ROSA Advisory Council Meeting

October 28, 2022

Agenda

12:00	Welcome, Introductions, Agenda Review
12:10	ROSA Tracking of Ongoing Science, Regional Priorities and Gaps
12:35	Follow-Up on Fisheries Resource Data Production, Storage, and Accessibility
1:00	A Regional Monitoring Network and Considerations for Fisheries
1:40	Updates from ROSA and AC Members
1:55	Summary of Meeting Outcomes and Next Steps
2:00	Adjourn

ROSA

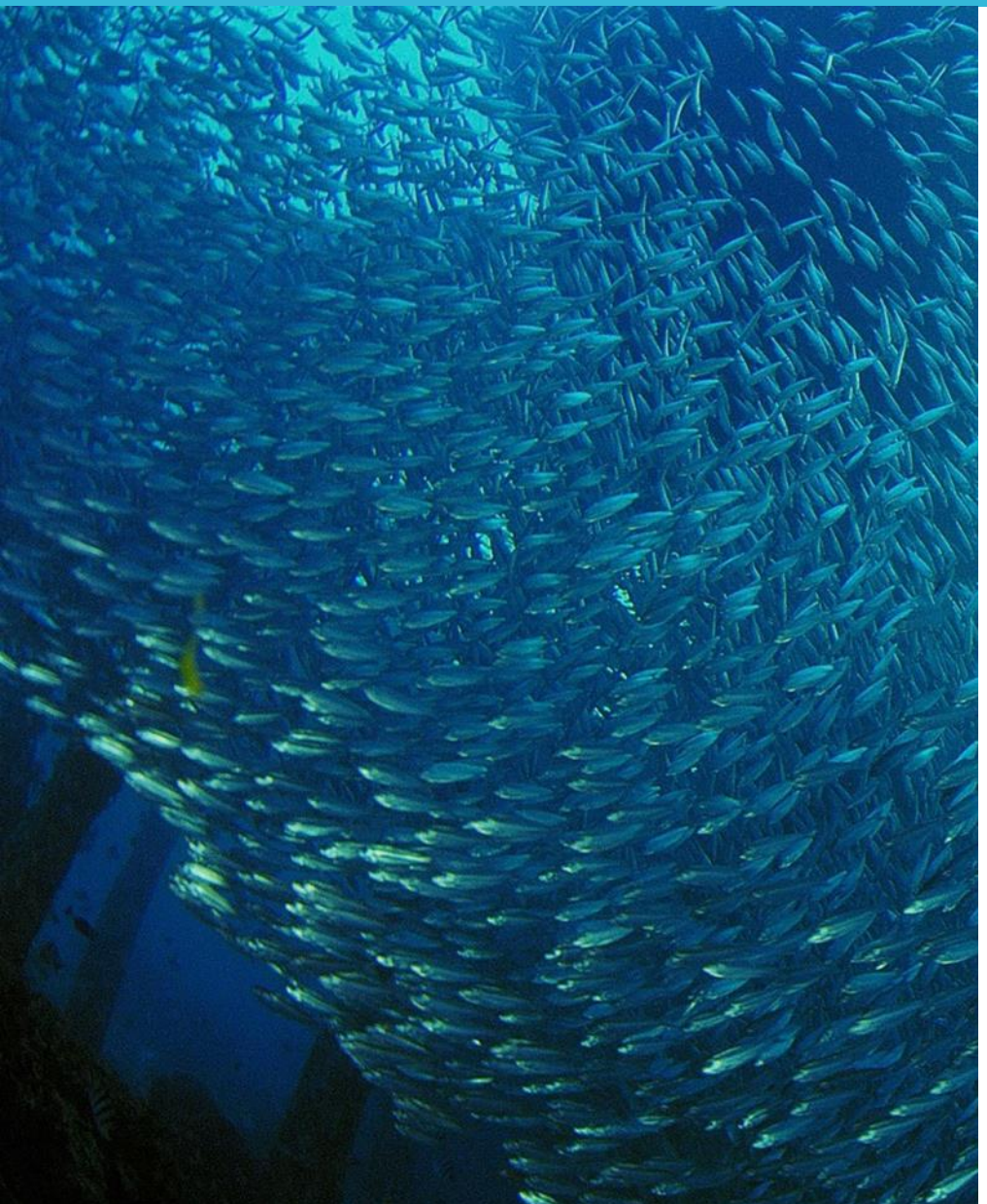
ROSA Tracking of Ongoing Science, Regional Priorities and Gaps

Regional Research Framework

- Many good and thoughtful research needs have already been identified through various efforts such as state, federal, or sector-based workshops and reports
- However, there is no shared framework or understanding of cross-sector priorities that could help focus existing resources
- Several large state/developer funds are being established that are seeking to at least be informed by region-wide priorities
  - **$10,000/megawatt (~$50 million)** for regional research and monitoring for wildlife and fish/fisheries in latest procurement agreements in NY and NJ
  - Additional funding anticipated through future procurement agreements in NY and NJ and possibly other states
- Objective, transparent processes are needed to help focus resources and research efforts in a coordinated way

ROSA

Regional Framework

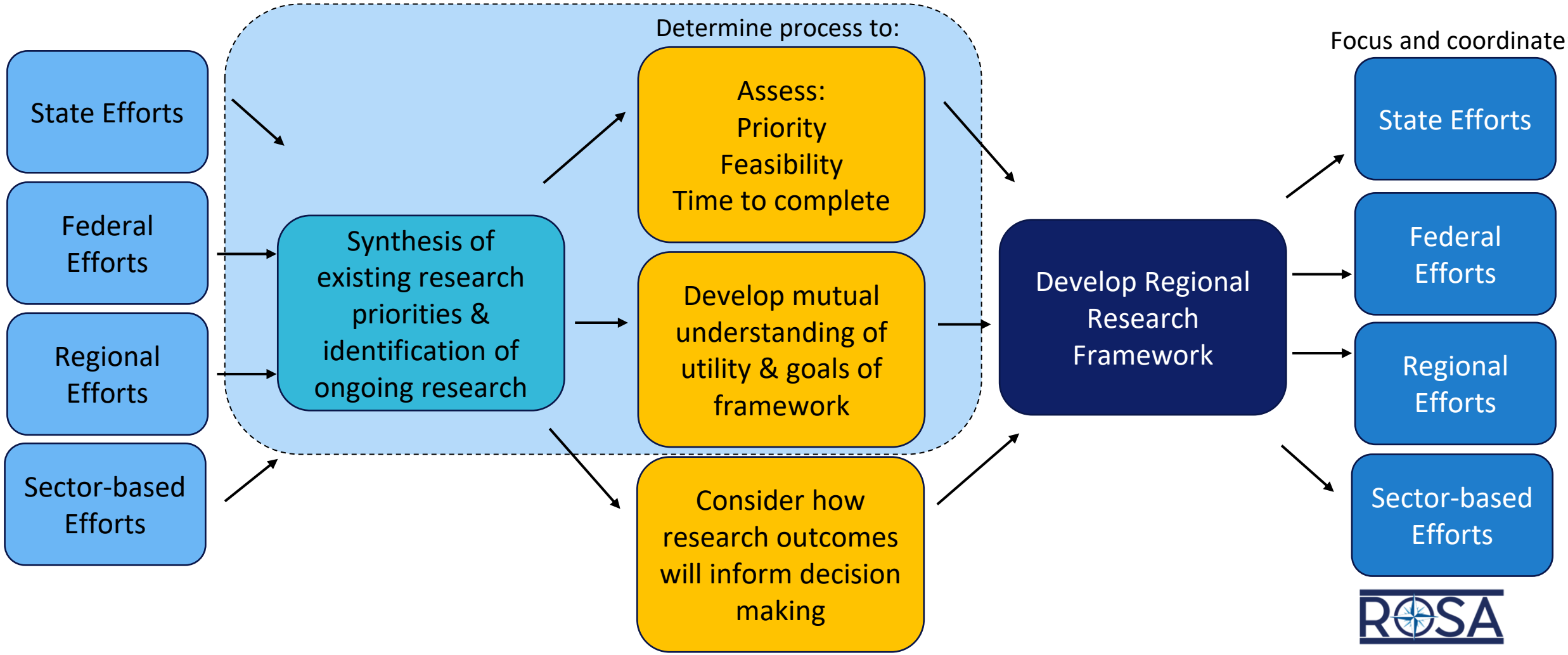


- **Overview**: Identified as priority after the March 2021 AC meeting and developed further at June 2021 AC meeting.

- **Progress to date:**
  - Committee met several times throughout 2021 and early 2022 to scope potential goals and needs
  - Feedback from committee and Advisory Council helped frame next steps
    - Creating a single, universal set of priorities is difficult, priorities may vary by region, sector, funding source, etc.
    - Identified immediate need for synthesis of research needs, ongoing research, and gap analysis
  - ROSA staff coordinated with RWSC, NY E-TWG, and others to identify possible avenues for coordination (e.g., prioritization criteria workshop July 2022)
  - Database project began summer 2022, building upon previous work by ROSA and others

Regional Research Framework

Many efforts have identified research gaps and needs. What's missing is a Choice-Making process to refine, hone and prioritize these topics



Fish FORWRD:
Fish & Fisheries OffshoRe Wind Research Database

Noelle Mathies & Kathleen Marean

WSP Core Project Team

Noelle Mathies

Marine Biology Consultant

- 8+ years of experience in threatened and endangered species tracking, fisheries surveys, cable routing, spatial planning, and feasibility for offshore projects
- Multiple desktop and field projects for offshore wind development projects in NJ, NY, RI, MA, etc.

Kathleen Marean

Senior Environmental Consultant

- 8+ years of experience in cable routing, spatial planning, and feasibility for offshore projects
- Well-versed in and has written applicable permits
- Multiple desktop and field projects for offshore wind development projects in NJ, NY, etc.

Fish FORWRD Goals

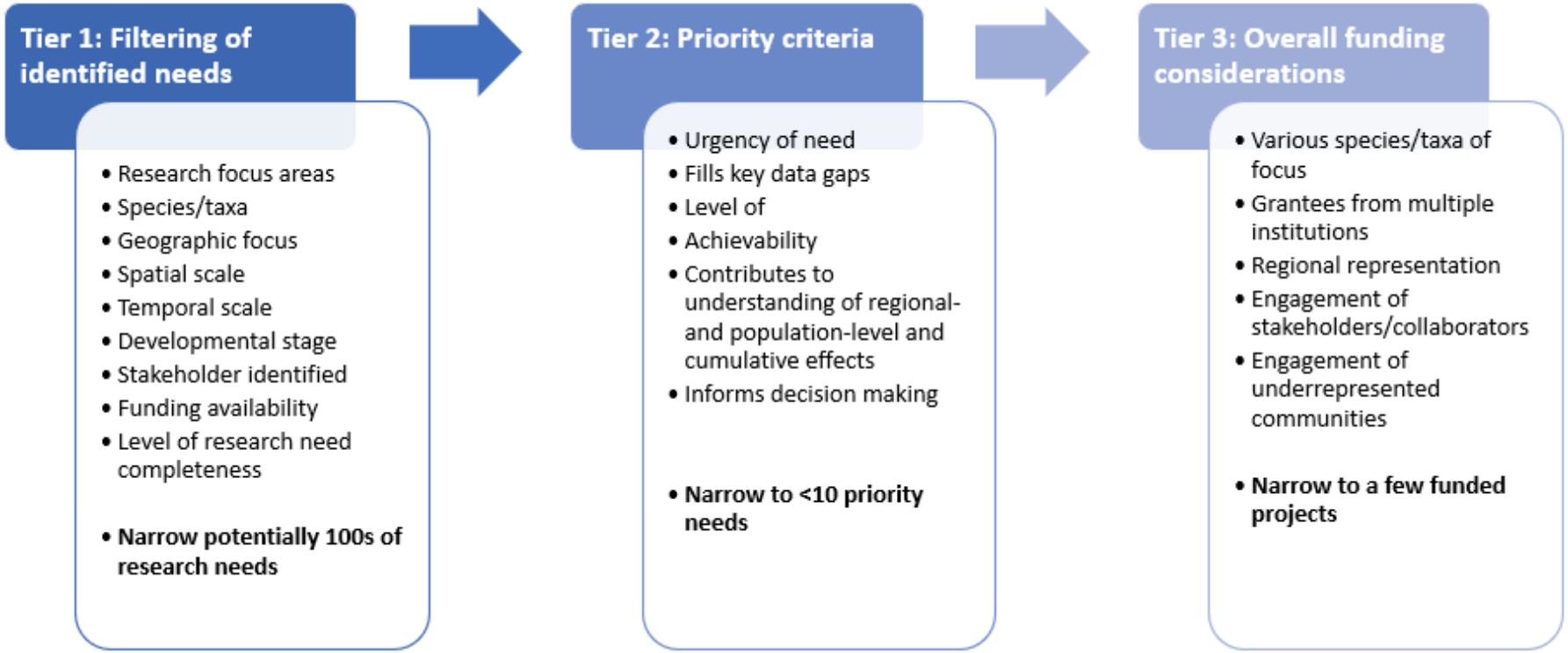
Find and catalog existing research (2017-present) relating to offshore wind impacts on fish and/or fisheries

Collate identified research needs for fish and fisheries relating to offshore wind from a range of sources (e.g., state, federal, management councils, eNGOs, academia)

Provide criteria with which to filter and narrow down research needs to fit users purpose of project identification at various scales

Spreadsheet Contents: Tabs

- Overview
- Existing Research Projects
- Identified Research Needs
- References
-
-
-



