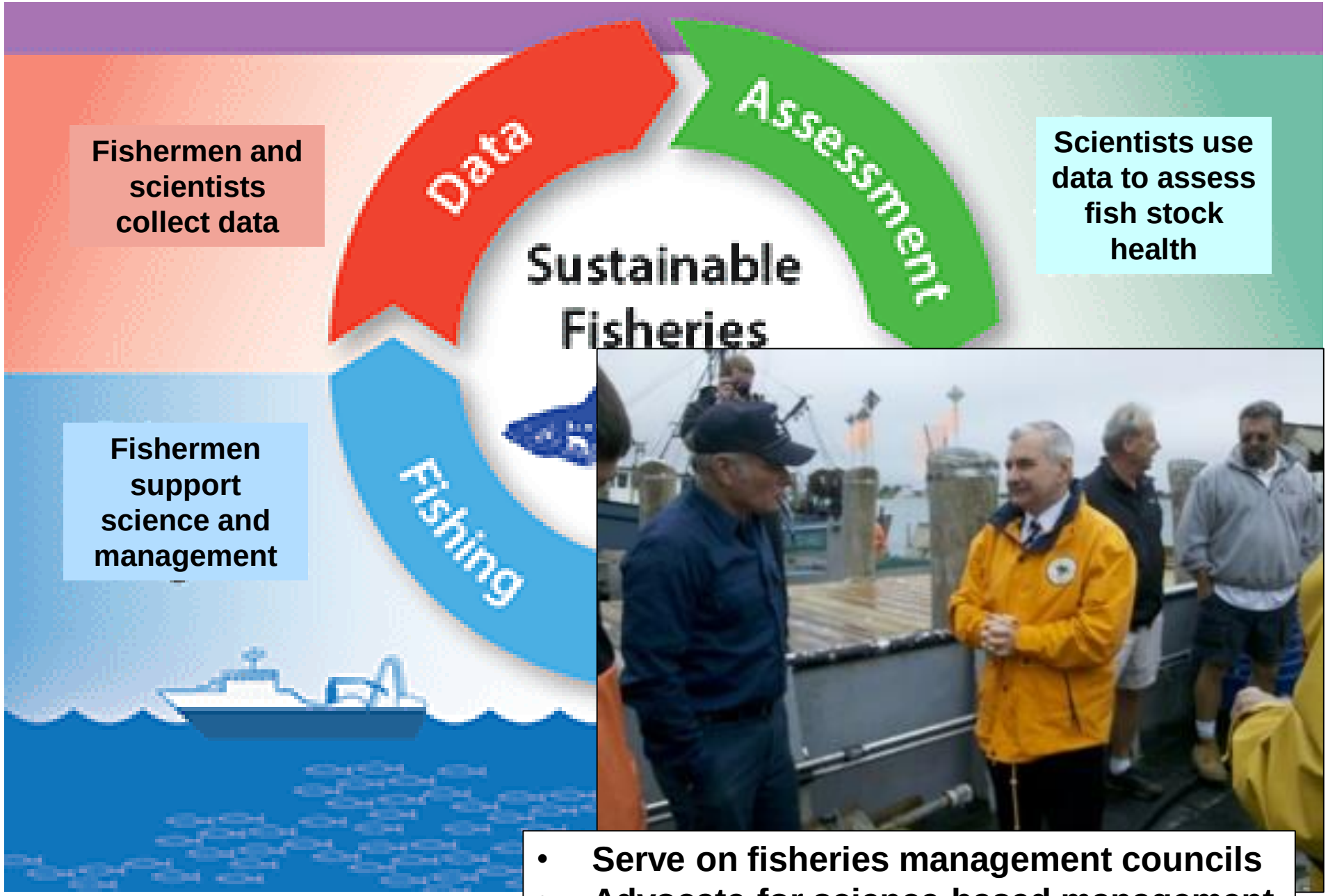
Assessment

Management

Scientists use data to assess fish stock health

Managers use assessments to set regulations


Fishermen and scientists collect data
Data
Sustaina
Fisheri
Fishermen support science and management
Fishing
Mana
• Review assumptions and data inputs
• Discuss results in relation to observations from the water



- Serve on fisheries management councils
- Advocate for science-based management
- Inform politicians

Fishermen and scientists collect data

Data

Assessment

Sustainable Fisheries

Management

Scientists use data to assess fish stock health

Managers use assessments to set regulations

- Conservation gear engineering
- Bycatch avoidance networks
- Tagging
- Biosample collection

NOAA FISHERIES

NEFSC Cooperative Research Branch

Mission:

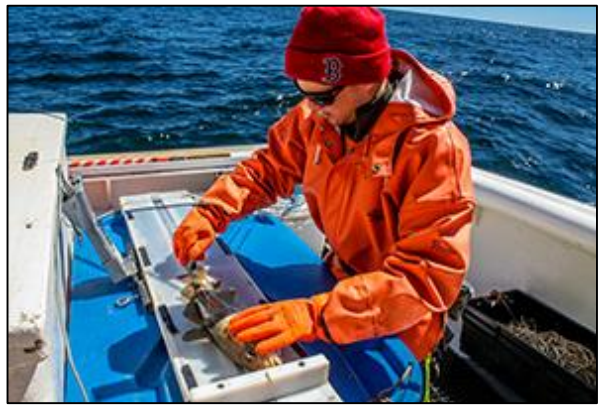
The Northeast Cooperative Research Branch conducts research to improve our ability to effectively manage fisheries, and to build trust and understanding among the various stakeholders in the fisheries community.

- Improve information about commercial fishing operations and the species they harvest.
- Produce tools to collect and share data to advance science and fishing.
- Harness expertise and knowledge of fishing communities.
- Foster partnerships between the fishing industry and science community.

