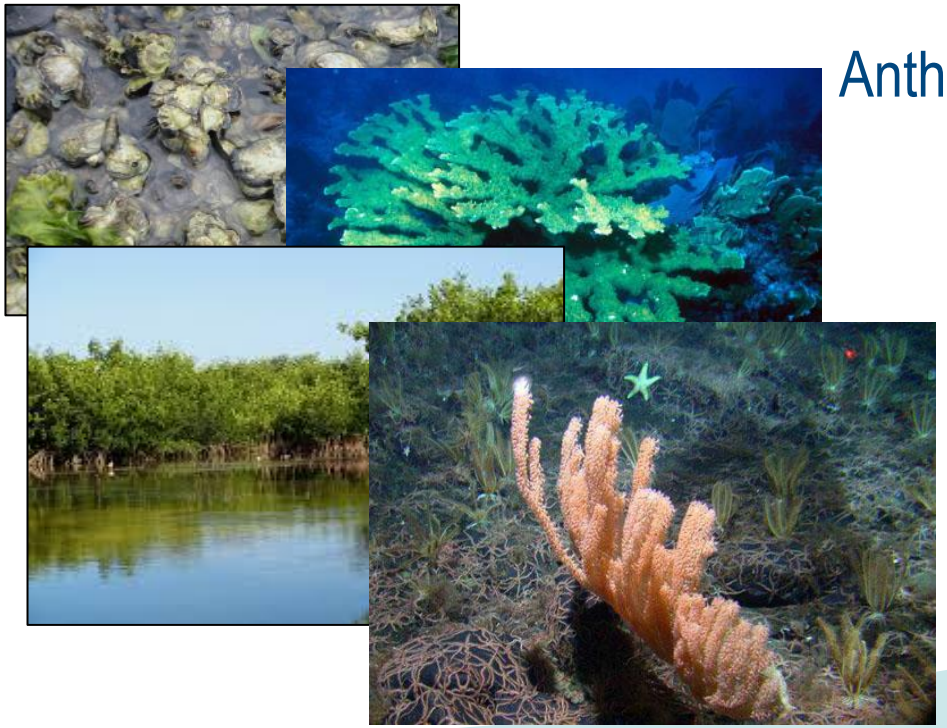
Marine Fisheries Habitat Science Program

Ecosystem Program Review



Anthony R. Marshak, Stephen K. Brown,
Kirsten M. Larsen, & HAIP Team

NMFS Office of Science & Technology

July 2016

Habitat within NMFS Mandates (TOR 1)

Magnuson-Stevens Fishery Conservation and Management Act (MSA):

Requires protection of essential fish habitat (EFH), defined as ". . . those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

Endangered Species Act (ESA):

Requires protection of listed species' critical habitat.

Marine Mammal Protection Act (MMPA):

Ensures marine mammal species and population stocks continue to be significant functioning elements of their ecosystems.

Habitat Science is Key Component of EBFM (TOR 1)

- **Foundational Habitat Information** is a major currency to build comprehensive EBFM.

- MSA encourages councils to use ecosystem & habitat science; Ecosystem Status Reports (ESRs) and Fisheries Ecosystem Plans (FEPs) include habitat information.
  - ✓ NMFS and Councils have requested stronger time-series data for benthic environments, and data on relations between habitats-benthic organisms-fish species.
- Data gaps include habitat maps, habitat-fisheries related models, and distribution/abundance of specific biogenic habitats (e.g. coral/oyster reefs).
  - ✓ For EFH designation and review.
  - ✓ Develop HAPCs and other MPAs.

Habitat Science in NMFS & NOAA Priorities (TOR 1)

NMFS

- EBFM Policy & Roadmap
- Climate Science Strategy
- Ecosystem Status Reports
- Fishery Ecosystem Plans
- Habitat Enterprise Strategic Plan
- EFH & ESA consultations, designations
- National Shellfish Initiative
- National Saltwater Rec Fish Plan
- Marine Aquaculture Strategic Plan

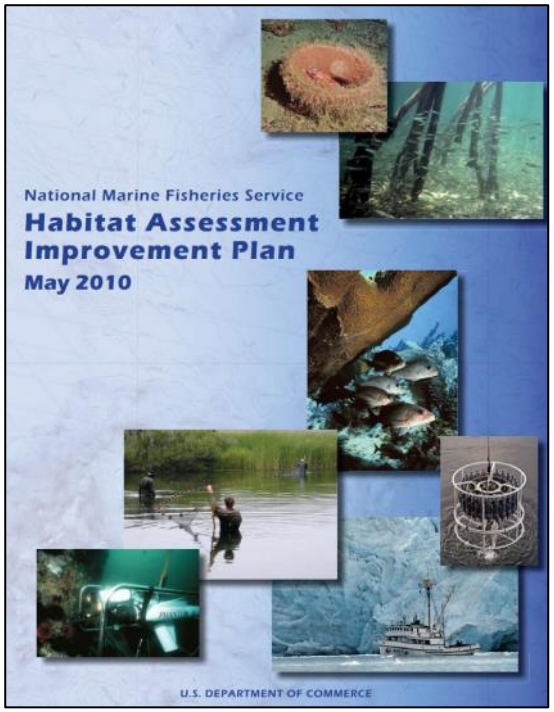
NOAA

- Habitat Policy
- Habitat Blueprint
- Ecological Forecasting Roadmap
- RESTORE Act Science Program
- Natural Resource Damage Assessment Activities
- Offshore Renewable Energy

Habitat Assessment Improvement Plan (HAIP, TOR 3)

HAIP Strategy:

- Pursuing & supporting fisheries **habitat science**
- Incorporating habitat science into every-day decision-making for fisheries



HAIP Goals:

→ **Improve habitat assessments to integrate into stock assessments and initiate demo projects**