Sources

CFRF COMMERCIAL FISHERIES RESEARCH FOUNDATION

New England Fishery Management Council

UNIVERSITY OF RHODE ISLAND HOPE 1892

Commonwealth of Massachusetts DIVISION of MARINE FISHERIES

SEER U.S. OFFSHORE WIND SYNTHESIS OF ENVIRONMENTAL EFFECTS RESEARCH

ASA ACOUSTICAL SOCIETY OF AMERICA

VIMS | WILLIAM & MARY VIRGINIA INSTITUTE OF MARINE SCIENCE

UNIVERSITY OF MARYLAND 18 56

RODA

RWSC Regional Wildlife Science Collaborative for Offshore Wind

NOAA FISHERIES

NOAA

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

ROSA

NOAA

Sea Grant

New York State Fisheries Technical Working Group

Sea Grant NJ Sea Grant Consortium

BOEM Bureau of Ocean Energy Management

STONY BROOK ESTABLISHED STATE UNIVERSITY OF NEW YORK 1957

MONMOUTH UNIVERSITY NEW JERSEY 1933

LAWRENCE UNIVERSITY LIGHT! MORE LIGHT! 1847 VERITAS EST LUX

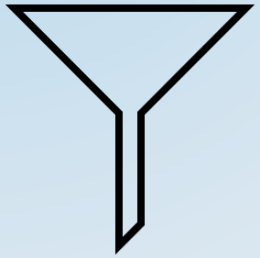
wsp

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Woods Hole Sea Grant

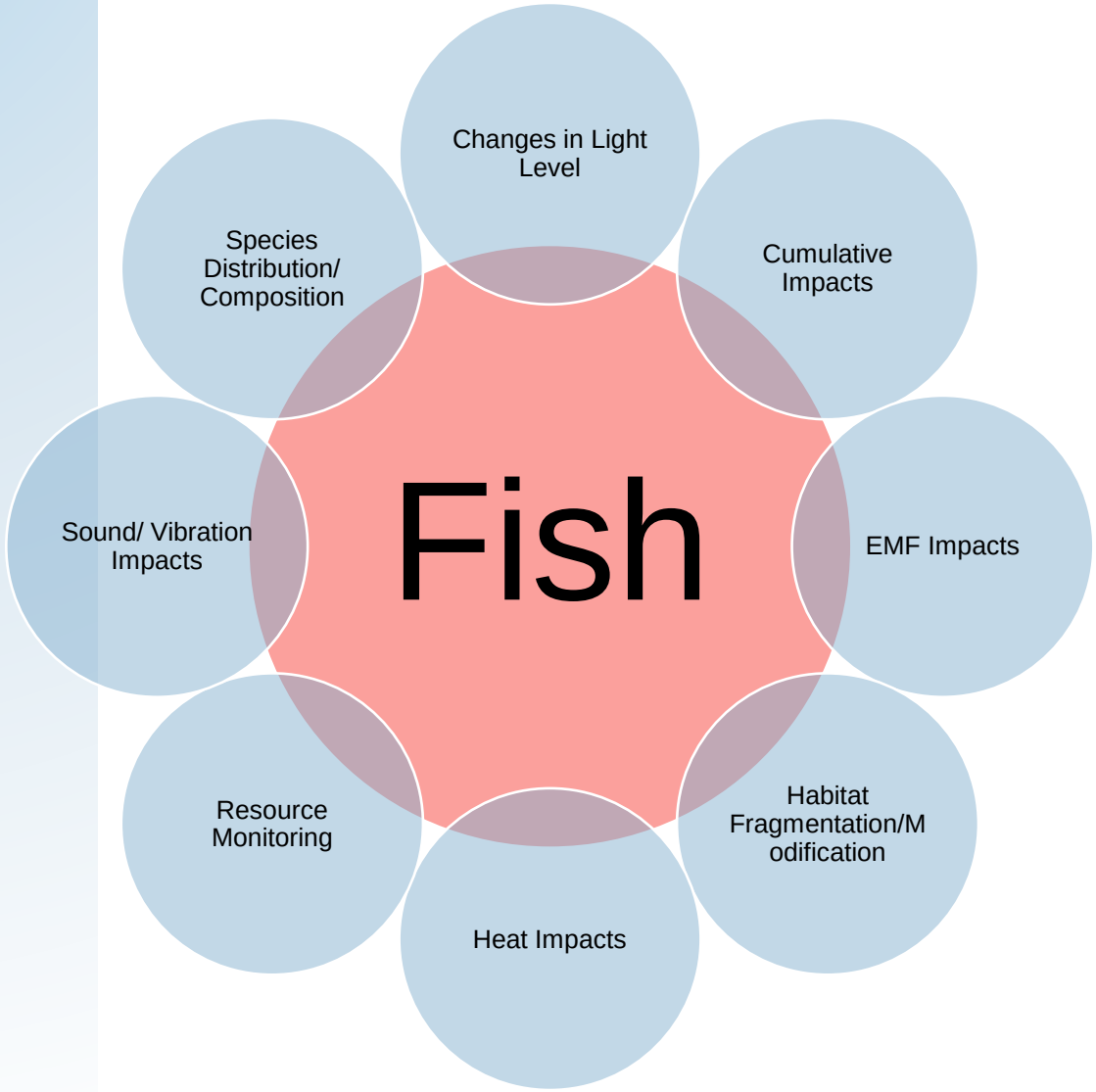
RUTGERS THE STATE UNIVERSITY OF NEW JERSEY 1766 ILLUSTRA SOL OCCIDENTEM ET LUSITANIAE

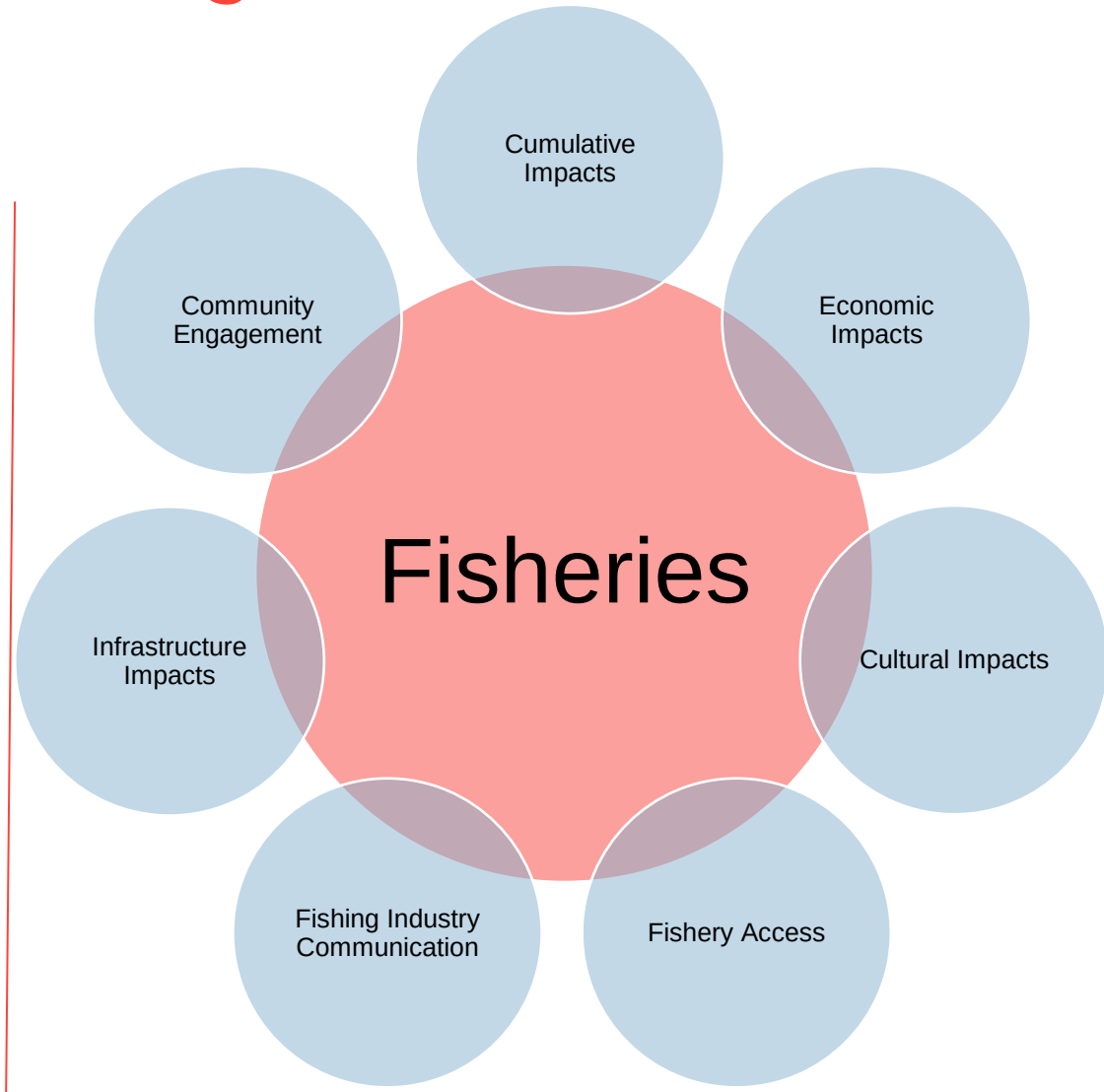
Spreadsheet Contents: Columns/Sorting Priorities



- Unique ID # (projects and needs)
- Parent Node Research Category
- Identified Research Need
- Source
- Fixed vs Floating
- Project Development Phase
- Spatial Scale
- Location
- Temporal Scale
- Animal Group (e.g., pelagic, demersal, shellfish, invertebrates, plankton, highly migratory species)

Identified Research Need Categories





Spreadsheet Contents: Data Gap Analysis

Research Needs	Distribution	Sound	Heat / EMF	Habitat	Light	Resource Monitoring	Cumulative	Access	Economic /Infrastructure	Engagement/ Communication	Cultural
Fish								---	---	---	---
Fisheries					---	---					

 = existing research project (s) addressing need

Pivot Tables: Subject

Count of Data Gap Analysis Score	Column Labels				
Row Labels	Fully Addressed	Not Addressed	Partially Addressed	(blank)	Grand Total
Fish		81	57		138
EMF Impacts		14	10		24
Fishery Access		1			1
Habitat Fragmentation/Modification		30	15		45
Other		1	1		2
Resource Monitoring		6	6		12
Sound/Vibration Impacts		7	2		9
Species Distribution/Composition		20	23		43
Cumulative Impacts		1			1
Heat Impacts		1			1
Fisheries	1	25	30		56
Economic Impact			6		6
EMF Impacts		1	2		3
Fishery Access		7	9		16
Fishing Industry Communication		1	1		2
Habitat Fragmentation/Modification		3	1		4
Other		2			2
Resource Monitoring			2		2
Sound/Vibration Impacts	1	1	8		10
Species Distribution/Composition		1	1		2
Community Engagement		1			1
Cumulative Impacts		2			2
Infrastructure Impacts		6			6
Other		22	10		32
Habitat Fragmentation/Modification		14	1		15
Resource Monitoring			1		1
Sound/Vibration Impacts		3	1		4
Species Distribution/Composition		1	2		3
Changes in Light Level		1			1
Cumulative Impacts		3	5		8
Grand Total	1	128	97		226

Pivot Tables: Subject

Count of Data Gap Analysis Score	Column Labels				
Row Labels	Fully Addressed	Not Addressed	Partially Addressed	(blank)	Grand Total
Fish		81	57		138
EMF Impacts		14	10		24
Fishery Access		1			1
Null		1			1
RN-210		1			1
Habitat Fragmentation/Modification		30	15		45
Other		1	1		2
Resource Monitoring		6	6		12
Sound/Vibration Impacts		7	2		9
Species Distribution/Composition		20	23		43
Cumulative Impacts		1			1
Heat Impacts		1			1
Fisheries	1	25	30		56
Economic Impact			6		6
EMF Impacts		1	2		3
Fishery Access		7	9		16
Economic Impact			1		1
RN-35			1		1
Fishing Industry Communication			1		1
RN-36			1		1
Habitat Fragmentation/Modification		1	1		2
RN-37			1		1
RN-38		1			1
Null		6	6		12
RN-27			1		1
RN-39		1			1
RN-40		1			1
RN-41			1		1
RN-42			1		1
RN-43		1			1
RN-44			1		1
RN-45			1		1
RN-46		1			1
RN-47			1		1
RN-48		1			1
RN-49		1			1
Fishing Industry Communication		1	1		2
Habitat Fragmentation/Modification		3	1		4

Pivot Tables: Scale

Row Labels	Fully Addressed	Not Addressed	Partially Addressed	(blank)	Grand Total
Changes in Light Level		1			1
Offshore Wind Project		1			1
Community Engagement		1			1
Offshore Wind Project		1			1
Cumulative Impacts		6	5		11
National		1			1
Offshore Wind Project			1		1
Regional		4	4		8
State		1			1
Economic Impact			6		6
Offshore Wind Project			5		5
Regional			1		1
EMF Impacts		15	12		27
Offshore Wind Project		10	9		19
Regional		4	3		7
State		1			1
Fishery Access		8	9		17
Offshore Wind Project		1	3		4
Regional		4	6		10
State		3			3
Fishing Industry Communication		1	1		2
Offshore Wind Project			1		1
Regional		1			1
Habitat Fragmentation/Modification		47	17		64
Individual Turbine		10	3		13
Offshore Wind Project		19	8		27
Regional		16	6		22
State		2			2
Heat Impacts			1		1
Offshore Wind Project			1		1
Infrastructure Impacts			6		6
Regional			6		6
Other			3	1	4
National			1		1
Offshore Wind Project			1		1
Regional			1		1
State				1	1
Resource Monitoring			6	9	15
National				1	1
Offshore Wind Project			2	1	3
Regional			4	5	9
Undetermined				2	2
Sound/Vibration Impacts	1		11	11	23
Individual Turbine			2		2
National			1	1	2
Offshore Wind Project	1		5	10	16
Regional			3		3
Species Distribution/Composition			22	26	48
Individual Turbine			1	1	2
National				3	3
Offshore Wind Project			6	7	13
Regional			11	10	21
State			4	5	9
Grand Total	1		128	97	226