NEFSC Cooperative Research Branch

- **3 Long-Term Cooperative Research Projects**
  - Study Fleet
  - GOM Bottom Longline Survey
  - Enhanced Biosampling

- **Other Cooperative Research Projects**
  - Conservation Gear Engineering
    - Reduce bycatch and fuel use
  - Cooperative Shark & Fish Tagging
    - Understand movement & migration patterns
  - River Herring Bycatch Avoidance
    - Track and share bycatch events in real time
  - Traditional Ecological Knowledge
    - Understand the impact of climate change on groundfish
  - Shortfin Squid Habitat Modeling
    - Identify how ocean dynamics impact squid distribution and productivity of the fishery
  - Electronic Monitoring
    - Develop technology to monitor fishing effort using video cameras
  - Conversion Factors
    - Develop ratios of whole fish weight to processed fish weight for stock assessments (Jonah crab)



NEFSC Cooperative Research Branch

- **3 Long-Term Cooperative Research Projects**
  - Study Fleet
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  - Conservation Gear Engineering
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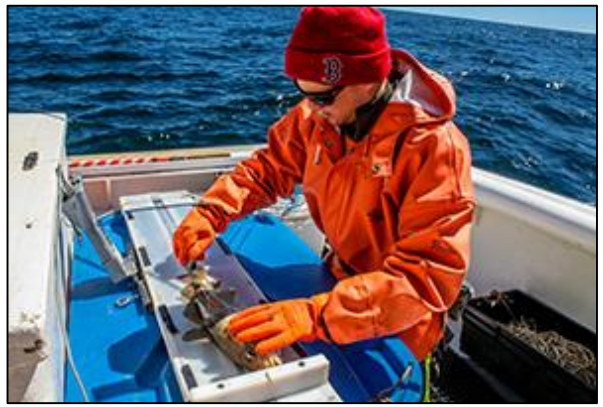


Study Fleet

Purpose:

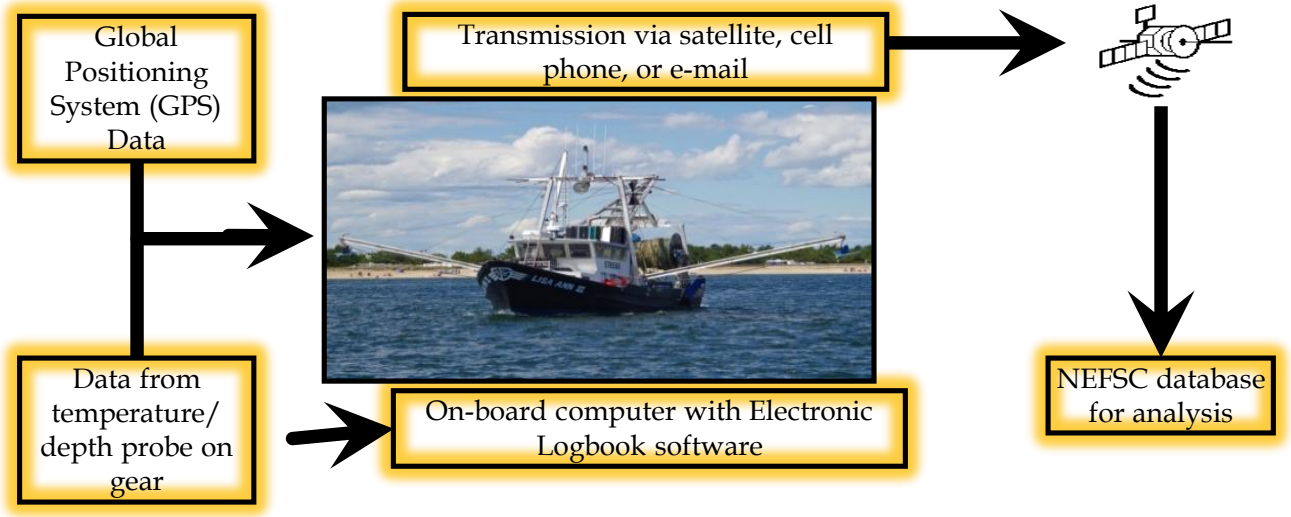
- Engage fishermen in collecting high resolution catch, effort, and environmental data to address science and management needs
- Develop an electronic data collection system (FLDRS) that if effective and efficient

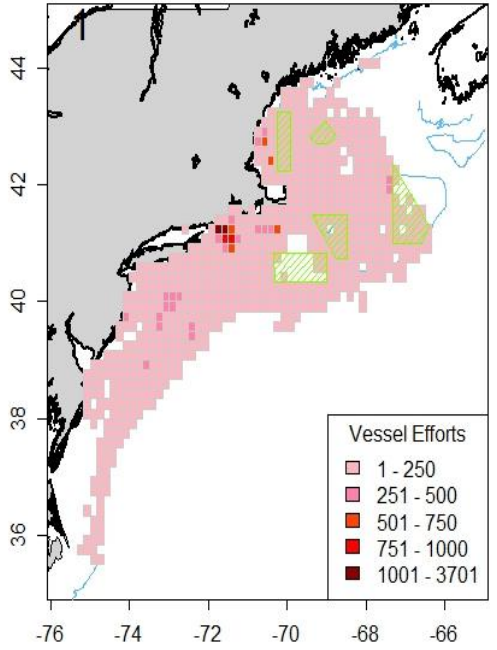
Industry Partners:

- 58 F/Vs currently involved in Study Fleet coast-wide
- Primarily trawl F/Vs, but also involves gill net, scallop dredge, and long line F/Vs

Spatial Coverage:

- Maine to North Carolina, with concentration of effort in southern New England

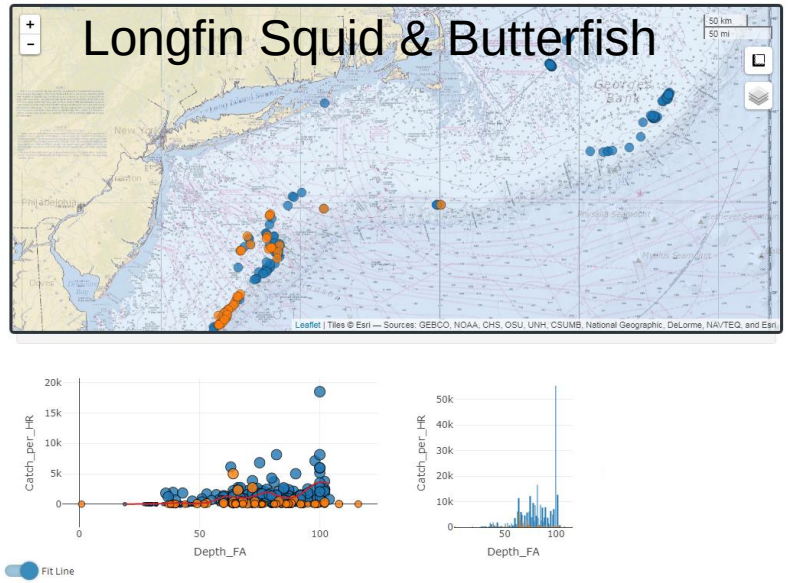


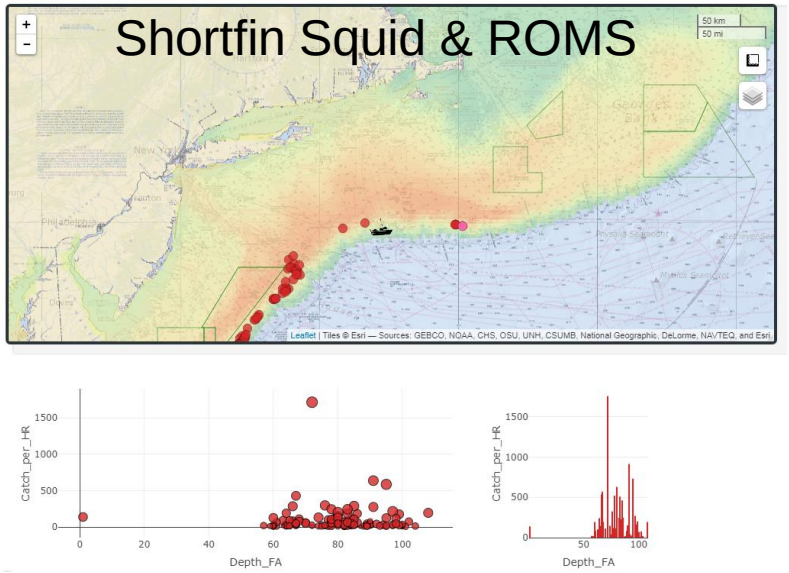


GO FISH

Graphical Onboard Fisheries Informatics System Homepage

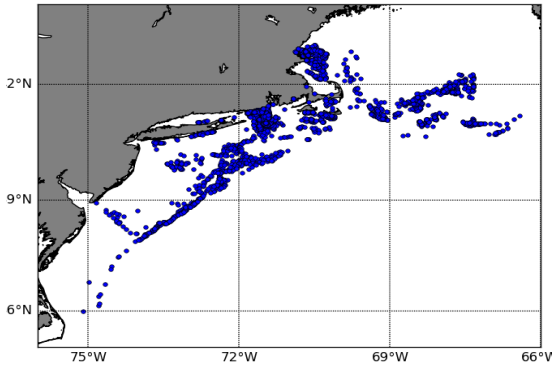
- Data visualization and analysis tool that uses data collected through FLDRS to conduct on-the-fly analyses of catch, bycatch, and environmental conditions
- Enables industry partners to visualize factors influencing fishing efficiency
  - Catch and bycatch rates over time, space, depth, temperature
  - Output from regional ocean models (bottom & surface temperature & salinity)
- Designed to simultaneously promote accurate fisheries science and cleaner, more efficient fishing businesses.

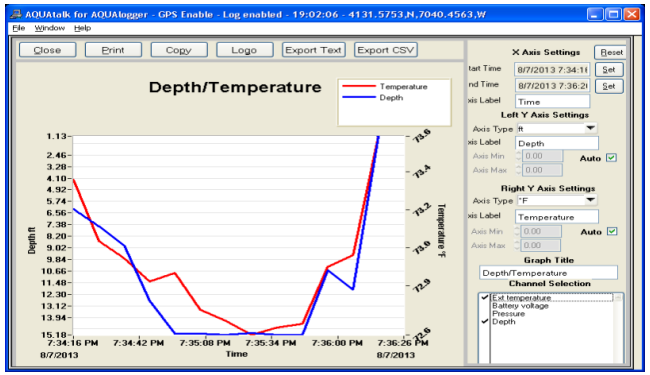


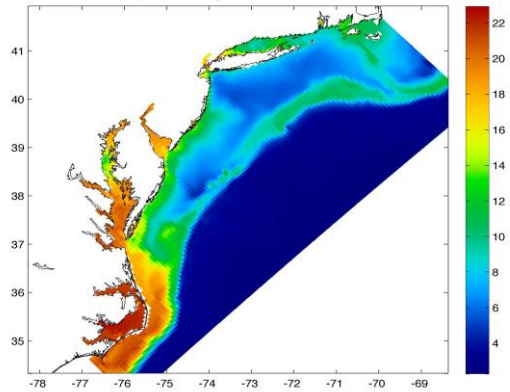


Environmental Data Collection & Telemetry

- F/Vs collect fine-scale temperature and depth data from fishing locations.
- Fishermen use onboard computer to immediately see how their data compare to historical records for that time and area.
- Data shared with oceanography community in real time





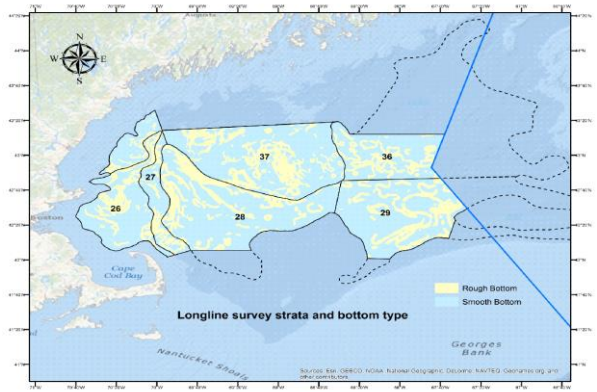


Data Access & Application:

- Data available via ERDDAP (publicly accessible data server)
- Data used in FVCOM hindcast model (UMass SMAST), Gulf of Maine Ocean Forecast System (NOAA), Doppio Regional Ocean Modeling System (Rutgers University)

Cooperative GOM Bottom Longline Survey

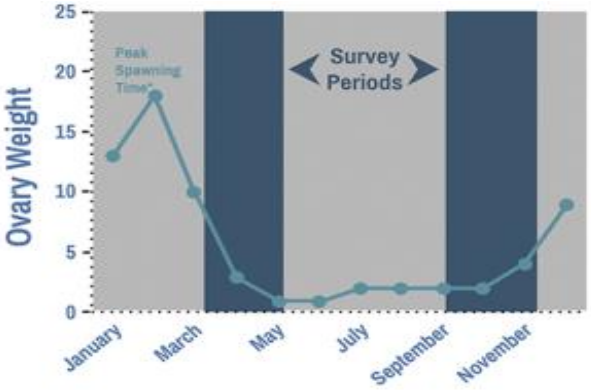
(2014-present)



- **Purpose:** Provide data from areas/habitats not sampled by NEFSC trawl survey, focusing on data-poor species (halibut, thorny skate, cusk, wolffish) and groundfish
- **Industry Partners**: F/V Mary Elizabeth, F/V Tenacious II
- **Survey Design:** 50 random-stratified stations sampled (tub-trawl bottom longlines) in spring and fall, coincident with NEFSC trawl survey
- **Products:** Indices of abundance, age and maturity sampling, environmental data, live fish

Enhanced Biosampling

- **Purpose**: Coordinate the collection of fish from F/Vs for life history analysis (age, growth, maturity, reproduction, energetics) from times of year and areas not otherwise sampled.
- **Species:** Summer flounder, winter flounder, haddock, yellowtail flounder, cusk, wolfish, halibut, herring, squid, Acadian redfish (and others)
- **Results**: Evaluate spatial and temporal variability in reproductive output and energetic condition of summer flounder, yellowtail flounder, winter flounder; Identify skipped spawning events for herring; etc.
- **Over 20,000 fish samples collected to date**



Take Aways

- Engaging fishermen in scientific research can:
  - Provide data from otherwise inaccessible areas and times of year
  - Provide an experienced and flexible platform
  - Provide ground-truthing of assumptions and methods
  - Build a sense of trust and mutual good
- Many other applications of collaborative research:
  - Conservation gear engineering
  - Supplemental surveys
  - Tagging studies
  - Habitat surveys
  - Offshore wind!