→ **Improve identification and impact assessments of EFH**

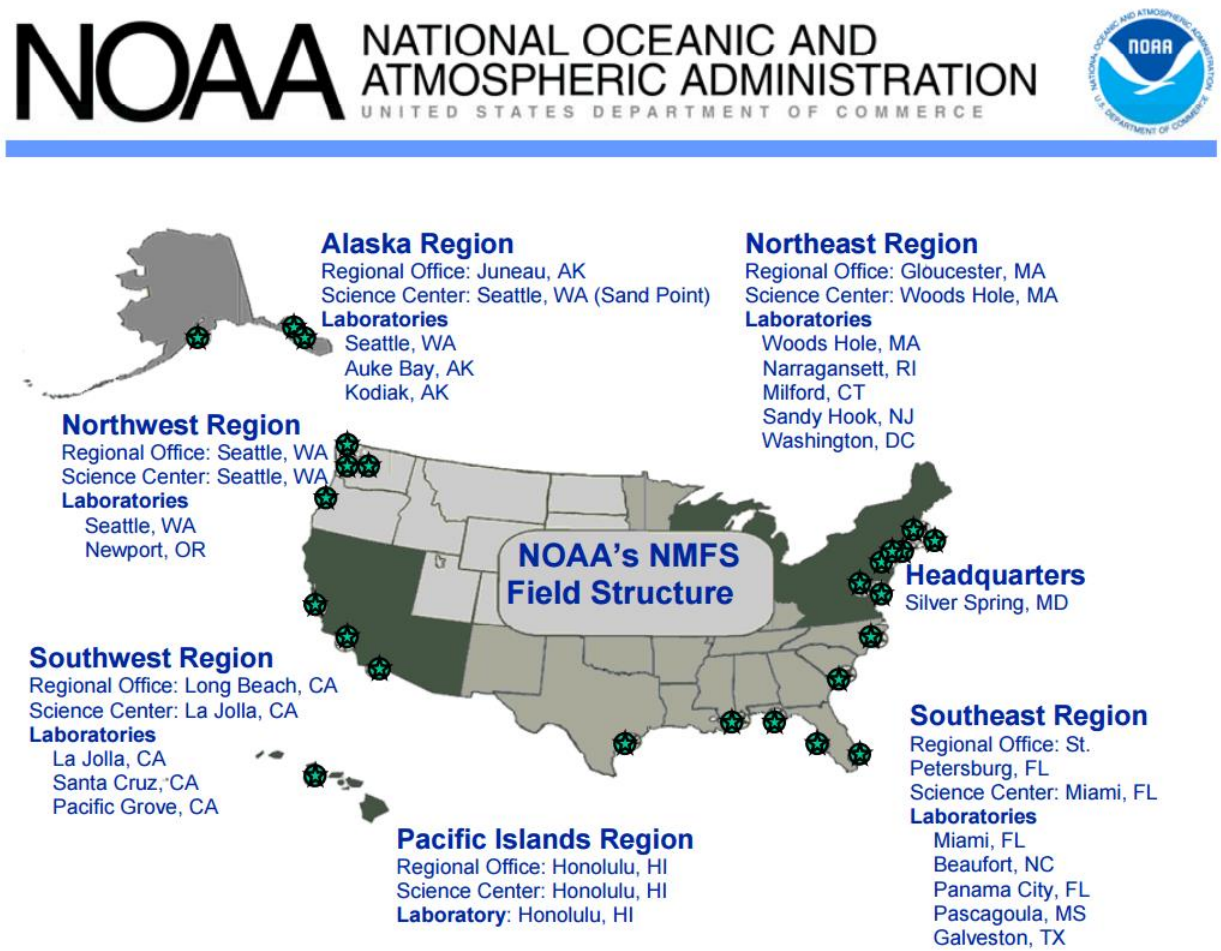
HAIP Recommendations:

- Increase collection of habitat data during fishery-independent surveys
- Convene regional and national workshops
- Prioritize stocks and geographic locations that would benefit from habitat assessments
- Develop new budget and staffing initiatives
- Develop a plan for better utilizing Advanced Tech
- Develop a NOAA-wide strategic plan
- Engage with partners

NMFS ST Habitat Science Program (TOR 1)

- Coordination and support of NMFS habitat science and research activities.
- Coordination between habitat science and habitat conservation and management activities.
- Implementation of the *Marine Fisheries Habitat Assessment Improvement Plan* (HAIP, 2010)
  - Stock assessments
  - Essential Fish Habitat (EFH)

NMFS Habitat Science Program Clients (TOR 2)



- Six Fisheries Science Centers (FSCs) – HAIP Team and Scientists
- Five Regional Offices (ROs) – Managers
- Office of Habitat Conservation (HQ) – Managers
- Other NOAA Line Offices

Habitat Science Activities

- NMFS – HAIP goals and recommendations
  - **Stock Assessment**
    - Internal proposal funding process
    - Funded studies - successful examples
  - **EFH consultations**
  - **National Habitat Assessment Workshops (NHAWs)**
  - **Habitat assessment prioritization**
  - **President budget initiative**
  - **Coral science**
- Cross-NOAA
  - **NOAA Habitat Conservation Team (NHCT) and Ecological Forecasting**
  - **Habitat Focus Areas (HFAs)**
- Cross-agency and external
  - **National Fish Habitat Partnership**
- Communication with the public

HAIP Goal – Stock Assessment
Internal Proposal Funding Opportunity (TOR 3)

- **Objectives:** Incorporate habitat info into stock assessments.
- Established to fill gaps identified in the HAIP.
- Ongoing since 2010, and to date: 118 proposals submitted; 32 funded (~27%).