Prioritization by Status of Research

Research Needs	Distribution	Sound	Heat / EMF	Habitat	Light	Resource Monitoring	Cumulative	Access	Economic /Infrastructure	Engagement/ Communication	Cultural
Fish								---	---	---	---
Fisheries					---	---					

 = existing research project(s) addressing need

= data gap

--- = not applicable

Spreadsheet Sorting Example

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Cumulative Impacts		1			1
Heat Impacts		1			1
Fisheries	1	25	30		56
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Other		2			2
Resource Monitoring			2		2
Sound/Vibration Impacts	1	1	8		10
Species Distribution/Composition		1	1		2
Community Engagement		1			1
Cumulative Impacts		2			2
Infrastructure Impacts		6			6
Other		22	10		32
Habitat Fragmentation/Modification		14	1		15
Resource Monitoring			1		1
Sound/Vibration Impacts		3	1		4
Species Distribution/Composition		1	2		3
Changes in Light Level		1			1
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EMF Impacts		1	2		3
Fishery Access		7	9		16
Economic Impact			1		1
RN-35			1		1
Fishing Industry Communication			1		1
RN-36			1		1
Habitat Fragmentation/Modification		1	1		2
RN-37			1		1
RN-38		1			1
Null		6	6		12
RN-27			1		1
RN-39		1			1
RN-40		1			1
RN-41			1		1
RN-42			1		1
RN-43		1			1
RN-44			1		1
RN-45			1		1
RN-46		1			1
RN-47			1		1
RN-48		1			1
RN-49		1			1
Fishing Industry Communication		1	1		2
Habitat Fragmentation/Modification		3	1		4

Spreadsheet Sorting Example

Research Need ID #	Research Category	Identified Research Need	Identified Research Need2	Source of Identification	Windfarm Development Stage	Spatial Scale	Location	Summary of Research Need	Existing Project Addressing Need (ID #)	Status of Research	Data Gap Analysis Score
RN-27	Fisheries	Fishery Access	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	Traffic route analysis that includes fishing vessels under all operational conditions (e.g., towing, trawling, transiting)	Ex-7, EX-35	Ex-7: ongoing Ex-35: ongoing	Partially Addressed
RN-35	Fisheries	Fishery Access	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	Technical Risk assessment focused on wind	none	none	Not Addressed
RN-36	Fisheries	Fishery Access	Habitat Fragmentation/ Modification	WH Sea Grant	All	State	MA	Sustainable fisheries and aquaculture- Studies or technologies that foster expansion of sustainable aquaculture practices in Massachusetts. Resiliency of commercial or recreational fisheries and/or aquaculture to: 1) changes in market conditions; and/or 2) stressors such as climate change, water quality, or fishing effort. 3) Diversifying aquaculture and fisheries opportunities in Massachusetts	none	none	Not Addressed
RN-37	Fish	Fishery Access	Null	MA DMF Recommend	All	State	MA	Study recreational boating effort and methods via aerial surveys (new or existing aerial surveys)	none	none	Not Addressed
RN-38	Fisheries	Fishery Access	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	Spatial operation needs for operating around turbines and within wind arrays for commercial fisheries (all gear types)	Ex-27	ongoing	Partially Addressed
RN-39	Fisheries	Fishery Access	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	Site-choice models to help predict location choice and displacement (including biological, economic, regulatory and social considerations).	none	none	Not Addressed
RN-40	Fisheries	Fishery Access	Null	NEFMC 2021	None	Offshore Wind Proj	Northeastern US	Investigate Atlantic herring fishery fleet behavior and decision-making with respect to their relationship to population dynamics, closed areas, catch rates, etc.	EX-35	ongoing	Partially Addressed
RN-41	Fisheries	Fishery Access	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	How does large scale wind development affect wind patterns and wind conditions within arrays and will/how this affects the ability of fishermen to operate.	none	none	Not Addressed
RN-42	Fisheries	Fishery Access	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	Fishing behavior studies and the perceived risk of operating within a wind area	EX-7, Ex-27	Ex-7: ongoing Ex-27: ongoing	Partially Addressed
RN-43	Fisheries	Fishery Access	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	Fishermen's perceptions of risk and assessments of operators decisions under risk uncertainty through surveys	Ex-27	ongoing	Partially Addressed
			Habitat					Evaluate the fishability of offshore windfarms (fixed or floating) and aquaculture sites, including			

1. Existing Research Projects | 2. Identified Research Needs | 3. References | 4. Definition of Terms | 5. Acronyms List | 6. Pivot Table | Column List Options

17 of 247 records found

Display Setting

Spreadsheet Sorting Example

Research Need ID #	Research Category	Identified Research Need	Identified Research Need2	Source of Identification	Windfarm Development Stage	Spatial Scale	Location	Summary of Research Need	Existing Project Addressing Need (ID #)	Status of Research	Data Gap Analysis Score
RN-35	Fisheries	Fishery Acces:	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	Technical Risk assessment focused on wind	none	none	Not Addressed
RN-36	Fisheries	Fishery Acces:	Habitat Fragmentation/ Modification	WH Sea Grant	All	State	MA	Sustainable fisheries and aquaculture- Studies or technologies that foster expansion of sustainable aquaculture practices in Massachusetts. Resiliency of commercial or recreational fisheries and/or aquaculture to: 1) changes in market conditions; and/or 2) stressors such as climate change, water quality, or fishing effort. 3) Diversifying aquaculture and fisheries opportunities in Massachusetts	none	none	Not Addressed
RN-37	Fish	Fishery Acces:	Null	MA DMF Recommend	All	State	MA	Study recreational boating effort and methods via aerial surveys (new or existing aerial surveys)	none	none	Not Addressed
RN-39	Fisheries	Fishery Acces:	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	Site-choice models to help predict location choice and displacement (including biological, economic, regulatory and social considerations).	none	none	Not Addressed
RN-41	Fisheries	Fishery Acces:	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	How does large scale wind development affect wind patterns and wind conditions within arrays and will/how this affects the ability of fishermen to operate.	none	none	Not Addressed
RN-46	Fisheries	Fishery Acces:	Null	Bachman et al. 2022	Operation/Maintenan	Offshore Wind Proj	Not specified.	Consider how turbine and offshore wind farm spacings influence the catchability of species in recreational or commercial fishing gears.	none	none	Not Addressed
RN-47	Fisheries	Fishery Acces:	Null	Silva et al. 2022	Operation/Maintenan	Regional	Not Specified	Collision risk studies with commercial fishing vessels and turbines	none	none	Not Addressed
RN-49	Fisheries	Fishery Acces:	Null	MA DMF Recommend	All	State	MA	Add observer coverage/new protocols to commercial fisheries to address specific wind farm-related questions.			Not Addressed

1. Existing Research Projects | 2. Identified Research Needs | 3. References | 4. Definition of Terms | 5. Acronyms List | 6. Pivot Table | Column List Options

8 of 247 records found

Display Setting

Spreadsheet Sorting Example

Research Need ID #	Research Category	Identified Research Need	Identified Research Need2	Source of Identification	Windfarm Development Stage	Spatial Scale	Location	Summary of Research Need	Existing Project Addressing Need (ID #)	Status of Research	Data Gap Analysis Score
RN-44	Fisheries	Fishery Access	Habitat Fragmentation/ Modification	NEFMC 2021	All	Offshore Wind Proj	Not specified	Evaluate the fishability of offshore windfarms (fixed or floating) and aquaculture sites, including related fishing displacement and how this affects spatial management of fisheries	Ex-62	Ex-62: complete	Partially Addressed
RN-46	Fisheries	Fishery Access	Null	Bachman et al. 2022	Operation/Maintenan	Offshore Wind Proj	Not specified.	Consider how turbine and offshore wind farm spacings influence the catchability of species in recreational or commercial fishing gears.	none	none	Not Addressed

1. Existing Research Projects | 2. Identified Research Needs | 3. References | 4. Definition of Terms | 5. Acronyms List | 6. Pivot Table | Column List Options

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Display Setting

Future Fish FORWRD

- Option to submit new projects
- Bi-annual updates to data gap analysis
- Support for RFP creation, mitigation fund allocation, and academic research
- Future online web-tool development

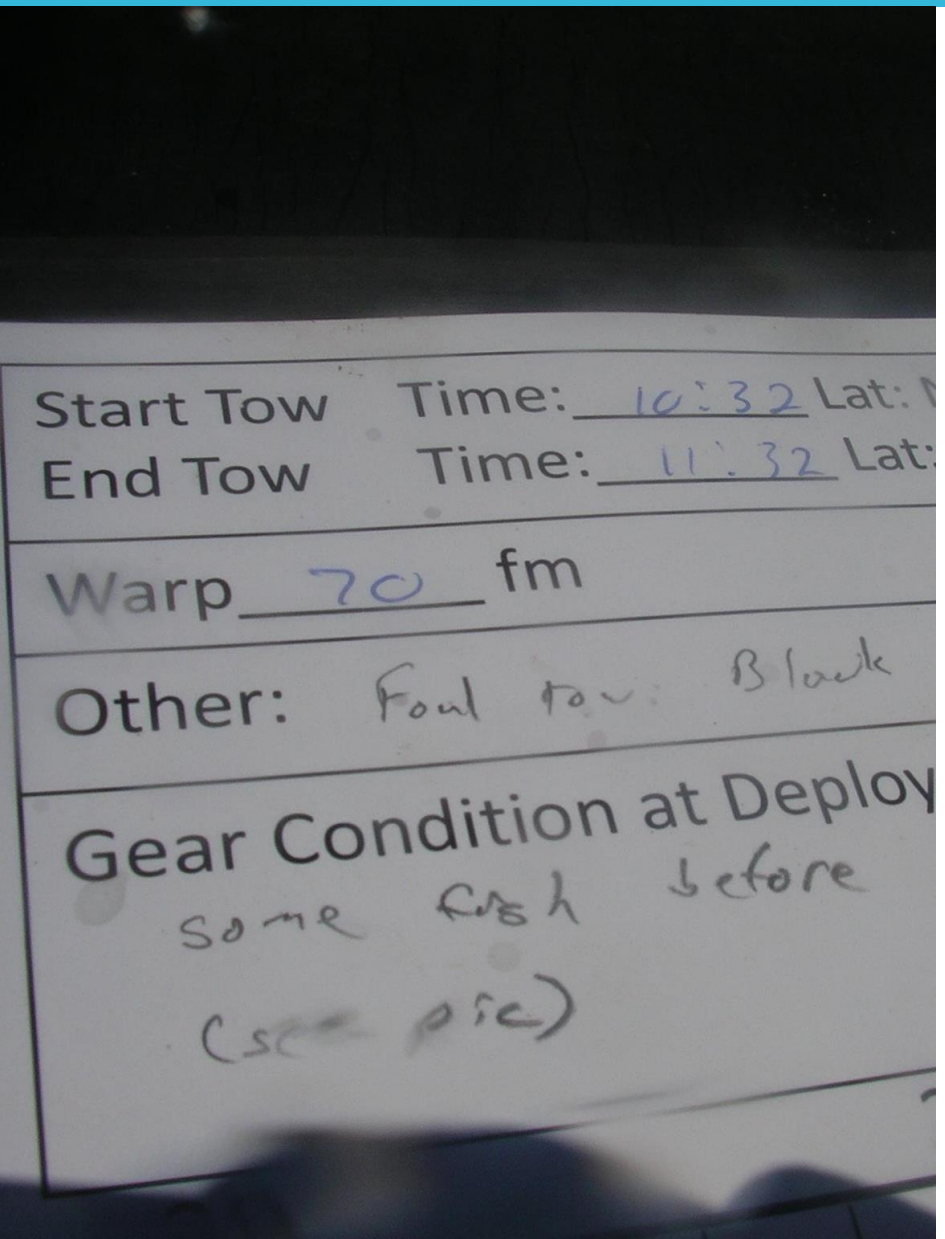
Thank you!