Thank You!

NOAA FISHERIES

Fishery Logbook Data Recording Software (FLDRS)

Primary Purpose:

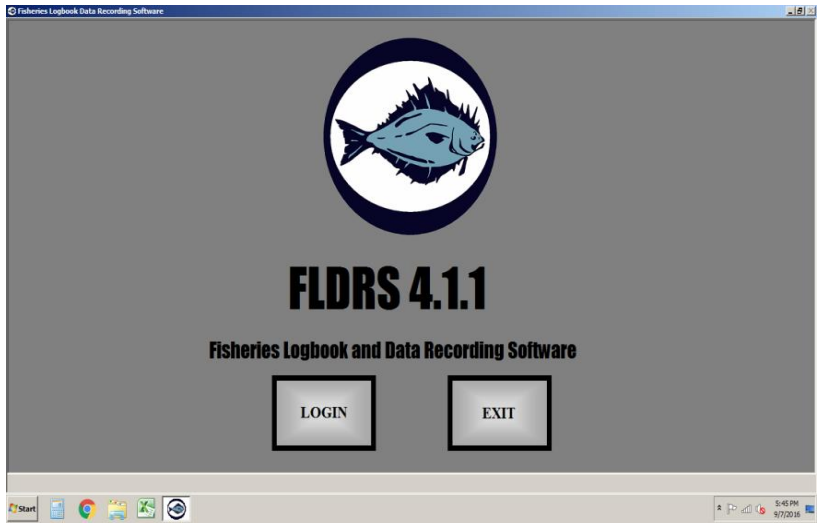
- Scientific data collection tool
- High resolution catch, discard, effort, location

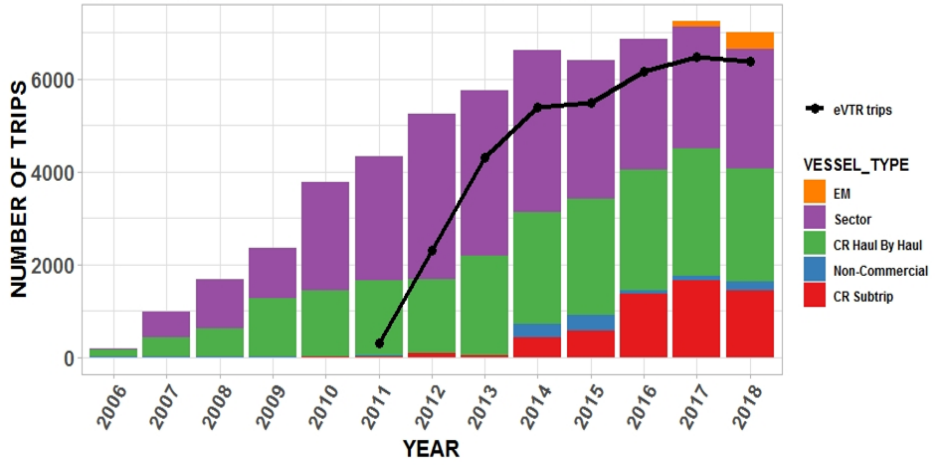
Additional Uses:

- Electronic vessel trip reporting platform (eVTR)
- Electronic Monitoring research
- Fishing gear research
- Bycatch avoidance

By the Numbers:

- 58 F/Vs collect haul-by-haul level data
- 41 F/Vs use FLDRS as an eVTR platform
- Over 7,000 trips reported through FLDRS in 2018





Research: How Developers Approach a Research Agenda

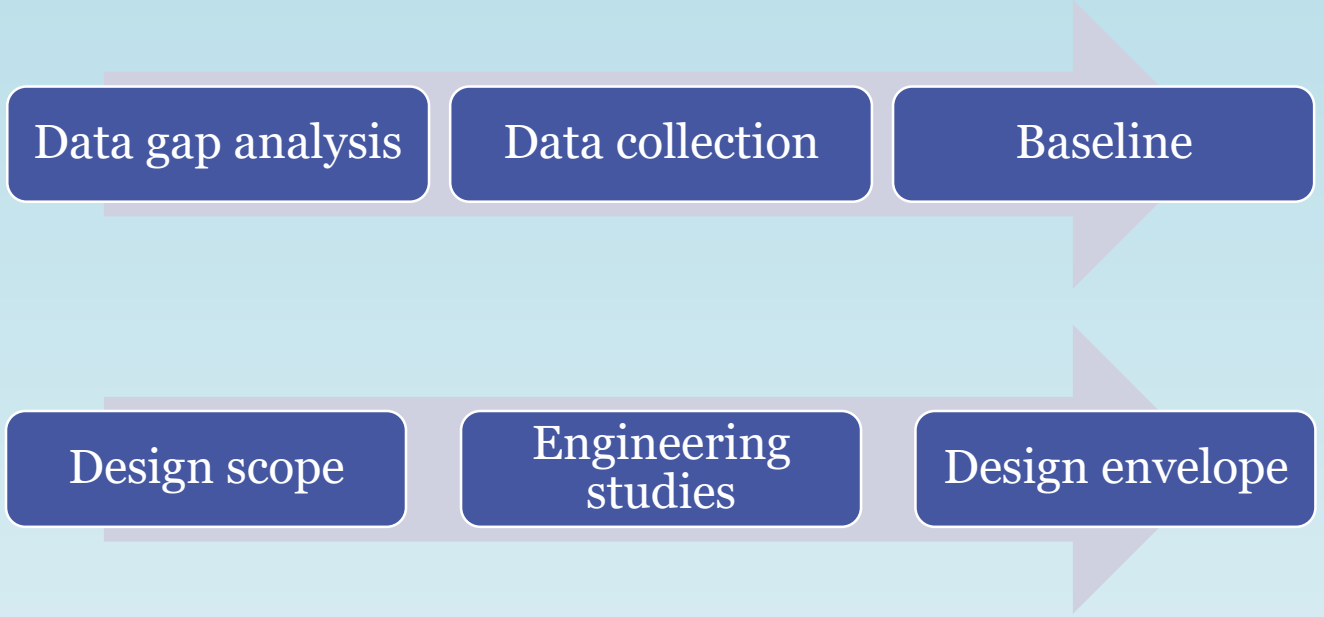
- **Martin Goff, Environmental & Permitting Manager, Equinor**

Why monitor?