Fiscal Year	# Proposals received	Total $ Amount Requested	Actual $ awarded
2016	18	$2.25M	$455,282
2015	17	$1.82M	$430,802
2014	22	$2.53M	$750,733
2013	15	$1.8M	$444,854
2012	22	$2.28M	$562,980
2011	18	$2.16M	$369,088
2010	5	$482K	$297,625
TOTAL	118	$13.3M	$3,311,364

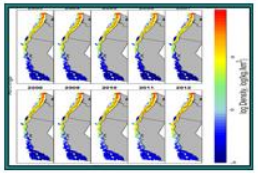
HAIP Goal – Stock Assessment Funded Studies (TOR 3)

2015 Projects

Improving Stock Assessments for Rockfishes Using Habitat-referenced Acoustic Surveys in the Gulf of Alaska

Principal Investigator: Chris Wilson

Region: Alaska Fisheries Science Center (AFSC)



Distribution and application of a new geostatistical index standardization and habitat modeling tool for stock assessments and essential fish habitat designation in Alaska and Northwest Atlantic regions

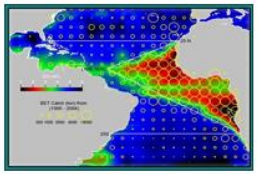
Principal Investigator: Jim Thorson

Region: Northwest Fisheries Science Center (NWFSC)

Using habitat-specific, spatial demographic information to improve stock assessments of groundfishes

Principal Investigator: Jameal Samhouri

Region: Northwest Fisheries Science Center (NWFSC)



Incorporating hypoxia-based habitat compression impacts into the stock assessment process for tropical pelagic billfish and tuna

Principal Investigator: Eric Prince

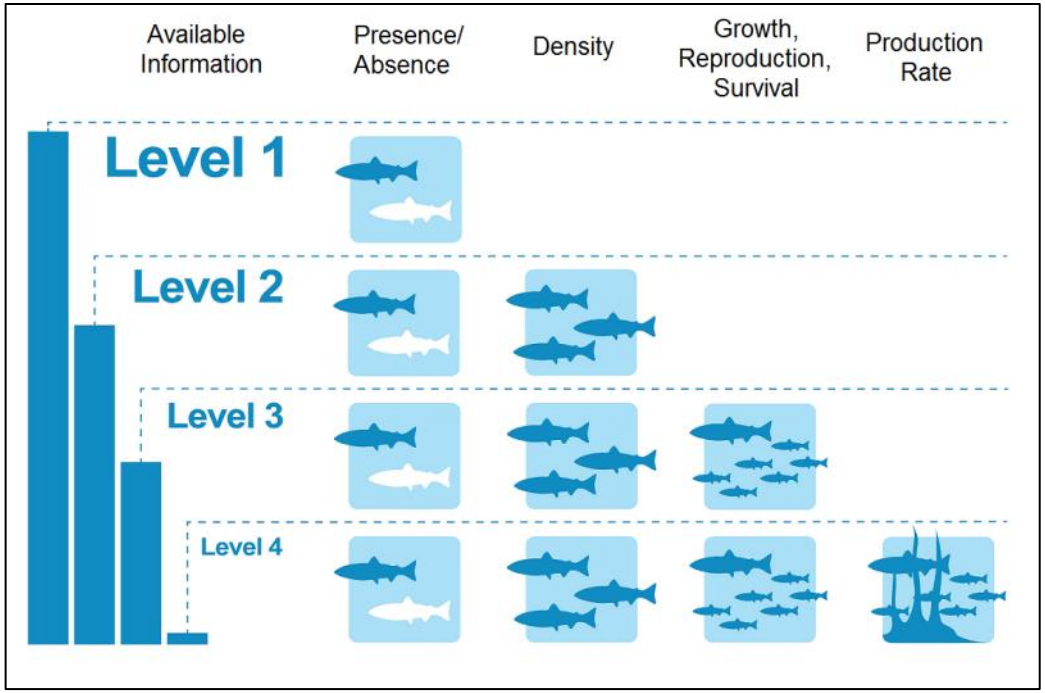
Region: Southeast Fisheries Science Center (SEFSC)

http://www.st.nmfs.noaa.gov/ecosystems/habitat/funding/projects/index

Incorporating Habitat into Stock Assessments - successful examples:

- NE Butterfish (FATE)
  - Scaled catchability for survey data based on thermal habitat availability
  - Accounts for abundance shifts & habitat-dependent survey error
- West Coast groundfish
  - Habitat-based predictive models of groundfish abundance (Yoklavich).
  - Integrated spatial habitat & fisheries effort data to develop bioindicators and abundance estimates (Shelton)
    - Plans for this work to be applied to the California Current IEA.

HAIP Goal - EFH Consultations (TOR 1,3)



NOAA HABITAT CONSERVATION | HABITAT PROTECTION

- Habitat managers complete >3000 consultations on projects that will affect EFH.
- **Most species have Level 1 –**
  - Level 2-4 data only exist for a handful of spp., and subset of their life-stages.
- Current EFH designations are broad geographic scope
  - Research needed to refine EFH for life stages of managed spp.
  - **It is impossible to refine/review EFH without foundational habitat information.**
- No direct ST funds for EFH science.

HAIP Recomm. - National Habitat Assessment Workshops (TOR 2, 5)

Who: Stock assessment & habitat scientists and habitat managers.