Questions?

wsp.com

Follow-Up on Fisheries Resource Data Production, Storage, and Accessibility

Review of data fields from different sources



- Recommendations from AC and Data Accessibility Committee to focus on data standards
- Will Shoup, ROSA intern, tasked with investigating any existing data standards relevant to offshore wind monitoring studies
- Took two tacks:
  - Investigate ACCSP, VIMS NEAMAP, and other possible sources
  - Request data from sources identified in the ROSA-RPS report on Data Accessibility, and compare common data fields
    - Definition
    - Format
    - Precision

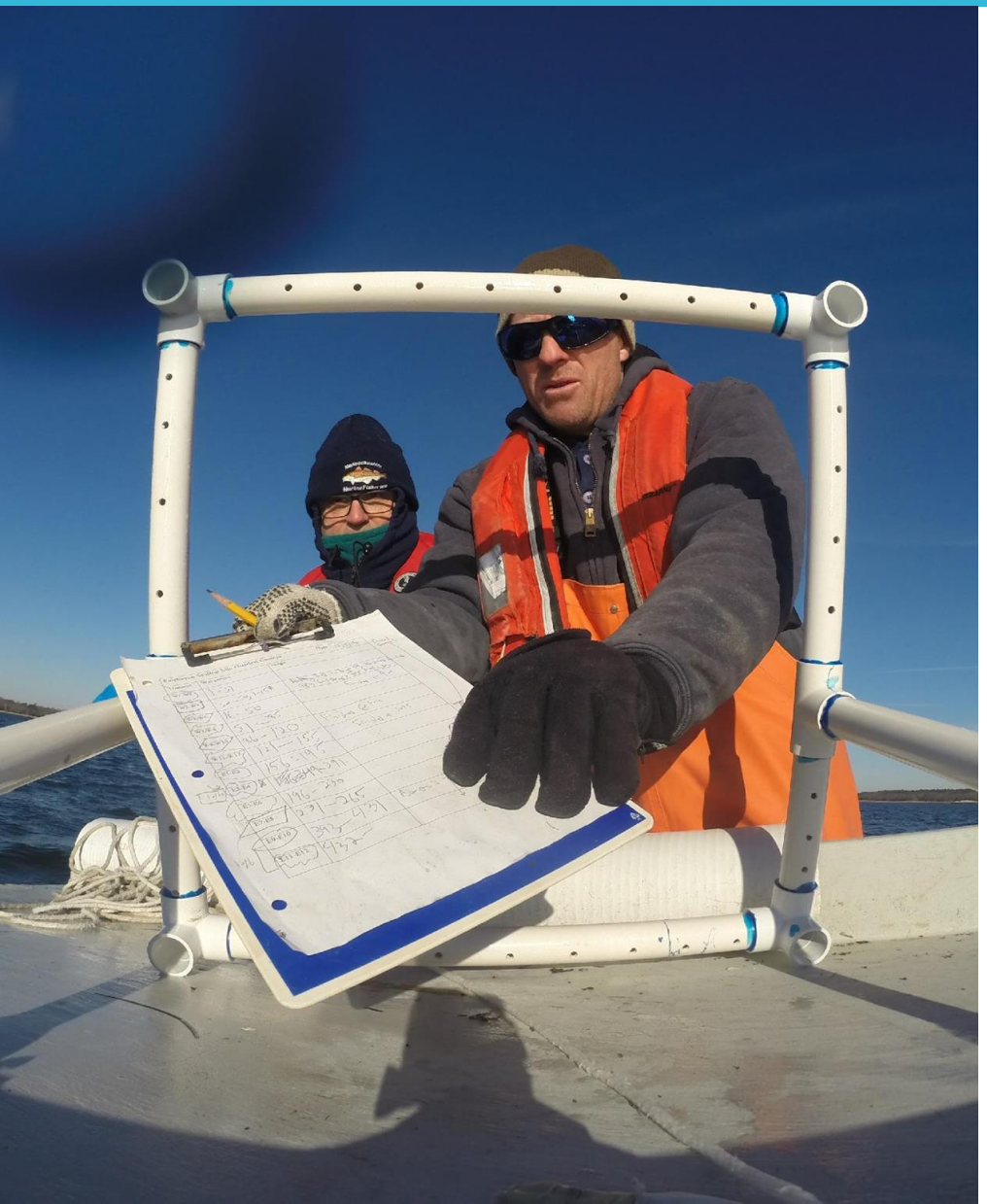
Review of data fields from different sources

- No current set of data standards easily adaptable to lease area monitoring
  - ACCSP, FIGIS (FAO), VIMS NEAMAP and others were investigated
  - ACCSP is currently fishery-dependent only and uses a variety of data formats
  - FIGIS was not applicable
  - VIMS NEAMAP is not interested in sharing data standards

Review of data fields from different sources

- Data were difficult to acquire
  - Sample data requested by email from seven surveys in the region identified in ROSA-RPS report
  - 36 emails to secure 13 trawl data related files for six of the seven
  - Up to six steps per survey (emails, phone calls, forms)
  - One survey has all data on a website
  - One email inactive
  - Most files were metadata: reports, survey history, field names and definitions, procedural documents
  - Actual data from 4 of the 7 surveys, either partial or complete data sets

Review of data fields from different sources



- Data standards differed a great deal between surveys
  - Date
    - 2 use the same format (m/d/yyyy); 1 used a similar one (mm/dd/yyyy) (possibly)
    - One used yyyymmdd (e.g., 19980820)
    - One used three different columns (year, month, day; m, d, yyyy)
  - Position
    - None recorded in the same way
      - Three use DDM, but formatted in 3 different ways
        - 41°34.5’ N; 4135; 4134.525
      - Two use DD but formatted in 2 different ways
        - 41.722218; 4172218

Review of data fields from different sources

- Species codes
  - Two surveys use ITIS codes (e.g., 172435)
  - One also uses own 1-4 digit code
  - NEFSC Bottom Trawl Survey code (2-3 digits)
  - List of common names (no code)
- Lengths
  - Most record total length in cm
    - Two identified fork or total length depending on tail
    - Two measure in mm
    - Two mention rounding to nearest cm

Review of data fields from different sources

- No existing accessible set of standards
- Access to public data is time-consuming
- No *ad hoc* standards
  - Merging some fields is possible but time-consuming
  - Other fields may be impossible to merge
- Metadata was more useful than the data

Review of data fields from different sources

- In what ways should ROSA help standardize data?
  - Encourage BOEM to convene fish workshops to set standards with ROSA as co-sponsor
  - Collaborate across disciplines (e.g., wildlife, ocean observing, engineering) with the UK Marine Data Exchange.
  - Draft a template developer data accessibility agreement
  - Pursue a pilot for two OSW monitoring projects to combine data
  - Continue dialogue with NOAA and ACCSP on their standards setting work
  - Other

A Regional Monitoring Network and Considerations for Fisheries

NERACOOS

NORTHEASTERN REGIONAL ASSOCIATION OF COASTAL OCEAN OBSERVING SYSTEMS

Designing a Buoy Array to Support Sustainable Development of Offshore Wind Energy

Jake Kritzer*, Katy Bland, Tom Shyka, Jackie Motyka

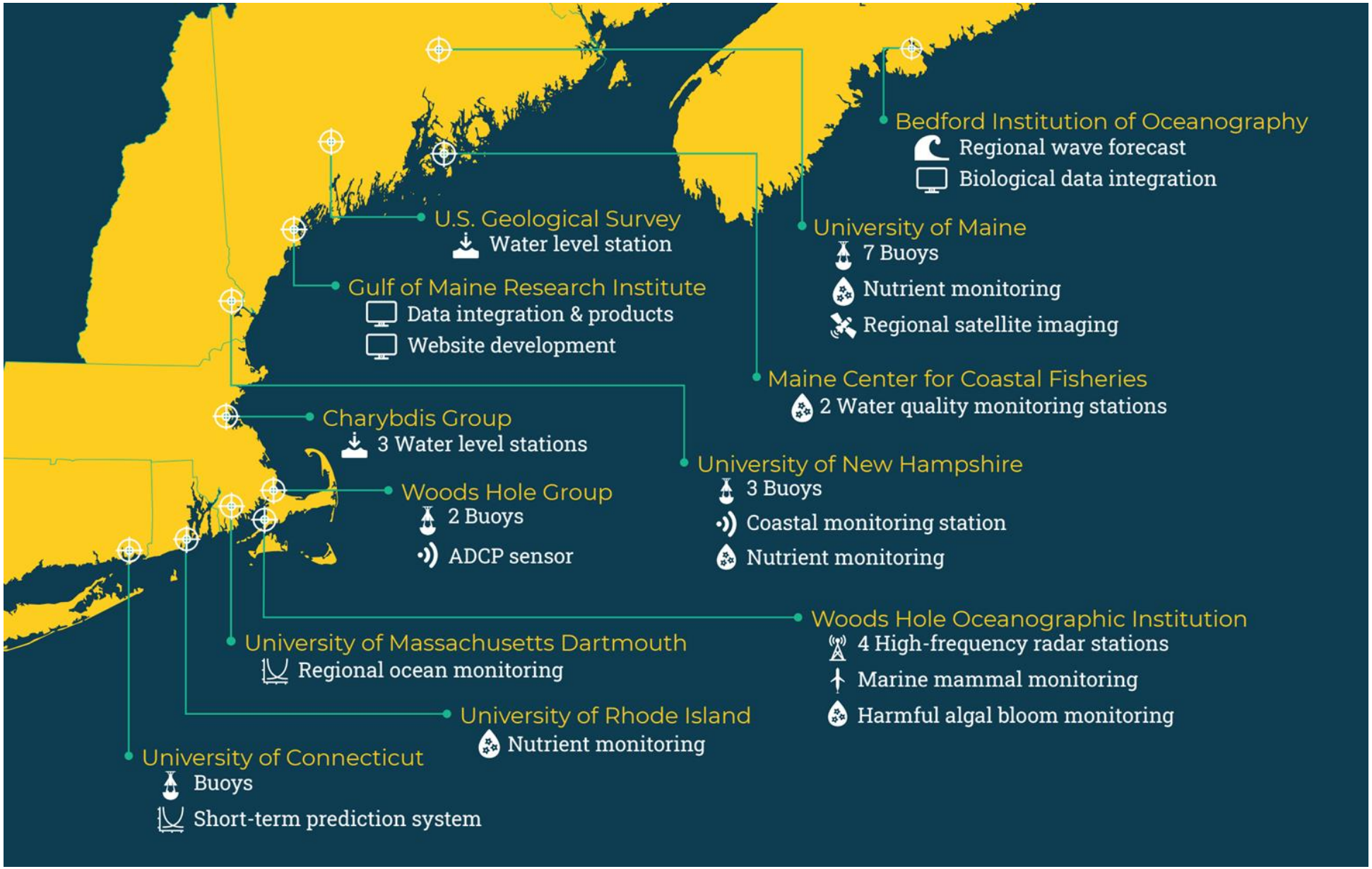
Responsible Offshore Science Alliance
Advisory Council
October 28, 2022

Objective

- Design a buoy array that will help to address five priority issues associated with development of offshore wind energy:
  - Mariner Safety
  - Pollutants and Contaminants
  - Climate Signals
  - **Fisheries Management Guidance & collaboration with ROSA**
  - Wildlife Conservation Guidance & collaboration with RWSC
- Buoys have unique value in sustained and continuous collection of a wide variety of data that would be freely accessible to meet multiple needs concurrently.
- Not intended to meet all needs! Complementary sustained observing tools (radar, gliders, satellites, etc.) plus targeted and time-limited research and monitoring remain important.

U.S. Integrated Ocean Observing System (IOOS)

- 11 regions
- 17 federal partners
- 34 core variables
- Buoys, gliders, HFR, satellites, ship-based surveys, coastal stations, etc.
- Variety of models
- Federally-certified data management


Bedford Institution of Oceanography
Regional wave forecast
Biological data integration
U.S. Geological Survey
Water level station
University of Maine
7 Buoys
Nutrient monitoring
Regional satellite imaging
Gulf of Maine Research Institute
Data integration & products
Website development
Maine Center for Coastal Fisheries
2 Water quality monitoring stations
Charybdis Group
3 Water level stations
University of New Hampshire
3 Buoys
Coastal monitoring station
Nutrient monitoring
Woods Hole Group
2 Buoys
ADCP sensor
Woods Hole Oceanographic Institution
4 High-frequency radar stations
Marine mammal monitoring
Harmful algal bloom monitoring
University of Massachusetts Dartmouth
Regional ocean monitoring
University of Rhode Island
Nutrient monitoring
University of Connecticut
Buoys
Short-term prediction system