- Inform regional and project level spatial planning
- Baseline data for impact assessments
- Inform resource specific permits (e.g. IHAs)
- Test impact assessment conclusions
- Address resource data gaps
- Address effects and impacts data gaps

Baseline monitoring

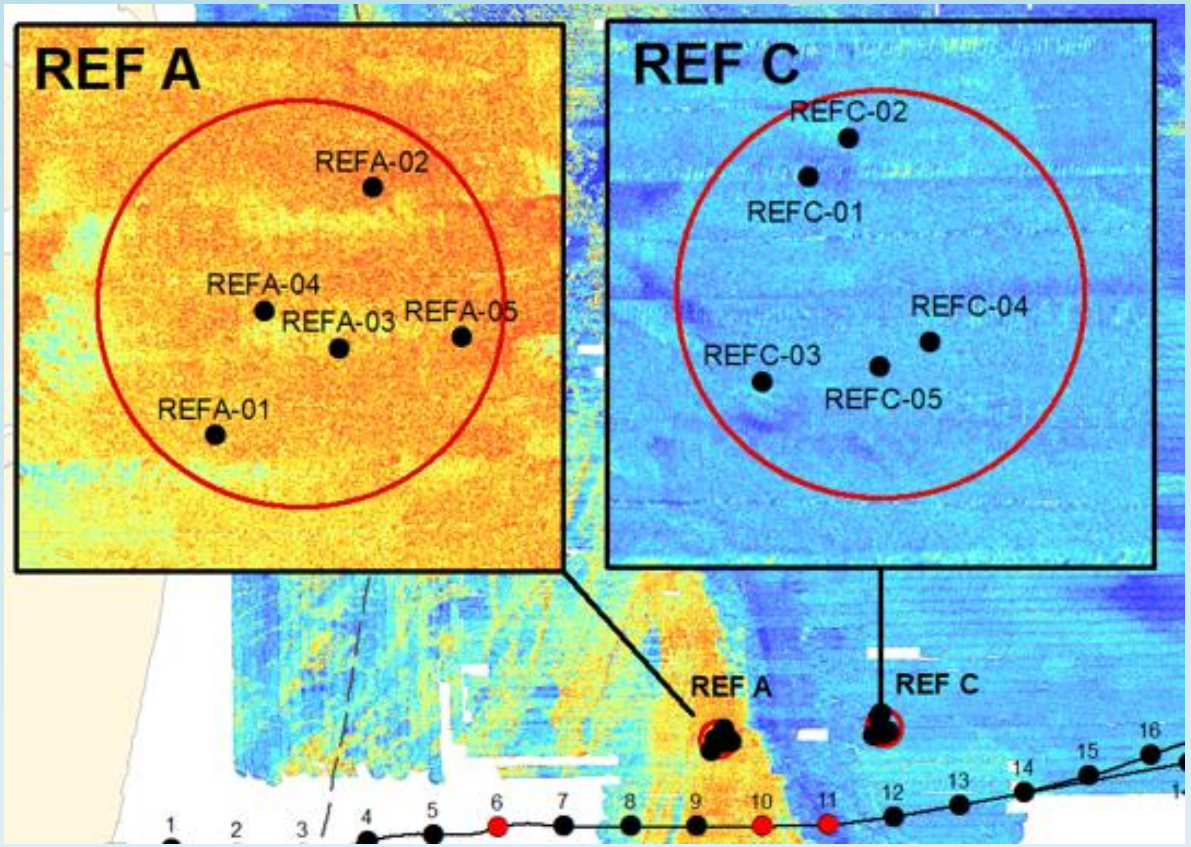
- Describe the key species and habitat potentially affected by the proposed actions.
- Spatial and temporal distribution of resources in relation to the development.
- To inform future monitoring.



Sensitivity of receptors x Magnitude of effect
=
Impact significance

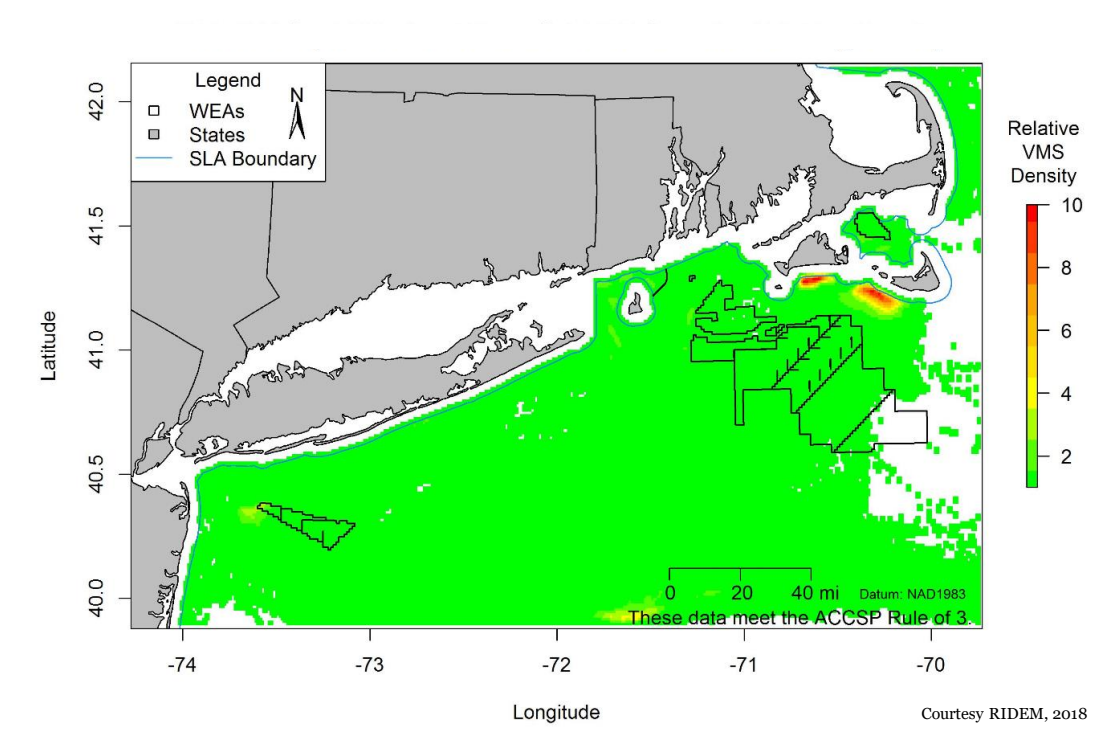
Baseline monitoring

- Does data already exist?
- Proxies
- Others utilizing that resource
- Habitat / conditions supporting that resource
- Other species indicative of potential presence
- Assume presence?
- Site and resource specific surveys
- Modelling