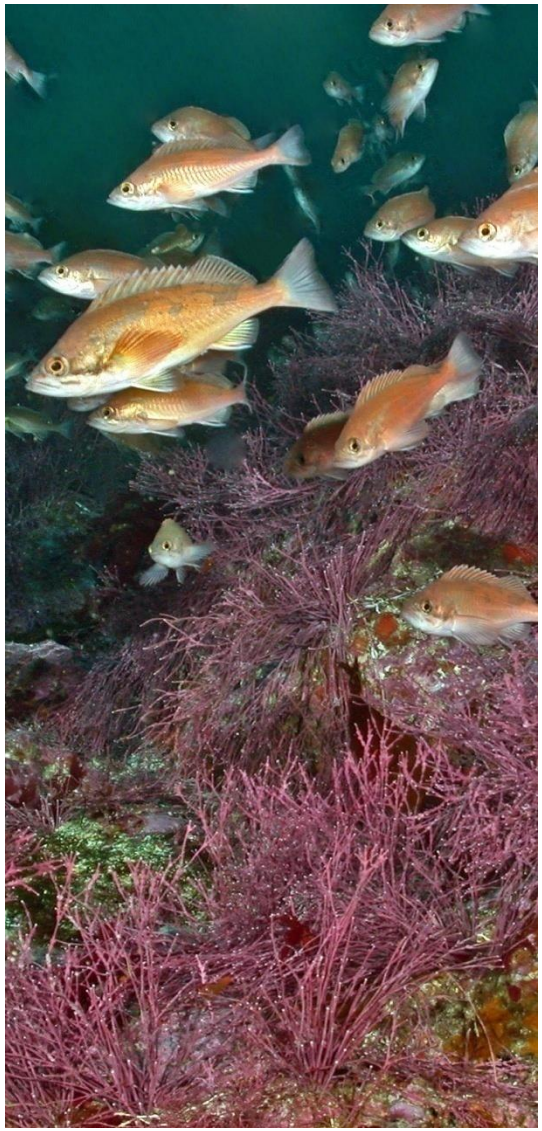
Why: Focus efforts toward more robust assessments & better habitat information for managers.

NHAW I (2010) –

- Increased communication between habitat scientists and managers.
- Provided information exchange to help determine and address habitat science needs.

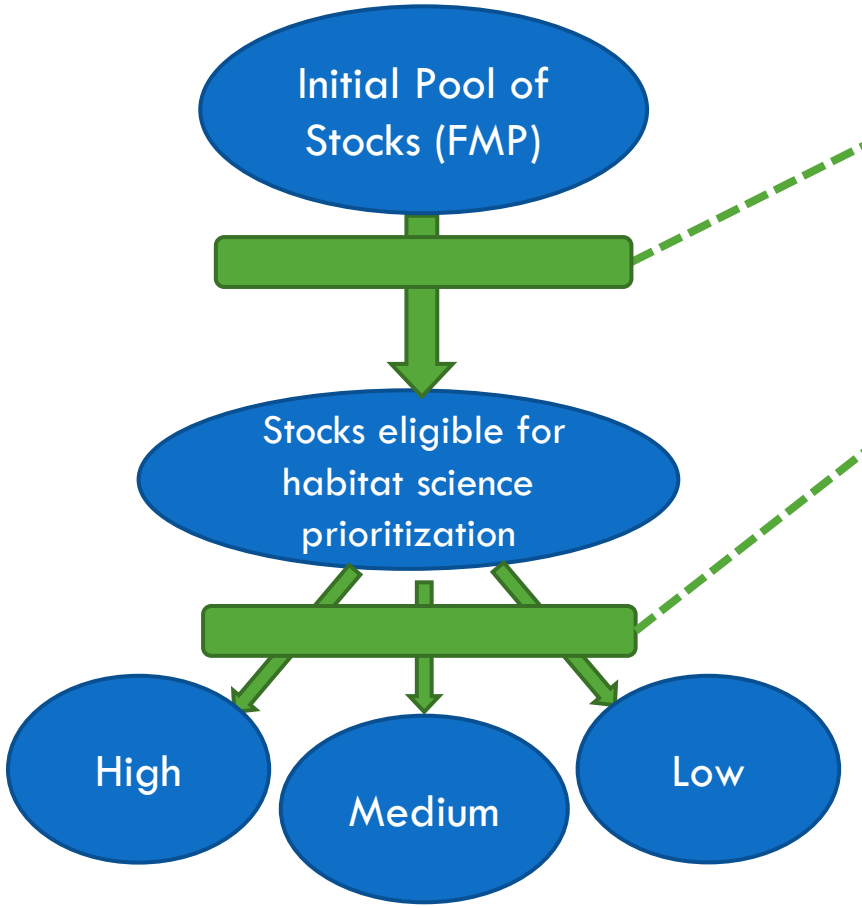
NHAW II (2012) –

- The **quantitative** link between **inshore habitat and offshore fisheries production** was identified as a high priority knowledge gap.
- Three pilot projects supported by ST and OHC.



HAIP Recomm. - Prioritization for Habitat Science (TOR 1, 3, 4)

- Prioritize funds and staff allocation to maximize research results for decision making
- Opportunity to prioritize where to fill data gaps, improve EFH consultations and stock assessments
- Regional rankings - SW, NW, and NE completed; PI and AK in progress



Filter criteria (Y/N)

- FSSI stock or Council research priority
- Likelihood to inform EFH and SA

Scoreable criteria, 0-5 pts each

- Likely to advance EFH & SA information
- Fishery status (e.g. overfished)
- Council research priority
- Habitat disturbance, vulnerability, or rarity
- Habitat dependence
- Ecological importance
- Economic, social, and management value

HAIP Recomm. – President's Budget Initiative

- Inshore Habitat - Offshore Fisheries Production concept
- "*Ecosystem-Based Solutions for Fisheries Management*"
  - ✓ **Pres Bud FY16 - $5M**
  - ✓ **Pres Bud FY17 - $5.929M**

"We've never been closer!"

- Linked to an NOS-led initiative also working in coastal waters, "*Ecosystem Based Solutions for Coastal Resilience*"
- 3-year rotations for each region – provide a larger pulse of funds to ensure more immediate and tangible outcomes
- Foundational habitat mapping, inshore-offshore studies, LMR ecological studies, ESV

ESA Coral Science & Coordination (TOR 2, 3, 4)

Coral is a habitat, of which there are ESA listed species

- Provide support to Southeast region on coral related science and management issues
  - Caribbean Coral Restoration Workshop – emerging science into reef recovery and resilience planning
  - Coral Demographics Toolkit – evaluate status and trends

- Develop population models to estimate extinction risk of listed corals
- Work with Global Coral Reef Monitoring Network and NGOs to gather data on listed corals throughout their species ranges

Cross NOAA Habitat Efforts (TOR 2, 5)

NOAA Habitat Conservation Team (NHCT):

- Guides cross-agency habitat conservation & science activities.
- NOAA Habitat Blueprint
  → NOAA Habitat Policy

Ecological Forecast Roadmap (NOAA):

- an operational framework to provide high quality forecast products at a broad scale, with consistent delivery.