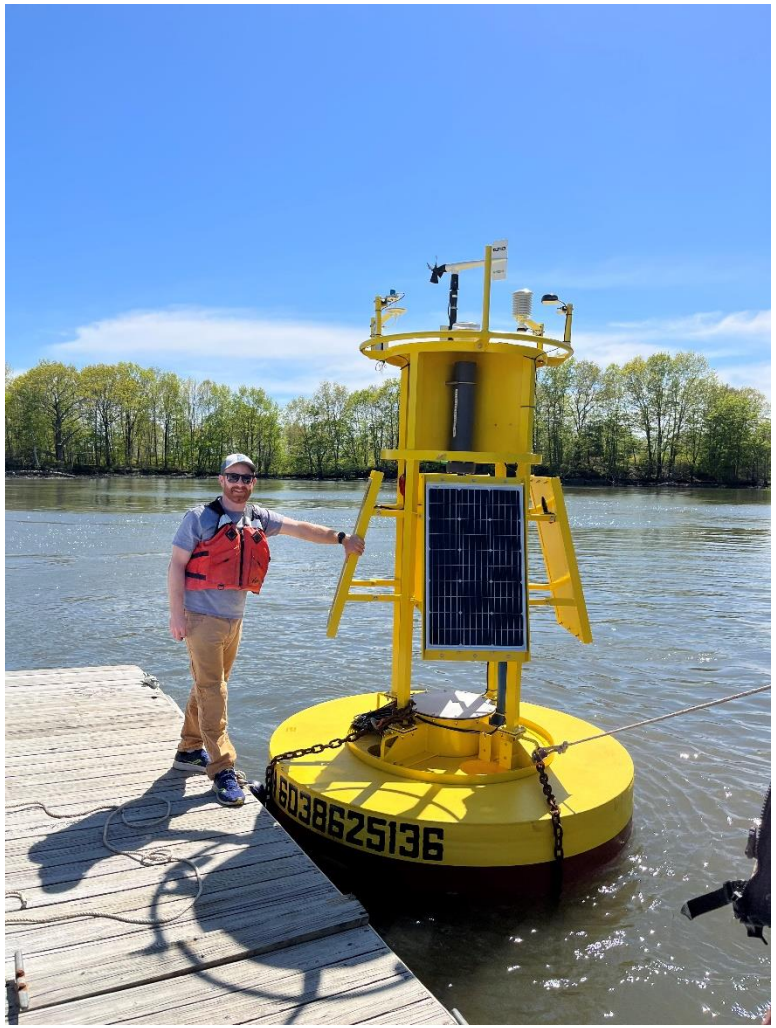
Private Sector Users

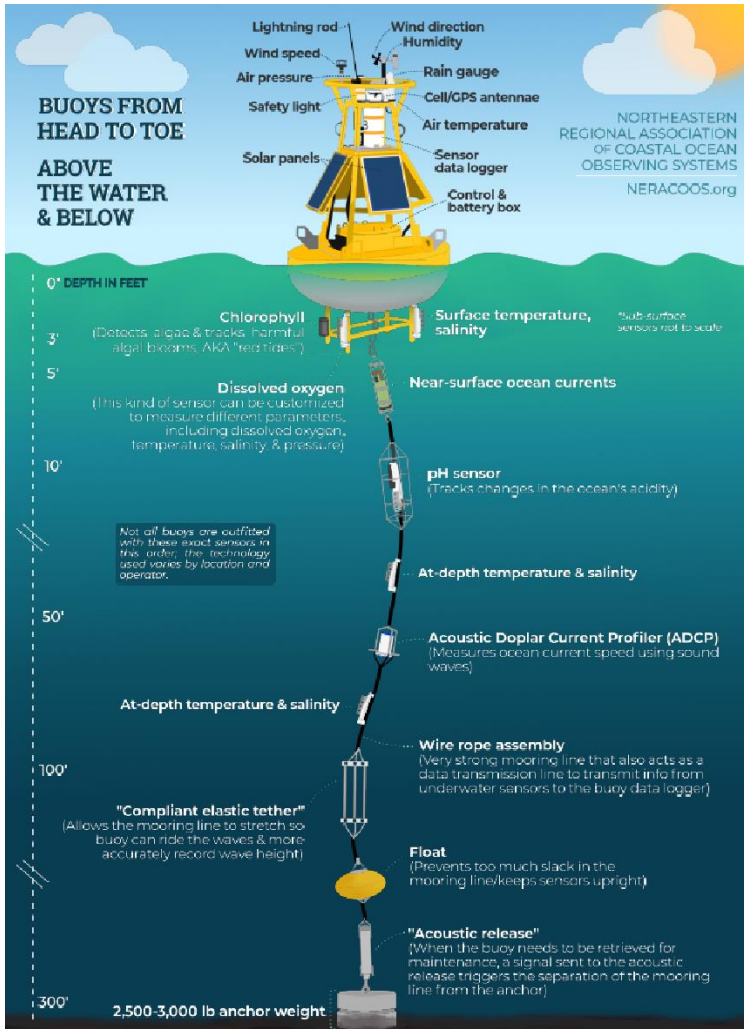
	Fishing	Shipping	Aquaculture	Recreational Guiding	Consulting	Oil and Gas	Renewable Energy	Insurance	Value Added Data	Other
AOOS	50.0%	7.1%	0.0%	7.1%	21.4%	14.3%	0.0%	0.0%	0.0%	0.0%
CARICOOS	3.9%	7.7%	0.0%	38.5%	15.4%	0.0%	7.7%	7.7%	0.0%	19.2%
CenCOOS	8.3%	0.0%	8.3%	8.3%	16.7%	8.3%	8.3%	0.0%	8.3%	33.3%
GCOOS	0.0%	0.0%	0.0%	25.0%	25.0%	0.0%	0.0%	0.0%	0.0%	50.0%
GLOS	5.0%	6.7%	5.0%	36.7%	10.0%	3.3%	3.3%	1.7%	0.0%	28.3%
NERACOOS	**35.6%**	**6.7%**	**6.7%**	**15.6%**	**8.9%**	**2.2%**	**0.0%**	**0.0%**	**8.9%**	**15.6%**
PacIOOS	7.1%	7.1%	0.0%	25.0%	21.4%	3.6%	7.1%	0.0%	0.0%	28.6%
SCCOOS	25.0%	0.0%	0.0%	0.0%	50.0%	25.0%	0.0%	0.0%	0.0%	0.0%
SECOORA	0.0%	7.1%	7.1%	0.0%	42.9%	0.0%	7.1%	0.0%	7.1%	28.6%

Types of Information Accessed

	Current Conditions	Forecast Conditions	Historical Data	Administrative Information	Resource Use
AOOS	37.6%	15.1%	28.2%	3.4%	8.7%
CARICOOS	51.5%	32.2%	7.4%	2.9%	3.1%
CenCOOS	49.5%	15.9%	19.5%	3.6%	2.0%
GCOOS	47.2%	12.5%	18.0%	6.7%	4.8%
GLOS	75.3%	15.6%	4.0%	0.7%	1.8%
NERACOOS	**59.1%**	**16.1%**	**20.2%**	**0.8%**	**1.9%**
PacIOOS	56.6%	33.2%	6.8%	0.9%	1.0%
SCCOOS	41.2%	15.4%	30.0%	2.3%	4.8%
SECOORA	44.7%	15.1%	20.7%	3.5%	4.9%

A Closer Look at Observing Buoys





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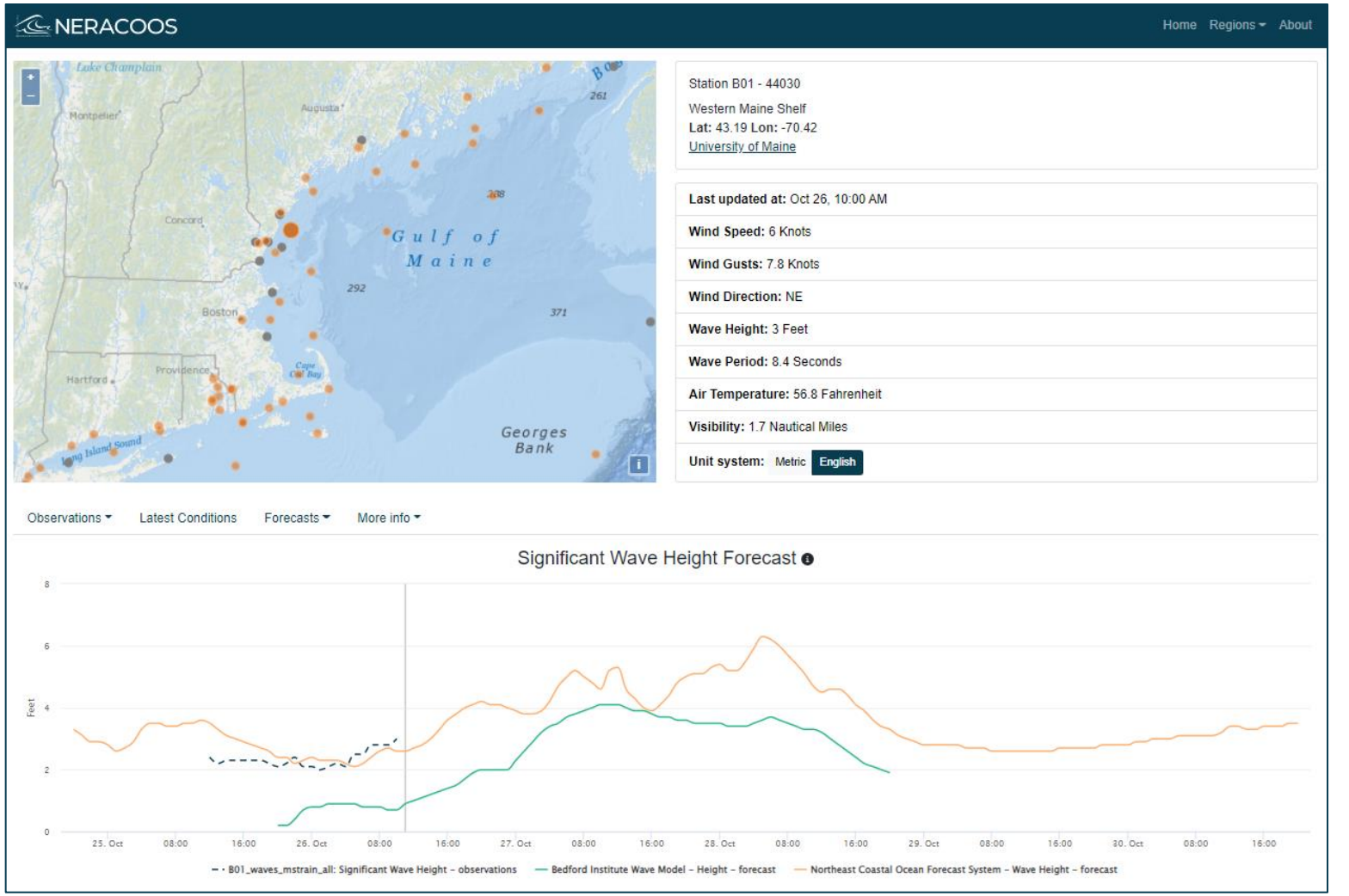
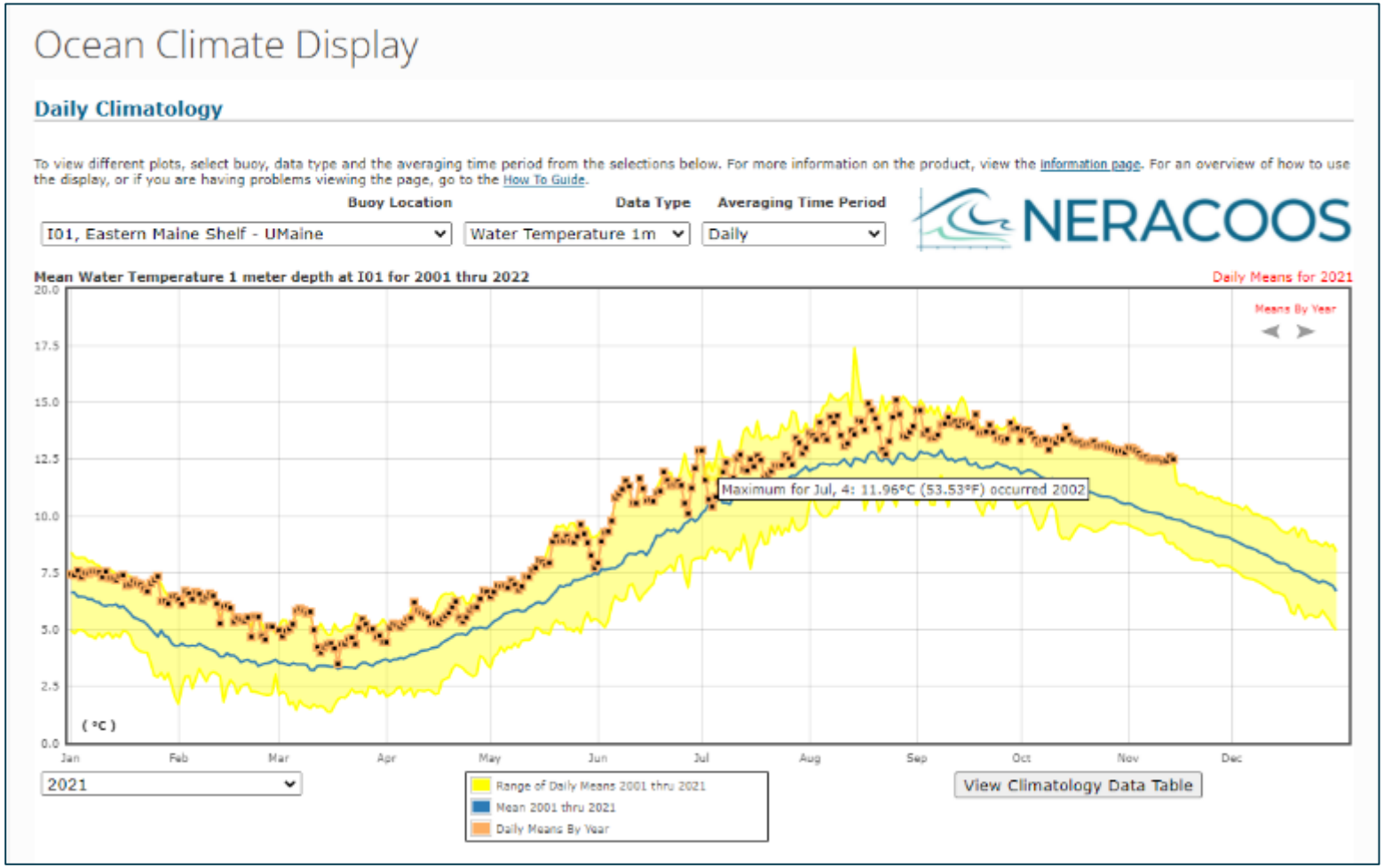
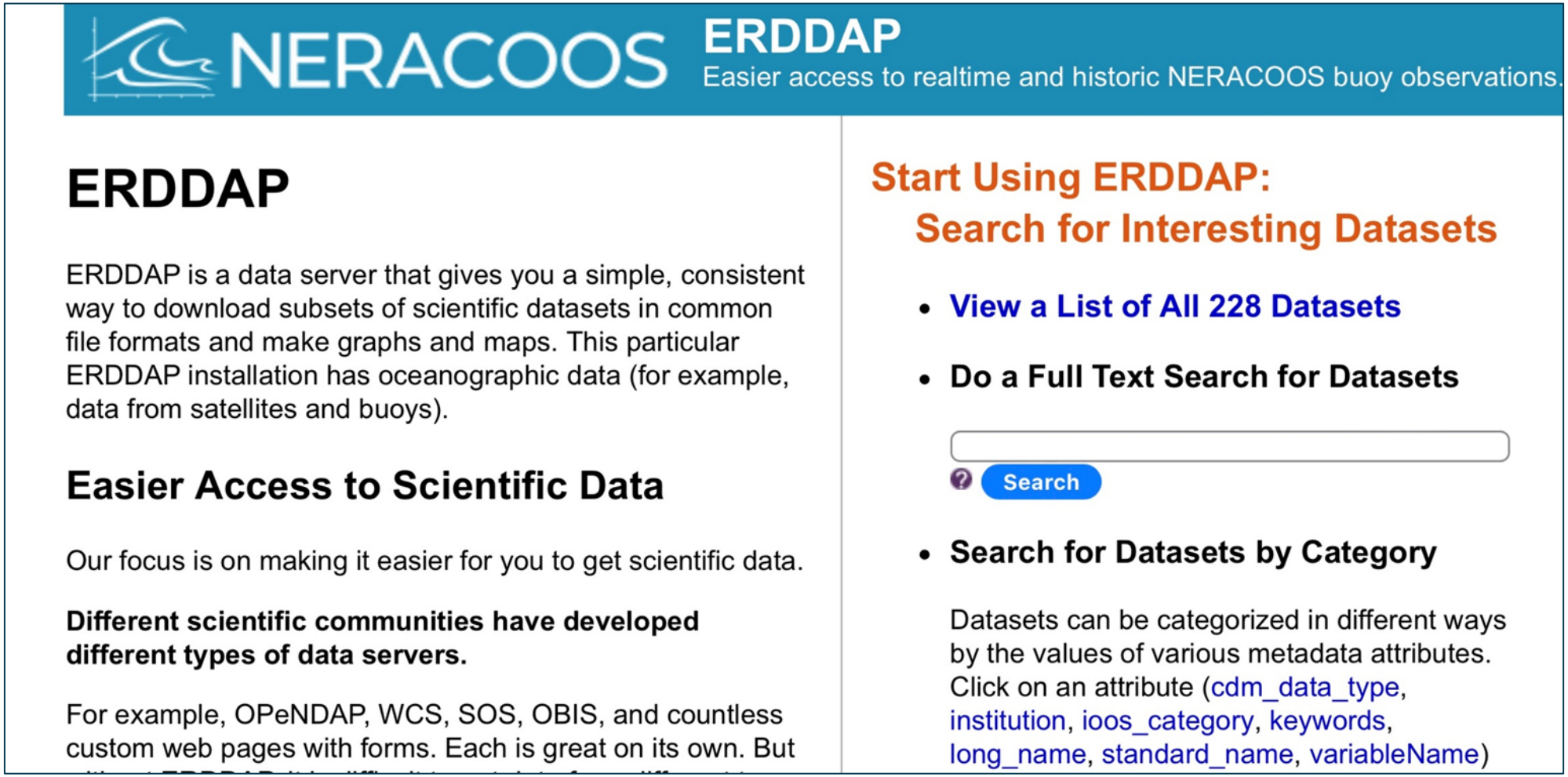
Real-Time Data & Forecasts