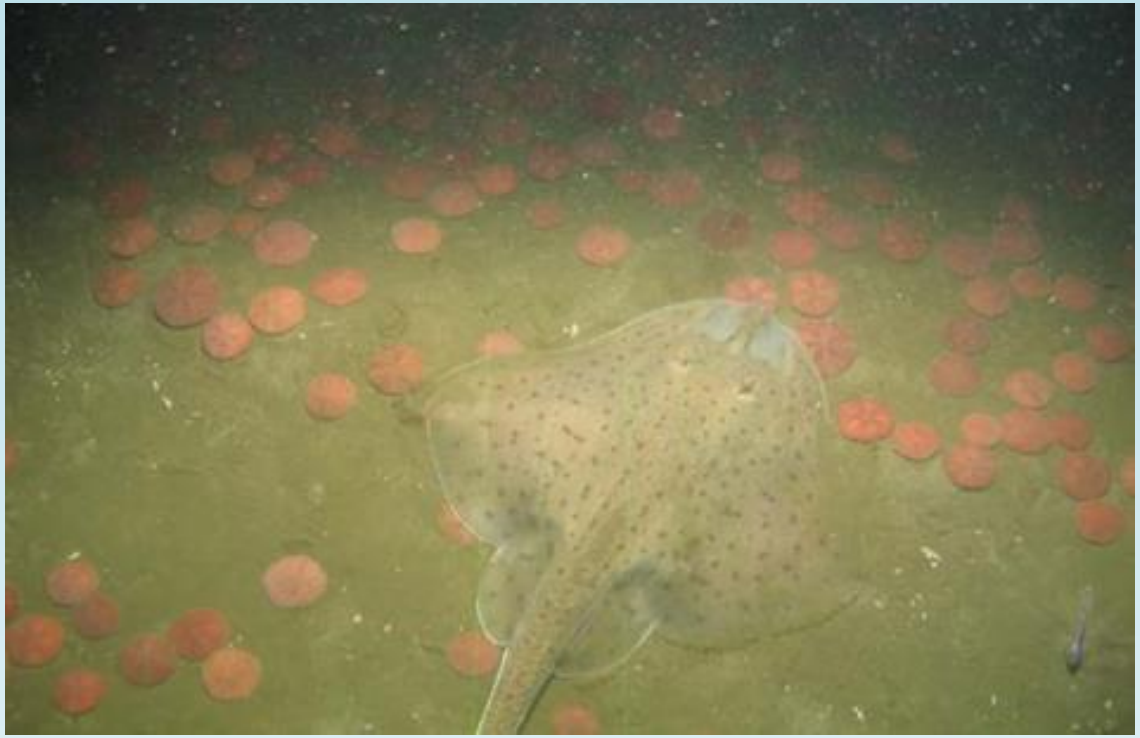
General environment informing potential resources or targeted surveys