Habitat Science and Ecological Forecasting Technical Team

- Developed agency habitat science priority guidance
  - Foundational habitat mapping, characterization, and assessment
  - Linking habitats and LMR productivity
  - Value of nature
  - Climate change effects
- Promotes cross-LO collaboration on habitat science and species distribution shift projects
- Supports HFA science projects

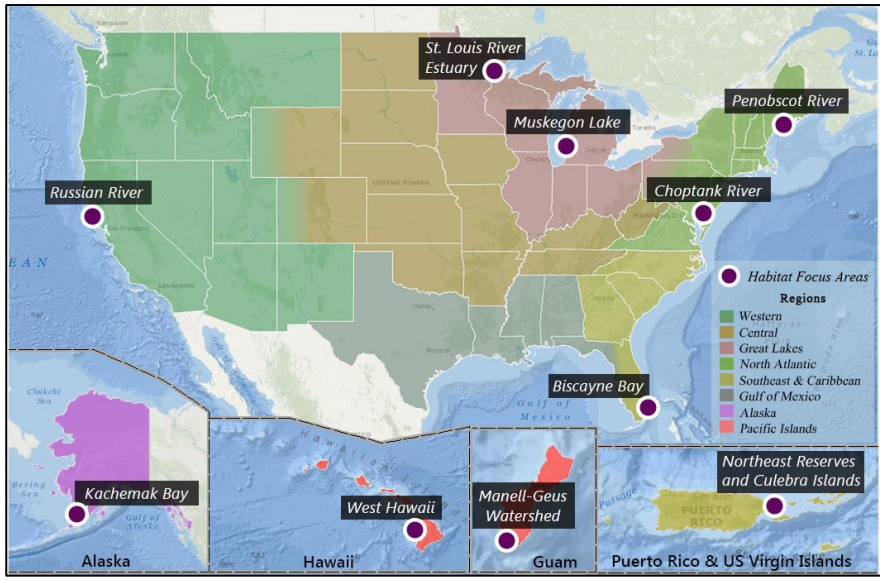
Habitat Focus Areas (TOR 2, 5)

Habitat Focus Areas (HFAs):

- Strong NOAA Leadership support
- Called out in Congressional approps narrative to continue funding

S&T supported HFA fisheries projects:

- Provided $350k in both FY14 and FY15
  - Hawaii and Alaska – benthic habitat mapping
  - Puerto Rico – grouper spawning and queen conch habitats
  - Penobscot River – monitoring
  - Biscayne Bay, FL – water quality monitoring
- Projects supported internal NOAA researchers and external cooperative agreements
- FY16 funding reallocated to other ecosystem efforts; likely similar FY17.