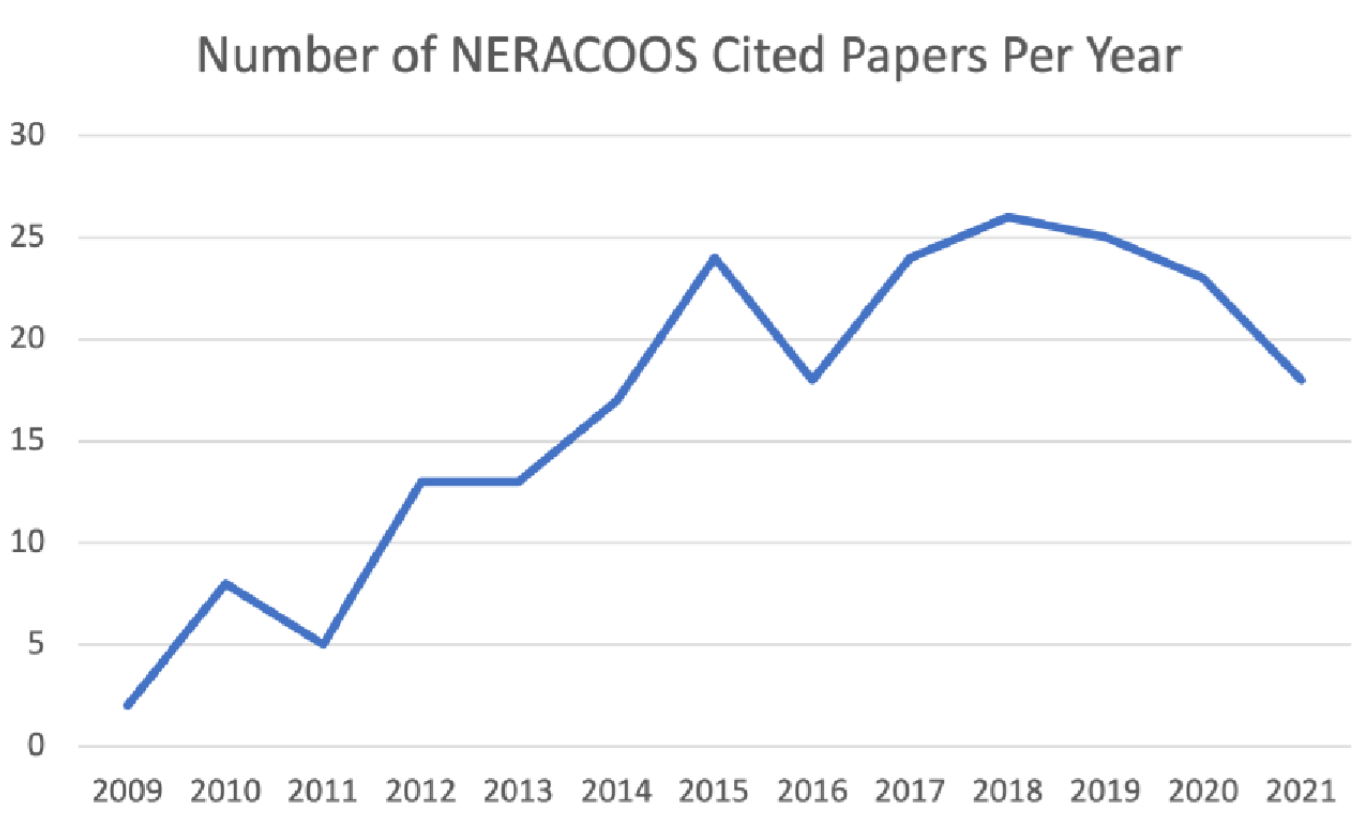
Long-Term Trends

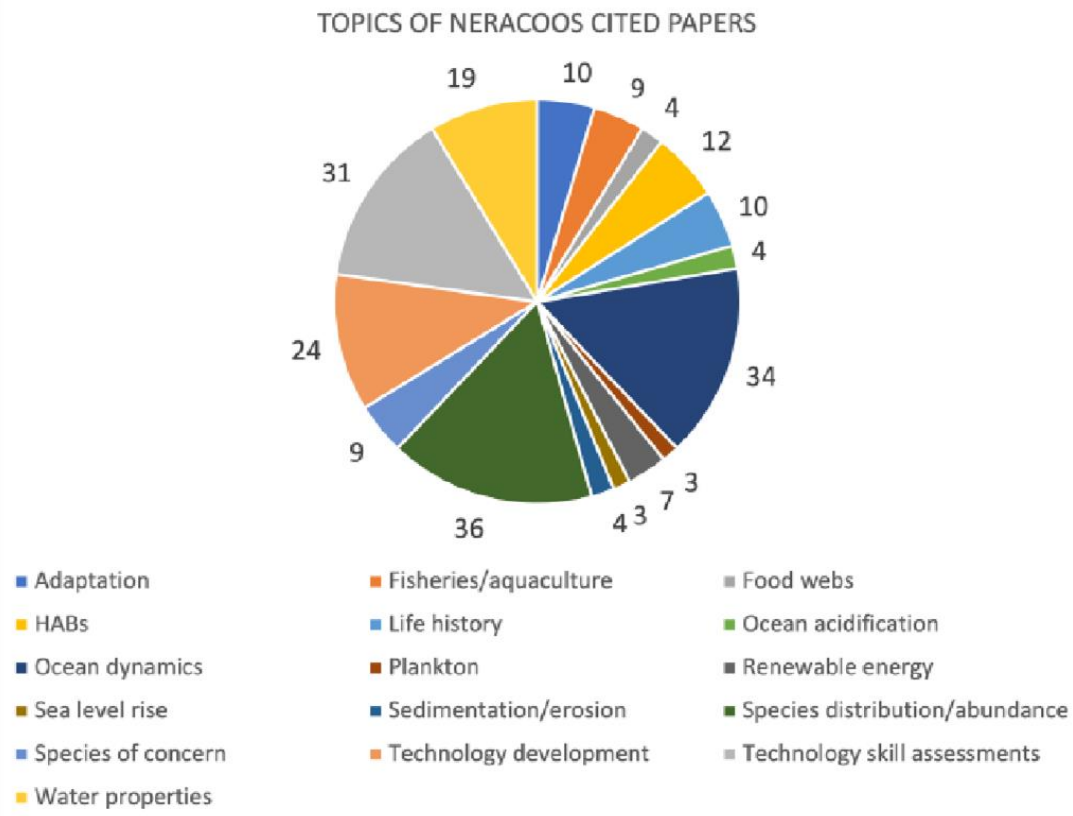


Downloadable Datasets



Scientific Contributions





Fisheries Applications: Spatial Shift in Lobster Catch

Received: 17 December 2018 | Revised: 26 April 2019 | Accepted: 19 June 2019
DOI: 10.1111/gcb.14778

PRIMARY RESEARCH ARTICLE

Global Change Biology WILEY

The brighter side of climate change: How local oceanography amplified a lobster boom in the Gulf of Maine

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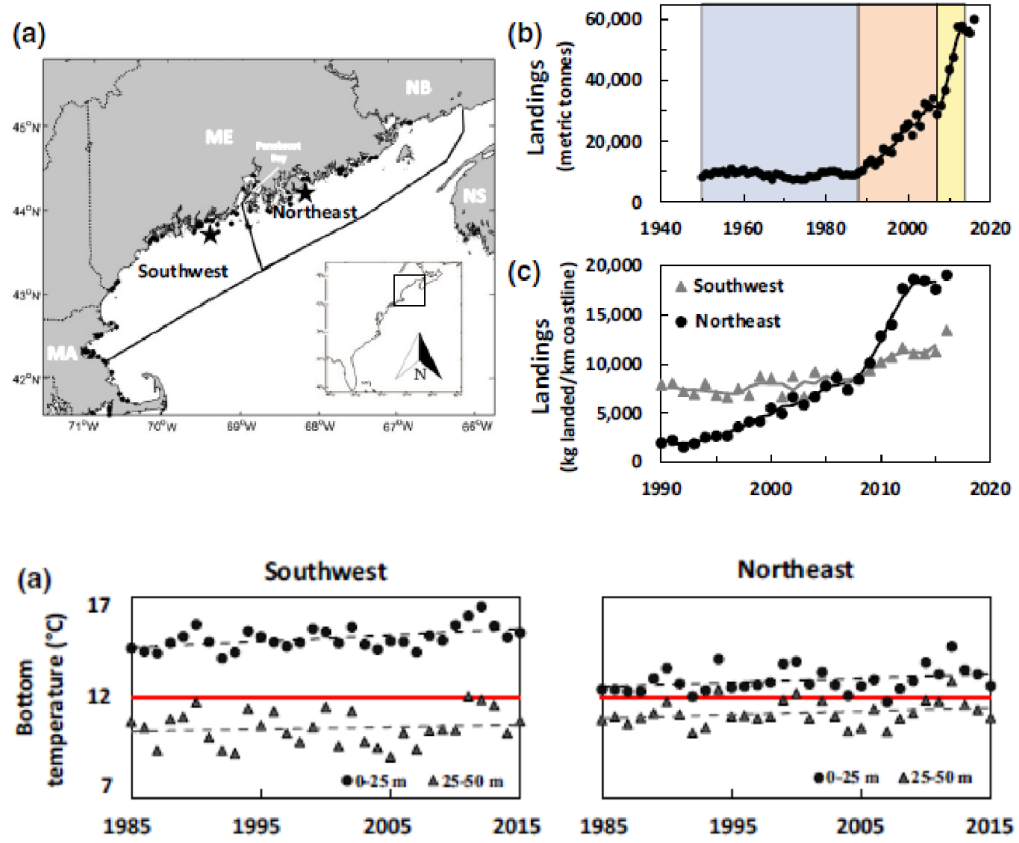
Abstract

Ocean warming can drive poleward shifts of commercially important species with potentially significant economic impacts. Nowhere are those impacts greater than in the Gulf of Maine where North America's most valuable marine species, the American lobster (*Homarus americanus* Milne Edwards), has thrived for decades. However, there are growing concerns that regional maritime economies will suffer as monitored shallow water young-of-year lobsters decline and landings shift to the northeast. We examine how the interplay of ocean warming, tidal mixing, and larval behavior results in a brighter side of climate change. Since the 1980s lobster stocks have increased fivefold. We suggest that this increase resulted from a complex interplay between lobster larvae settlement behavior, climate change, and local oceanographic conditions. Specifically, postlarval sounding behavior is confined to a thermal envelope above 12°C and below 20°C. Summer thermally stratified surface waters in southwestern regions have historically been well within the settlement thermal envelope. Although surface layers are warming fastest in this region, the steep depth-wise temperature gradient caused thermally suitable areas for larval settlement to expand only modestly. This contrasts with the northeast where strong tidal mixing prevents thermal stratification and recent ocean warming has made an expansive area of seabed more favorable for larval settlement. Recent declines in lobster settlement densities observed at shallow monitoring sites correlate with the expanded area of thermally suitable habitat associated with warmer summers. This leads us to hypothesize that the expanded area of suitable habitat may help explain strong lobster population increases in this region over the last decade and offset potential future declines. It also suggests that the fate of fisheries in a changing climate requires understanding local interaction between life stage-specific biological thresholds and finer scale oceanographic processes.