Data sources acting as a proxy or indicator



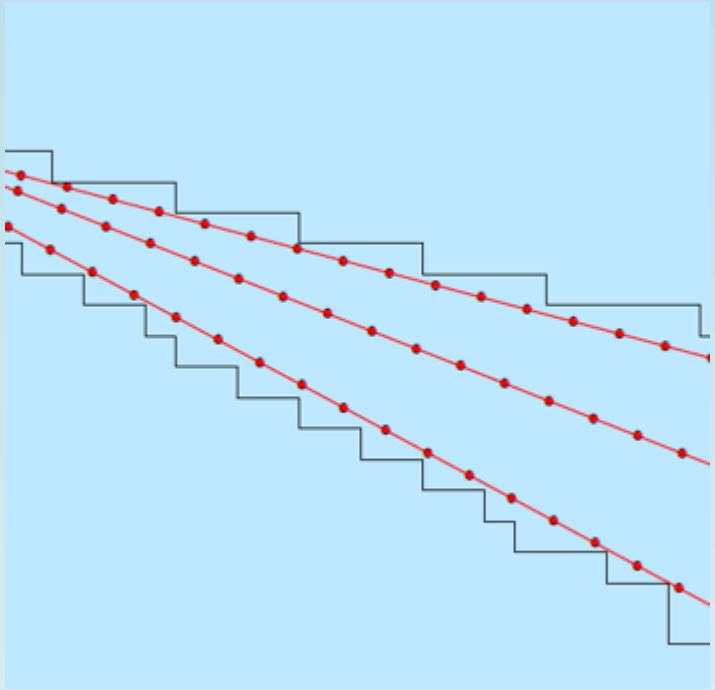
Courtesy RIDEM, 2018

Site use may indicate species presence

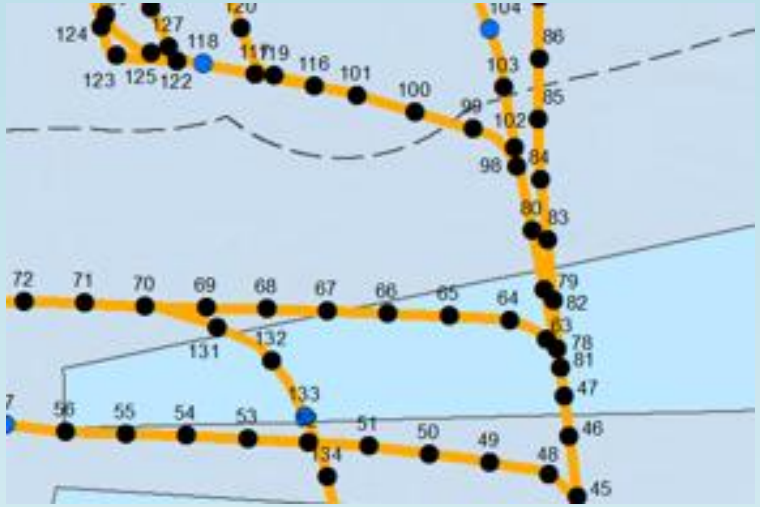


Habitat and fauna informing potential presence of other resources and uses

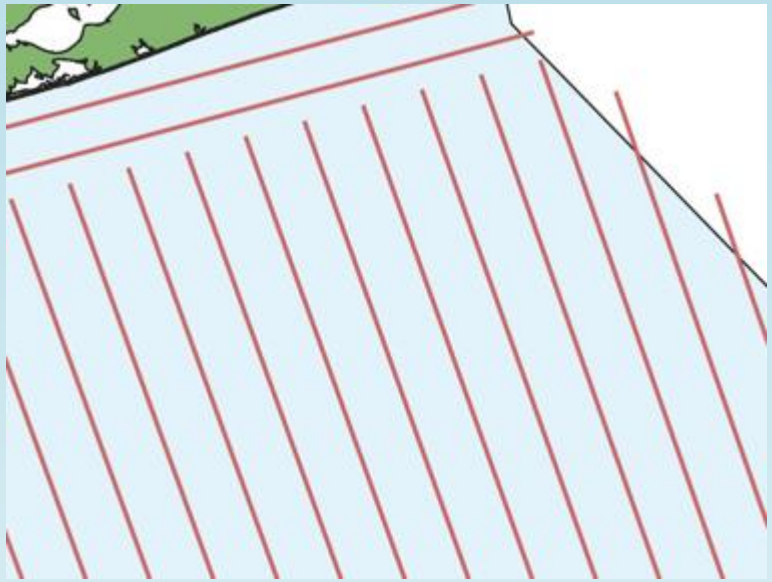
Site specific surveys



Targeted sample locations along transects



Targeted sample locations along specific planned areas



Spatial and temporal coverage

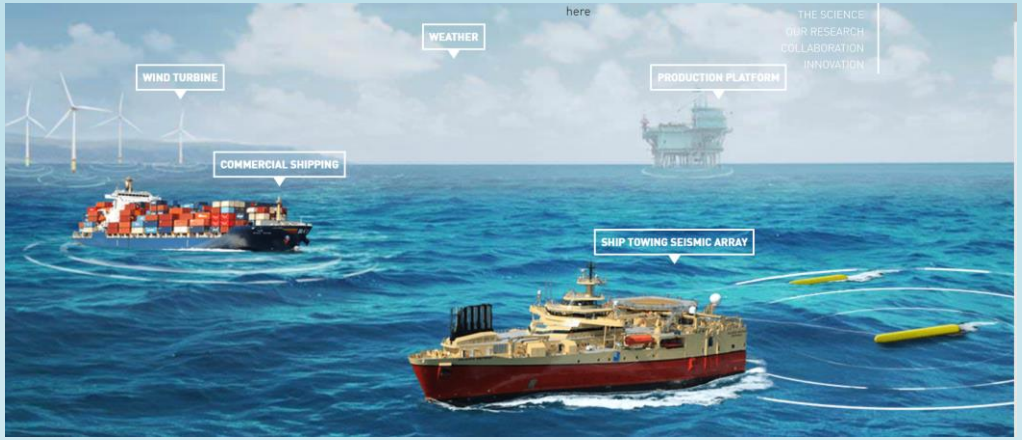
Resource monitoring (project level)

- Assessing actual impacts versus EIA
  - Where there is uncertainty
  - High value, high sensitivity
  - Permit conditions
  - De-risking future development
- Pre, during and post construction
  - Can change attributed to activities be detected statistically?
  - Other influences (e.g. oceanographic conditions, mobile species, seasonal variability, quotas, market)
- Decoupled from BACI
  - Behavioral responses
  - Responses to environmental conditions

Targeted monitoring / behavioural responses

Regional collaborative monitoring & research

- Sharing resources, avoiding duplication and dilution
- Behavioral responses
- Environmental responses
- Informing future developments EIAs
- Mitigation and relationships



Courtesy Sound and Marine Life, 2019

- Sound and Marine Life
- OWSMRF
- ORJIP Bird Collision Avoidance, Acoustic Deterrent Devices, Pile Driving and Fish
- ScoMer
- JNCC Tagging Study of Red Throated Diver (Loons)

Courtesy West of Morecambe Bay Fund, 2015

- DEPONS
- Joint Industry Marine Mammal Surveys
- Morecambe Bay Fund – Lobster study
- ROSA
- Flamborough and Filey Monitoring Group

LUNCH

OFFSHORE WIND OPERATIONS

- **John O'Keeffe, Head of Marine Affairs U.S., Orsted U.S. Offshore Wind**

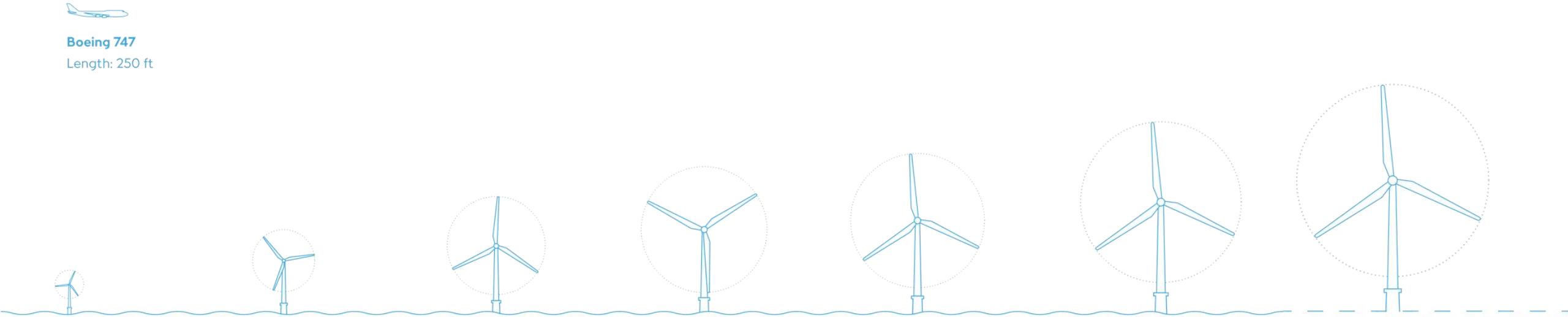
Offshore Wind Operations

ØRSTED U.S. OFFSHORE WIND

JOHN O'KEEFFE
OCTOBER 2019

Ørsted

Rapid advances in offshore turbine technology



Boeing 747
Length: 250 ft

Vindeby
Year: 1991
Diameter: 115 ft
Tower Height: 115 ft
Capacity: 0.45 MW

Middelgrunden
Year: 2001
Diameter: 250 ft
Tower Height: 210 ft
Capacity: 2.00 MW

Anholt
Year: 2013
Diameter: 392 ft
Tower Height: 268 ft
Capacity: 3.60 MW

Anholt
Year: 2013
Diameter: 394 ft
Tower Height: 270 ft
Capacity: 3.60 MW

Block Island Wind Farm
Year: 2016
Diameter: 505 ft
Tower Height: 335 ft
Capacity: 6.00 MW