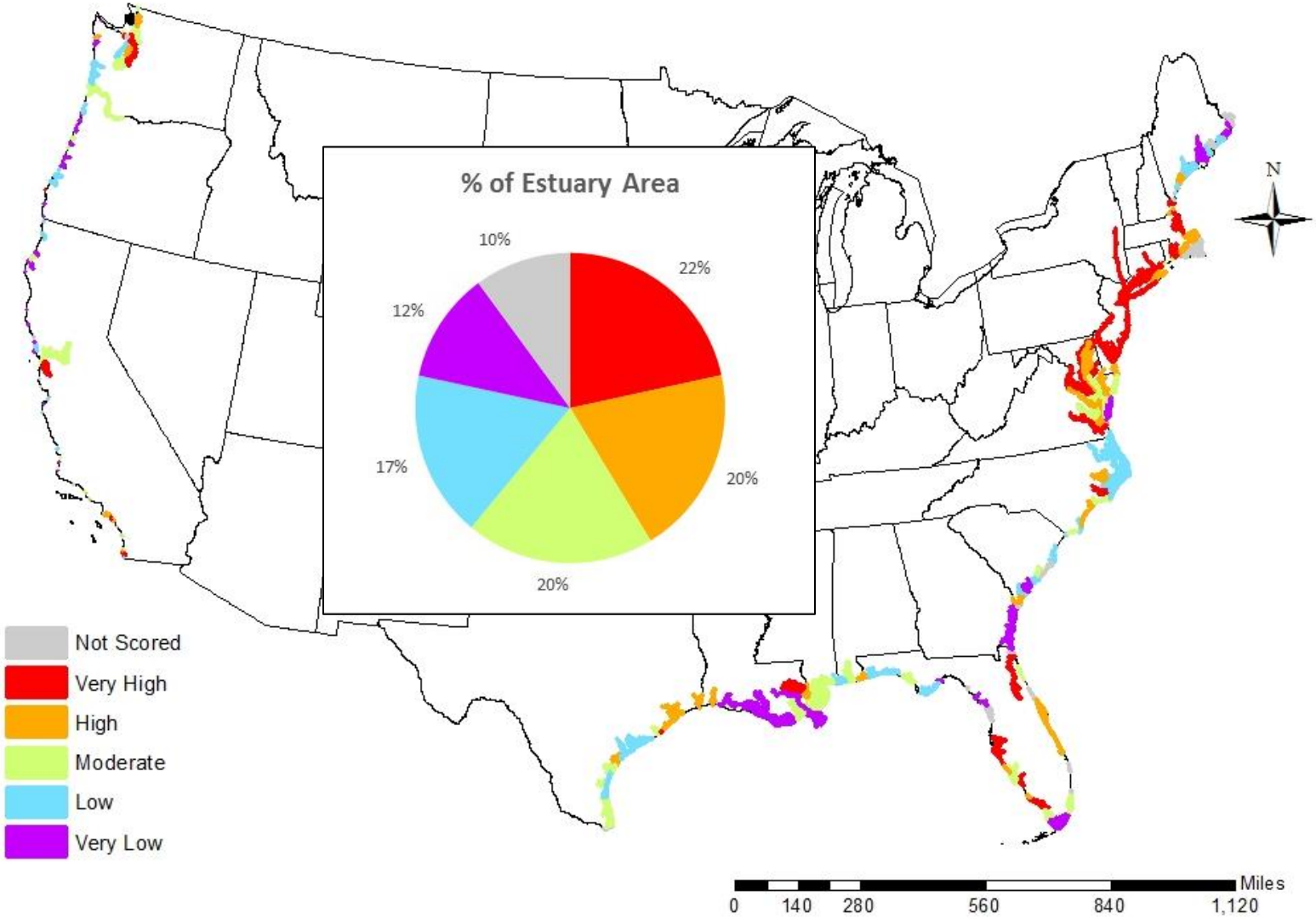


http://habitat.noaa.gov/habitatblueprint

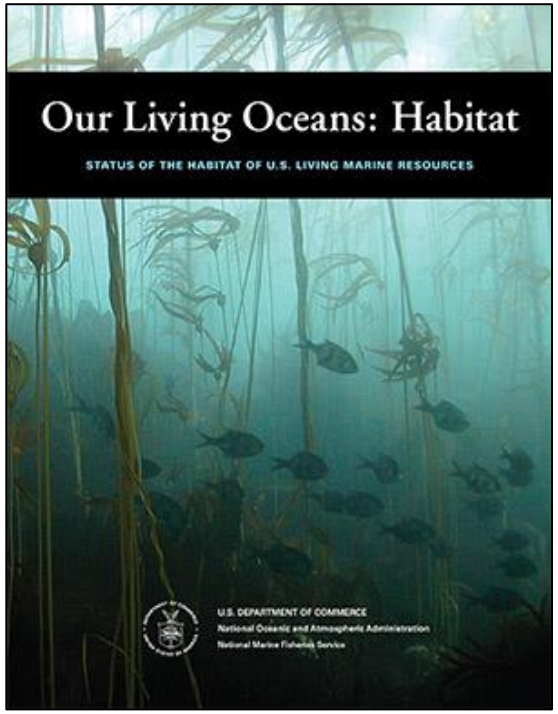
Cross Agency - National Fish Habitat Partnership (NFHP, TOR 4, 5)

- Federal, state, private partnership
- Led by DOI bureaus (FWS/USGS)
- NOAA staffs and supports many of the partnerships
- S&T conducts coastal and estuarine fish habitat assessment in 2010 and 2015

NFHP 2015 National Estuary Assessment (TOR 4, 5)



Communications (TOR 5)



Our Living Oceans: Habitat

http://spo.nmfs.noaa.gov/olohabitat/

- Provides the first comprehensive summary of national/regional habitat types, and use by U.S. managed marine species.
- Includes details on habitat science, trends, issues and research needs
- Addresses the steps NOAA is taking to protect/restore vital national habitats (including Blueprint efforts)
- National and regional fact sheets are available online too.

Comms - 2016 Habitat Science Meetings (TOR 5)

- ✓ EFH 20th Anniversary Summit
  May 17-19, Annapolis, MD
- ✓ World Fisheries Congress Session
  May 23-27, Korea
- ✓ HFA Leadership Workshop
  June 7-9, Oxford, MD
- ✓ Artificial Reef Workshop
  June 9-10, DC Metro Area

EFH Symposium, AFS

August 21-25, Kansas City

EFH Symposium, RAE

December 10-15, New Orleans

Communicating with the Public – Website (TOR 5)

NOAA OFFICE OF SCIENCE AND TECHNOLOGY
NATIONAL MARINE FISHERIES SERVICE

S&T Home
Recreational Statistics
Commercial Statistics
Cooperative
Observer Pro
Marine Mamm
Ecosystems
Stock Assess
Economics
Human Dimer
Apps & Tech
Climate
About Us
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Newsroom

ECOSYSTEM SCIENCE

2010 HABITAT ASSESSMENT IMPROVEMENT PROJECTS

Relating Population Abundance of Groundfish Species to Habitats Using Predictive Models and Broad-scale Seafloor Maps

Principal Investigator: Mary Yoklavich
Co-Principal Investigator: Lisa Wedding

Deep rocky banks and outcrops, underwater pinnacles, and submarine canyons are important habitats for hundreds of species of demersal fishes in California waters. Rocky areas on the continental shelf and upper slope off central California are dominated by more than 40 species of rockfishes, of which seven have been declared overfished by NOAA Fisheries. Sedentary rockfishes living in heterogeneous high-relief rocky habitats are particularly difficult to appraise accurately with conventional methods such as bottom-trawl gear. The first objective of this project is to develop statistical models that predict densities of individual demersal fish species and multispecies fish assemblages over broad spatial scales. We will base these models on a number of associated habitat variables (e.g. depth, substratum type, patch size and configuration) and the densities of co-occurring fish species, using a subset of our database from central California. Issues related to spatial scale also will be explored. The second objective is to couple these models with the broad-scale seafloor habitat maps in a geographical information systems (GIS) environment to forecast fish densities on a regional basis. Such efforts have been limited in deep water systems because of the lack of detailed habitat maps from which broad-scale fish densities can be derived. The recent availability of detailed and accurate habitat maps from the multibeam-acoustic surveys of the seafloor within California's territorial waters makes this proposed effort possible. From these predictive models and maps of density for various demersal species, population size (total abundance and biomass, when coupled with size composition) can be estimated in the study area. , in addressing such needs as (1)

Project # 10-003

InPort ID#

Region
Southwest Fisheries Science Center (SWFSC)