KEYWORDS
American lobster, biological thresholds, climate change, ocean warming, regional oceanography, thermal habitat

[Correction added on 13 September 2019, after first online publication: the funding information and acknowledgements have been updated in this current version.]



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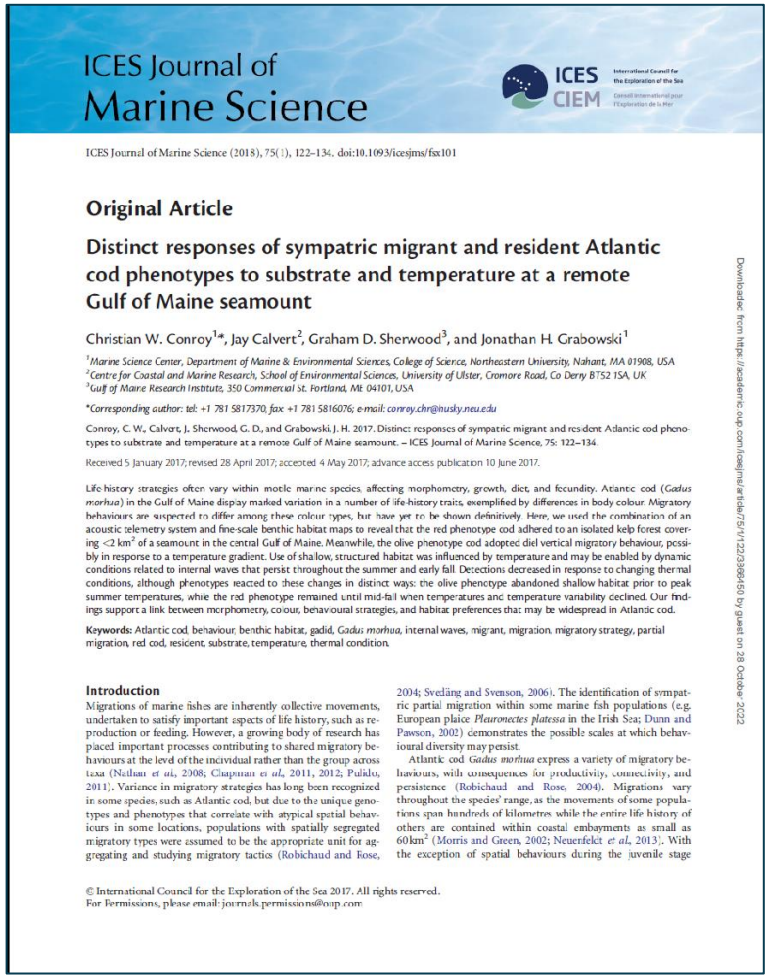
Fisheries Applications: Cod Behavior at Ammen Rock



ICES Journal of Marine Science

ICES CIEM

ICES Journal of Marine Science (2018), 75(1), 122–134. doi:10.1093/icesjms/fsx101

Original Article

Distinct responses of sympatric migrant and resident Atlantic cod phenotypes to substrate and temperature at a remote Gulf of Maine seamount

Christian W. Conroy[1]*, Jay Calvert[2], Graham D. Sherwood[3], and Jonathan H. Grabowski[1]

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[2]Centre for Coastal and Marine Research, School of Environmental Sciences, University of Ulster, Cromore Road, Co Derry BT52 1SA, UK
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Conroy, C. W., Calvert, J., Sherwood, G. D., and Grabowski J. H. 2017. Distinct responses of sympatric migrant and resident Atlantic cod phenotypes to substrate and temperature at a remote Gulf of Maine seamount. – ICES Journal of Marine Science, 75: 122–134.

Received 5 January 2017; revised 28 April 2017; accepted 4 May 2017; advance access publication 10 June 2017.

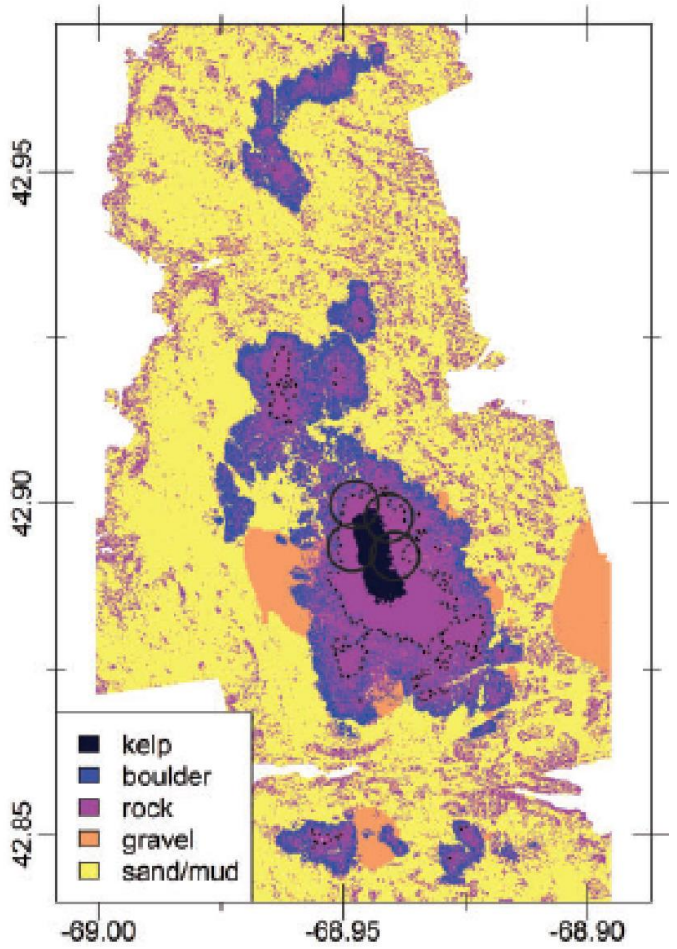
Life history strategies often vary within motile marine species affecting morphometry, growth, diet, and fecundity. Atlantic cod (*Gadus morhua*) in the Gulf of Maine display marked variation in a number of life-history traits, exemplified by differences in body colour. Migratory behaviours are suspected to differ among these colour types, but have yet to be shown definitively. Here, we used the combination of an acoustic telemetry system and fine-scale benthic habitat maps to reveal that the red phenotype cod adhered to an isolated kelp forest covering <2 km^2 of a seamount in the central Gulf of Maine. Meanwhile, the olive phenotype cod adopted diel vertical migratory behaviour, possibly in response to a temperature gradient. Use of shallow, structured habitat was influenced by temperature and may be enabled by dynamic conditions related to internal waves that persist throughout the summer and early fall. Detections decreased in response to changing thermal conditions, although phenotypes reacted to these changes in distinct ways: the olive phenotype abandoned shallow habitat prior to peak summer temperatures, while the red phenotype remained until mid-fall when temperatures and temperature variability declined. Our findings support a link between morphometry, colour, behavioural strategies, and habitat preferences that may be widespread in Atlantic cod.

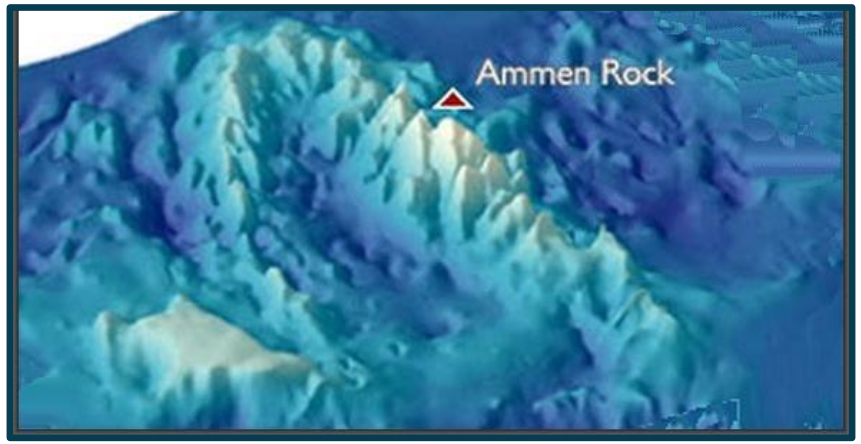
Keywords: Atlantic cod, behaviour, benthic habitat, gadid, *Gadus morhua*, internal waves, migrant, migration, migratory strategy, partial migration, red cod, resident, substrate, temperature, thermal condition.

Introduction

Migrations of marine fishes are inherently collective movements, undertaken to satisfy important aspects of life history, such as reproduction or feeding. However, a growing body of research has placed important processes contributing to shared migratory behaviours at the level of the individual rather than the group across taxa (Nathan *et al.*, 2008; Chapman *et al.*, 2011, 2012; Pulido, 2011). Variance in migratory strategies has long been recognized in some species, such as Atlantic cod, but due to the unique genotypes and phenotypes that correlate with atypical spatial behaviours in some locations, populations with spatially segregated migratory types were assumed to be the appropriate unit for aggregating and studying migratory tactics (Robichaud and Rose, 2004; Svedäng and Svenson, 2006). The identification of sympatric partial migration within some marine fish populations (e.g. European plaice *Pleuronectes platessa* in the Irish Sea; Dunn and Pawson, 2002) demonstrates the possible scales at which behavioural diversity may persist.

Atlantic cod *Gadus morhua* express a variety of migratory behaviours, with consequences for productivity, connectivity, and persistence (Robichaud and Rose, 2004). Migrations vary throughout the species' range, as the movements of some populations span hundreds of kilometres while the entire life history of others are contained within coastal embayments as small as 60 km^2 (Morris and Green, 2002; Neuenfeldt *et al.*, 2013). With the exception of spatial behaviours during the juvenile stage





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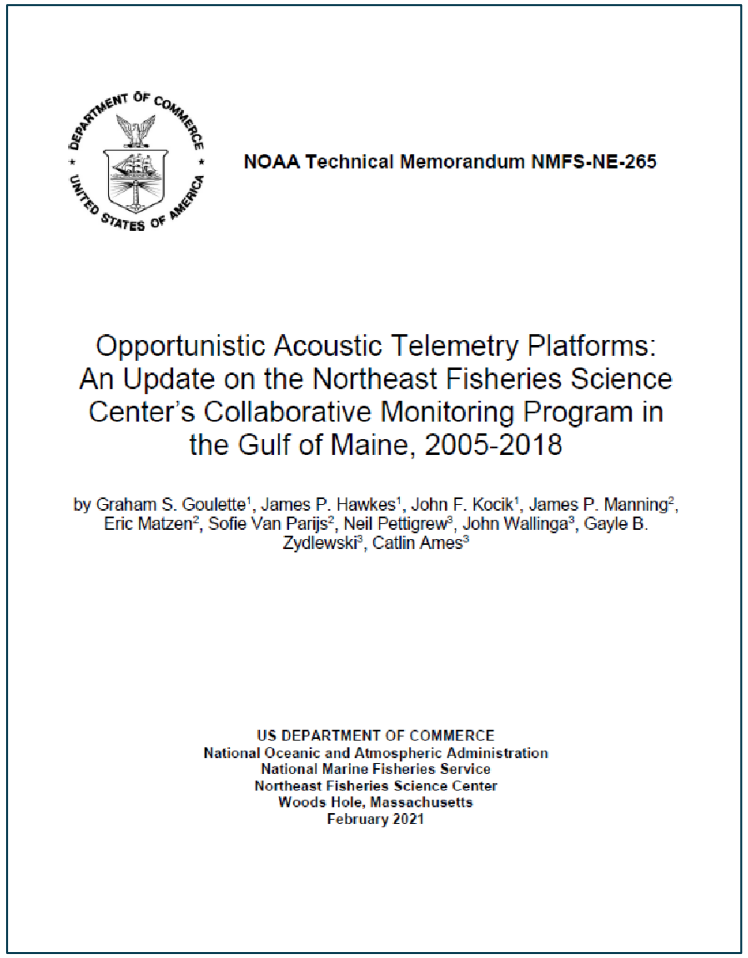
Fisheries Applications: Tracking Studies