Burbo Bank Extension
Year: 2017
Diameter: 538 ft
Tower Height: 370 ft
Capacity: 8.00 MW

Year: 2022
Diameter: 722 ft
Tower Height: 502 ft
Capacity: 12.00 MW*

Investing in American port infrastructure

Rhode Island

- Two ports: ProvPort and Quonset
- Investing $40 million in upgrades
- Construction, fabrication, and operations for multiple projects

New London

- Investing $22.5 million in upgrades
- Committing an additional $35 million in new capital expenditures for State Pier infrastructure improvements
- Supporting construction for regional projects

Baltimore

- Former Bethlehem Steel site is an excellent heavy construction facility
- Investing $38 million in fabrication and port upgrades
  - $13.2 million invested at Tradepoint Atlantic
- Serving the Skipjack Wind Farm project

Long Island

- Constructing a new Operations and Maintenance (O&M) hub in the greater Port Jefferson area
- Creating up to 100 permanent full-time jobs and economic investment for Long Island
- Will be used to dock our Service Operation Vessel

Operations in the U.S.

Ørsted

30 MW project

17,000 homes

First in the nation

Ørsted

Operations and Maintenance (O&M) facility – Quonset, Rhode Island

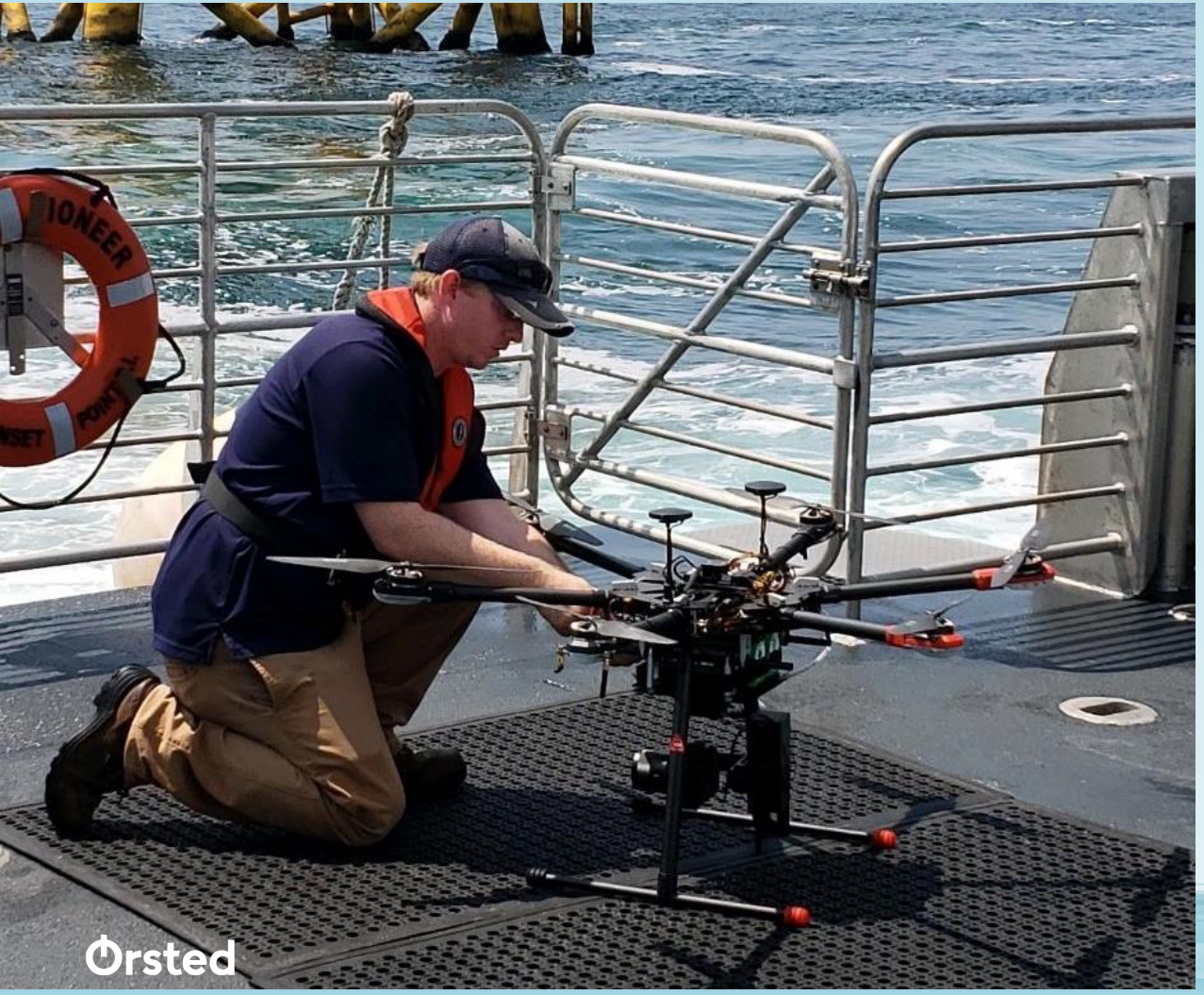
Crew Transport Vessel (CTV) Built in Rhode Island

The crew transfer vessel is a 70’ catamaran with a tier 3 engine and custom bow to safety and efficiently transport workers from the Quonset to the Block Island Wind Farm

CTV transfer – Block Island, Rhode Island

Helicopter transfer – Block Island, Rhode Island

Foundation inspections



Blade inspections

Operations in Europe

Ørsted

659 MW project

600,000 homes

Largest in the world

Ørsted

O&M facility – Grimsby, United Kingdom

CTV – Grimsby, United Kingdom

Ørsted

Bridge transfer – Grimsby, United Kingdom

Bridge transfer – Grimsby, United Kingdom

Scaling a turbine

Inside a turbine

Q&A

JOHN O'KEEFFE
HEAD OF MARINE AFFAIRS, U.S.
JOHNO@ORSTED.COM

Ørsted

Thanks & Next Steps