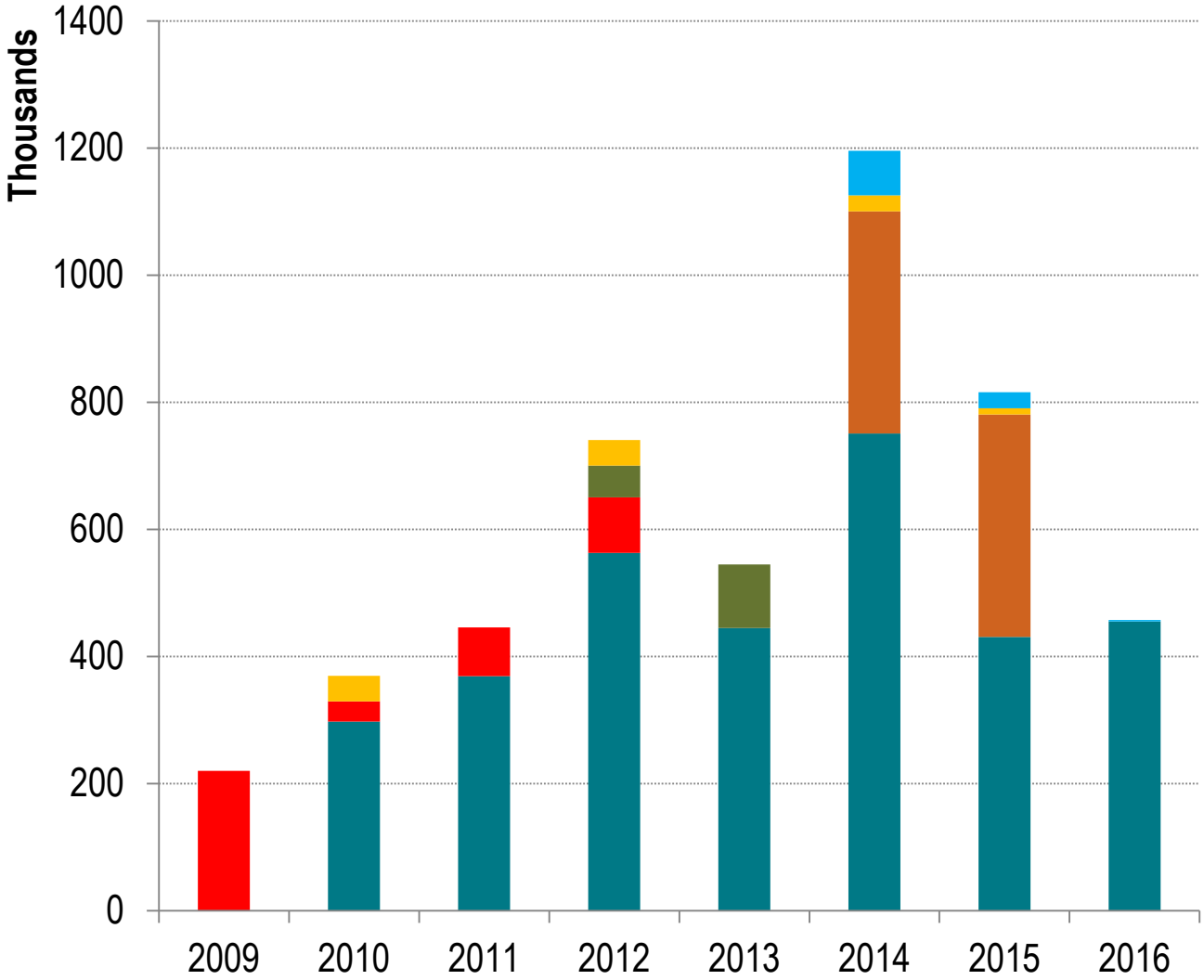
Reports
Annual Report – Year 1
Annual Report – Year 2

Publications & Presentations
Habitat-based Predictive Models and Maps of Rockfish Abundance off California

Media & Other Products
SWFSC Project Site

- Program overview
- Publications
- Prioritization
- Projects
- Workshops
- http://www.st.nmfs.noaa.gov/ecosystems/habitat/funding/projects/index

Habitat Science Budget



Staffing in Assessment & Monitoring Division

- 1 FTE, 2009-present
- ½ - 2 contractors
- ½ Knauss fellow

Other
Workshops
Inshore-Offshore
HFA
NFHP
Internal Projects

Questionnaire Response Summary

- Need greater integration across all of the ecosystem program components
  - Overlap between programs and artificial distinction between programs confusing
  - Internal proposal requests better coordinated or combined
- Habitat science often viewed separately from ecosystem science in some parts of agency
  - Spatial component (i.e. habitat) is one of building blocks for successful EBFM
- We need to continue operationalizing habitat science
  - Incorporation into stock assessments
  - Providing Level 2-4 EFH data for managers

Major Take Home Messages

- Continued support of habitat science meets the needs of NMFS science & holistic management priorities, especially in light of climate change.
- Foundational habitat science makes for more ecologically robust stock assessments, and is needed for the agency to implement EBFM
- Habitat science provides for scientifically sound habitat conservation, protection, and restoration.
- Currently the focus is on fished species (MSA), very little attention to ESA listed species (critical habitat, MMPA)

Habitat Science - Strengths

- Cross-cutting need of the agency
- High levels of expertise within agency
- High level of interest and persistence amongst field and HQ staff
  - Increased communications across Centers/Regional Offices / NOAA
  - Represent needs and capabilities of NMFS broadly
- Significant accomplishments despite limited resources
  - —Implementing many of the HAIP recommendations
  - —Improving stock assessments and use of survey data