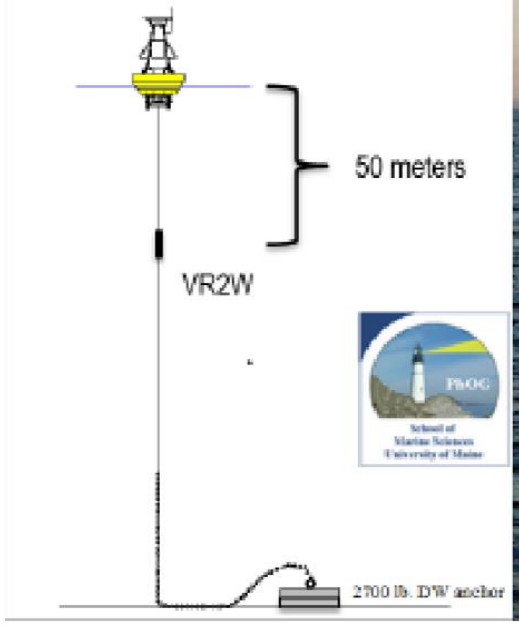


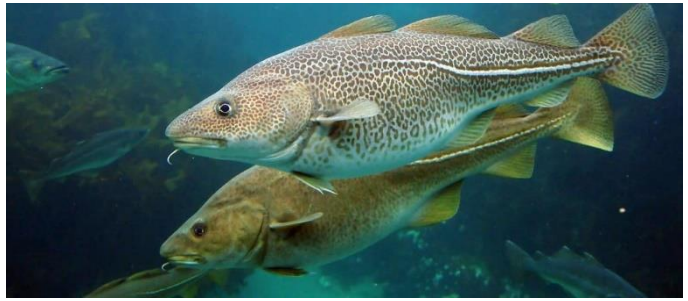
NOAA Technical Memorandum NMFS-NE-265

Opportunistic Acoustic Telemetry Platforms: An Update on the Northeast Fisheries Science Center's Collaborative Monitoring Program in the Gulf of Maine, 2005-2018

by Graham S. Goulette[1], James P. Hawkes[1], John F. Kocik[1], James P. Manning[2], Eric Matzen[2], Sofie Van Parijs[2], Neil Pettigrew[3], John Wallinga[3], Gayle B. Zydlewski[3], Catlin Ames[3]

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts
February 2021

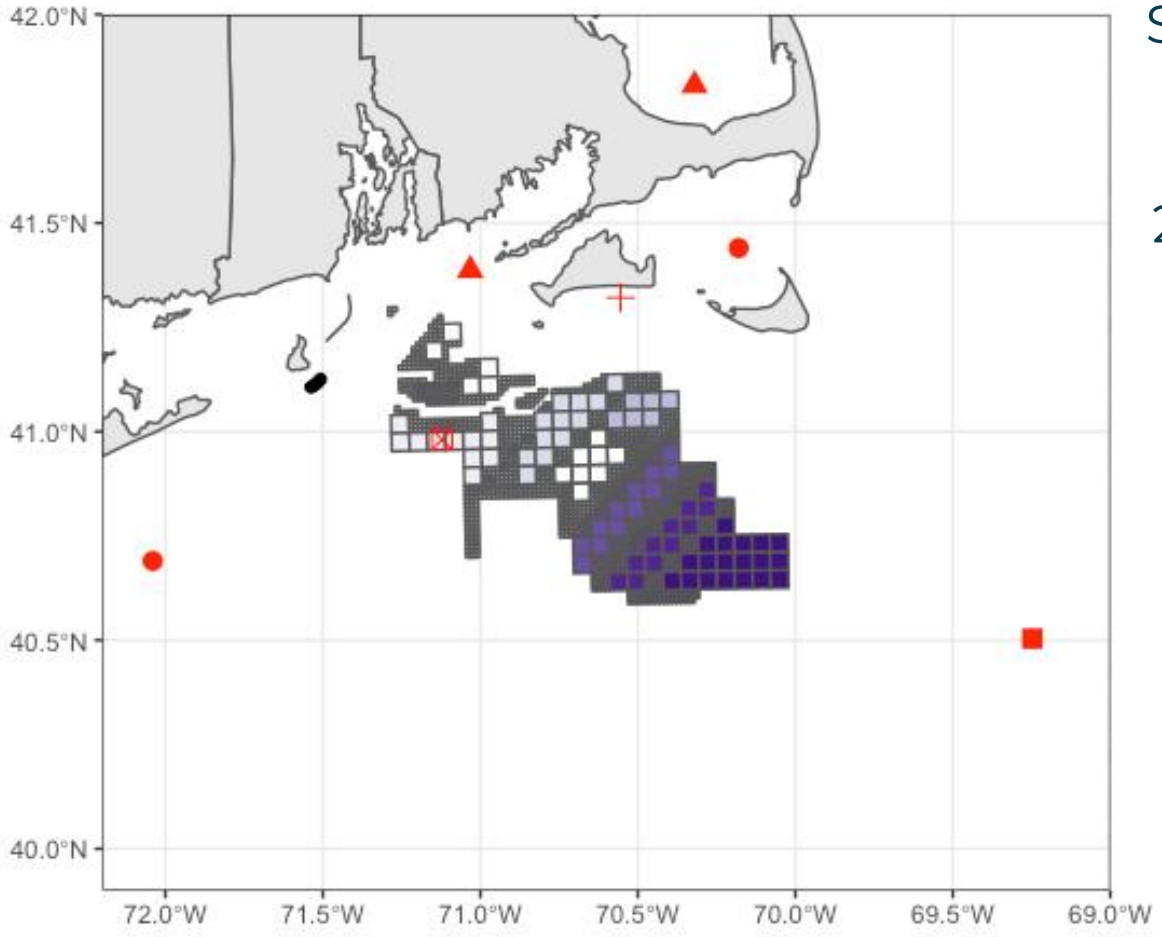




NERACOOS

Sustained Observing Buoys near the MA/RI WEA

	●	▲	■	+	⊠
Air Pressure	☒			☒	
Air Temperature	☒	☒	☒	☒	
Humidity				☒	
Surface winds	☒		☒	☒	
Above-surface winds			☒	☒	
Visibility					
SST	☒	☒		☒	☒
Waves	☒	☒	☒	☒	☒
Currents		☒			
Conductivity				☒	
Subsurface temp.				☒	
Dissolved oxygen					
Chlorophyll					
pH/PCO2					
CDOM					
Nitrate					
Telemetry receivers					
Passive acoustics					
Active acoustics					
PAR					
Genomics					
Imaging (Plankton)					
HABS/toxins					



Sustained, continuous, real-time, and fully accessible.

2D coverage is limited relative to the scale of development and biased toward shore.

3D coverage is scant and many variables are absent.

Valuable assets, but insufficient to serve the breadth of user needs.

Designing an Expanded System

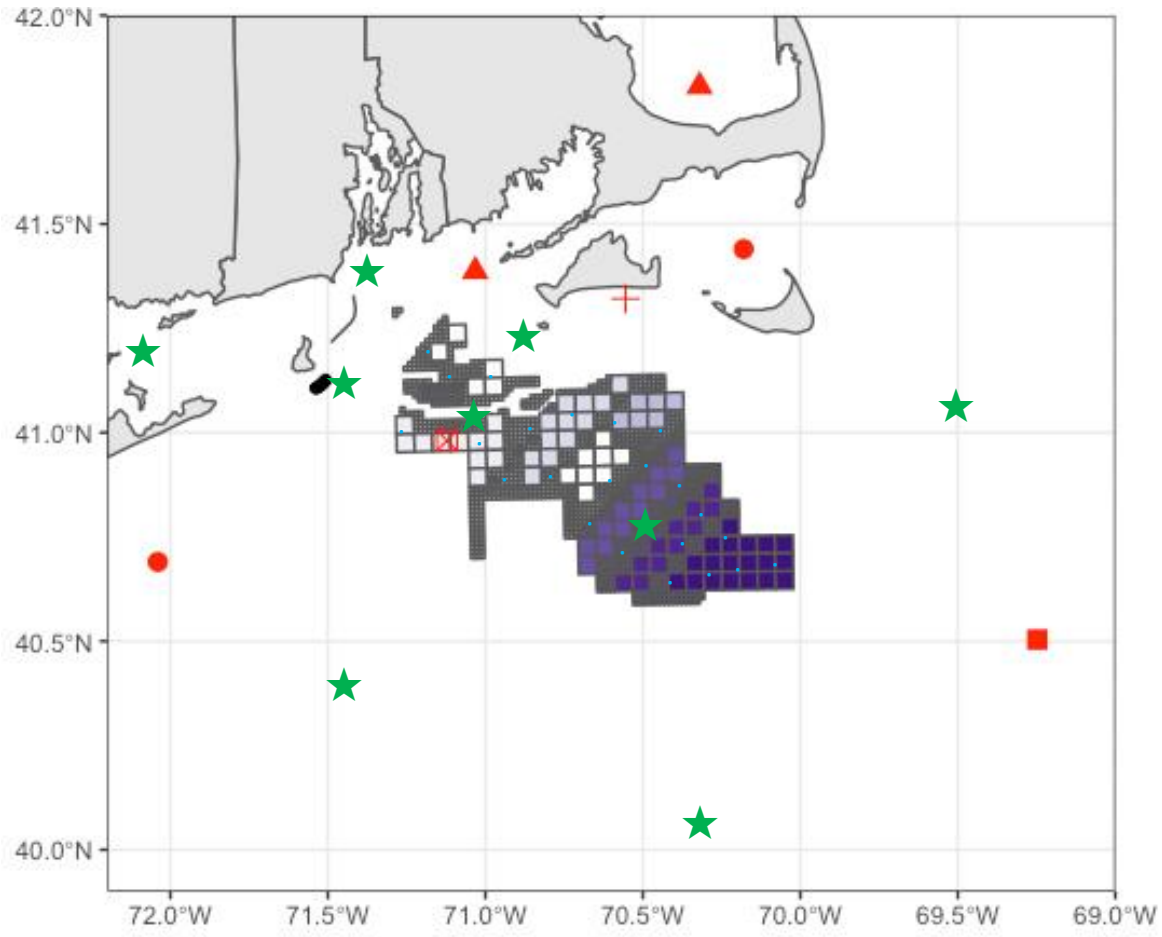
- General methodology: Compile as much information as possible on user needs from agencies, industries, and researchers to develop a single network design that meets as many needs as possible in a coordinated and cost-effective manner

- Activities to date:
  - Discussions with Ørsted and OSW Marine Affairs WG about public-private partnerships on assets for mariner safety at the scale of the WEA
  - SOST roundtable submission with Ørsted on partnership for multiple user needs
  - Panels at IOOS FAC and ACP Offshore Windpower conference
  - ROSA side event on applications for non-extractive fisheries resource assessment during NYSERDA State of the Science Workshop
  - Ongoing user discussion with agencies, industries, and researchers to identify needs, with supplemental review of policies, reports, and papers
  - Ongoing discussion about overlapping interests with leadership of RWSC and ROSA, and larger community discussions this week

Major Themes

- Mariner Safety
  - Real-time data on sea state for navigation and operational planning
  - Forecasts for search-and-rescue, esp. currents
- Pollutants and Contaminants
  - Current forecasts for post-event tracking and response
  - Ecosystem measurements for impact assessment
- Climate Signals
  - Disentangling effects of OSW development from broader climate impacts
  - Predicting future state of the marine ecosystem in and around WEAs
- **Fisheries Management Guidance & collaboration with ROSA**
- Wildlife Conservation Guidance & collaboration with RWSC

Working Design



<u>Two major components</u>:

1. High-density array* of stations within WEA, esp. for surface currents and waves (·):
   a. Search-and-rescue
   b. Spill response
   c. Plankton & larval dispersal
   d. WTRIM

   *Considering an OSSE
2. Network of targeted exterior & interior locations for more comprehensive ecosystem monitoring (★).

Questions for Discussion

- What is the overall utility of this concept for fisheries science ? E.g.:
  - Development of habitat suitability models?
  - Covariates for life history parameters in stock assessments?
  - Larval dispersal modelling?
  - Enabling development and application of ecosystem models?

- Are there general design attributes that should be incorporated? E.g.:
  - Horizontal or vertical distribution/density of stations?
  - Priority variables to measure?
  - Data management/delivery needs?

- Comments on specific priority locations?

Brief Updates

ROSA and Others Updates

- Upcoming meetings
- Recent meetings & workshops
- Other updates?

Upcoming Meetings

- **NOAA Cooperative Research Summit**
  - January 31, 2023- Newport News, VA
  - February 15, 2023- Providence, RI
  - Abstracts due December 7, 2022
- **AFS Southern Division annual meeting**
  - February 2-5, 2023- Norfolk, VA
  - Session on “Offshore wind and fisheries: monitoring interactions and assessing impacts“
  - Abstracts due November 15, 2022
- **AFS Mid-Atlantic chapter annual meeting**
  - November 15-16, 2022- Asbury Park, NJ
  - Reduced registration for fishing & aquaculture industry members

Recent meetings

July 2022

- *Criteria for prioritization of offshore wind-related environmental & fisheries research.* Joint with NY E-TWG and RWSC
- *State of the Science Workshop on Wildlife & Offshore Wind Energy*
  - ROSA side workshop on non-extractive sampling techniques

August 2022

- *Offshore Wind, Fish, and Fisheries- Emerging Knowledge & Applications*. Symposium at AFS annual meeting

September 2022

- *Methodologies to assess the impact of offshore wind development on fishery data collections.* Theme session at ICES Annual Science Conference

ROSA and Others Updates

- Upcoming meetings
- Recent meetings & workshops
- Other updates?

Next Steps

- **Save the Date:** Next quarterly meeting December 19, 2022
  - Focus on regional partner updates
  - If you are interested in presenting, please let us know in comments or reach out directly
- **New ROSA website** anticipated late November 2022
  - Website will include the databases discussed today

- Please reach out to us with topics of interest for meetings or sector-specific calls (lyndie@rosascience.org or mike@rosascience.org)