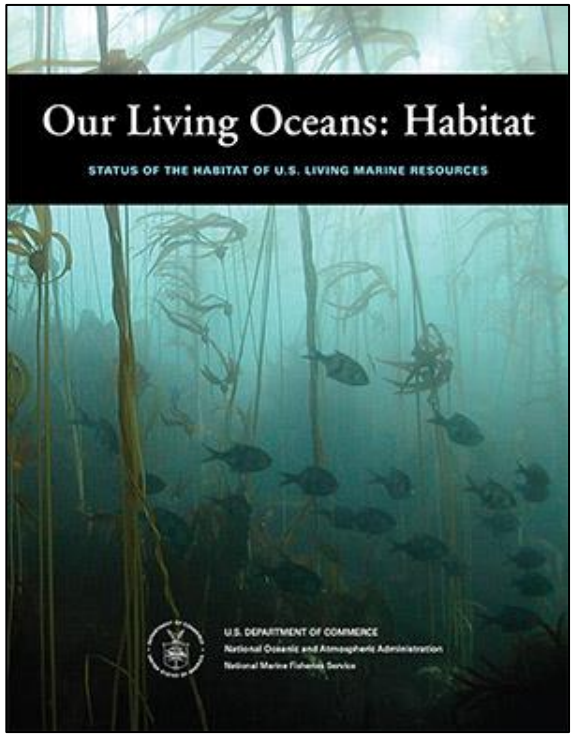
Habitat Science - Challenges

- Not enough resources to fully exploit / maximize the expertise of the field staff overall
- Little funding for many aspects of habitat science
  - EFH, restoration, and ESA-listed species critical habitat
- Not well integrated with other "ecosystem science" components within S&T/HQ and NMFS Science Centers
  - A lower priority in many Science Centers
- Disconnect: Science Center research focuses on offshore habitat – Regional Office managers focus on human activities occurring within coastal/nearshore habitats
- Narrow scope (Stock Assessment, 1-2 yr) of internal proposal funding limits progress/success
- Pres Bud ≠ Real $$

Habitat Science - Solutions

- Increased communication, coordination, and integration amongst ecosystem staff within S&T and field.
  - Transfer FTE into Mar Eco Division
- Increase external partnerships (Navy, BOEM, USGS, ACoE).
- Revamp internal proposal process.
  - Merge or coordinate with others
  - Reconsider size and scope
  - Explore more strategic and less tactical projects
- Continue to leverage work across our NOAA Line Offices on “hot topics” such as ecoforecasting, climate change, and HFAs.
- Develop stakeholder/congressional outreach strategies & budget promotion.
- Revisit HAIP to include restoration and protected species habitat research.

For More Information



NMFS Habitat Science Website
http://www.st.nmfs.noaa.gov/ecosystems/habitat/

Our Living Oceans: Habitat
http://st.nmfs.noaa.gov/ecosystems/habitat/plans/olohabitat

NOAA Habitat Blueprint
http://www.habitat.noaa.gov/habitatblueprint/

NOAA-NMFS Office of Habitat Conservation
http://www.habitat.noaa.gov/

NOAA Habitat Policy
http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-117.html

Backup slides

NMFS Habitat Science Working Group

AFSC - Bob McConaughey

NWFSC - Correigh Greene, Waldo Wakefield

SWFSC - Mary Yoklavich

PIFSC - Michael Parke

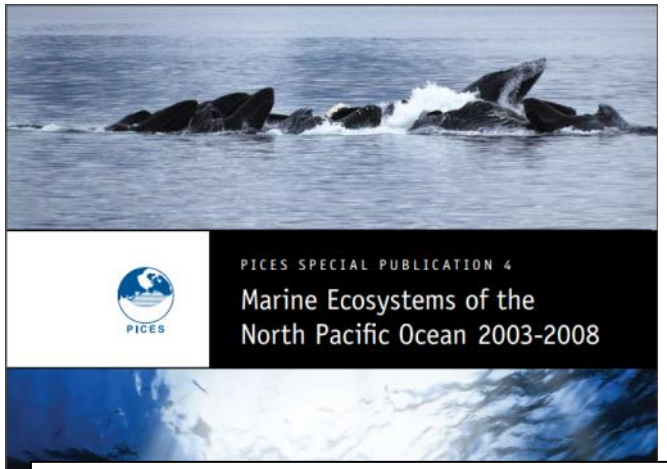
SEFSC - Tom Minello

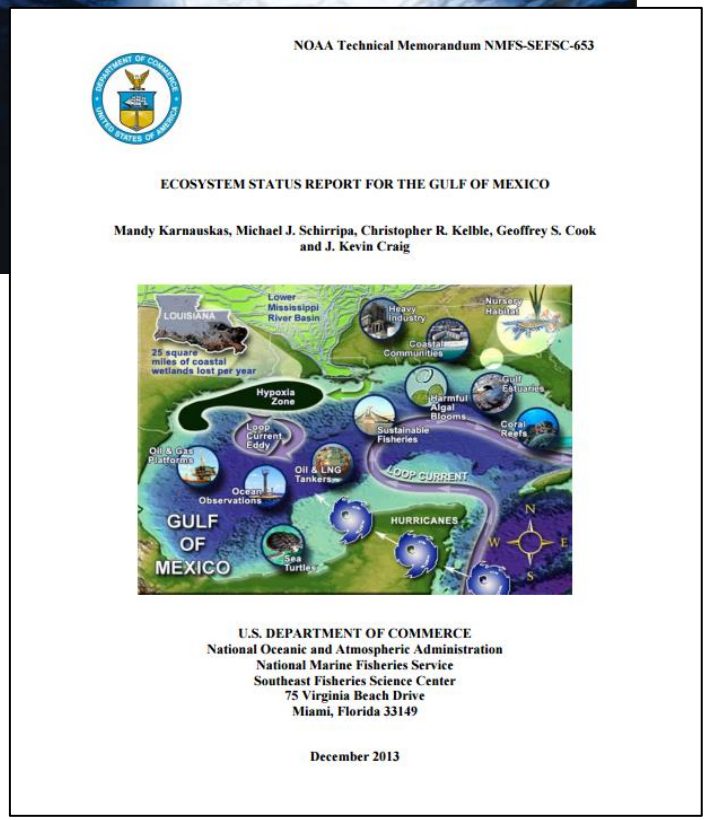
NEFSC - Thomas Noji, Vincent Guida

OHC - Terra Lederhouse

S&T – Kirsten Larsen, Steve Brown, Tony Marshak

Ecosystem Status Reports





NOAA Technical Memorandum NMFS-SEFSC-653

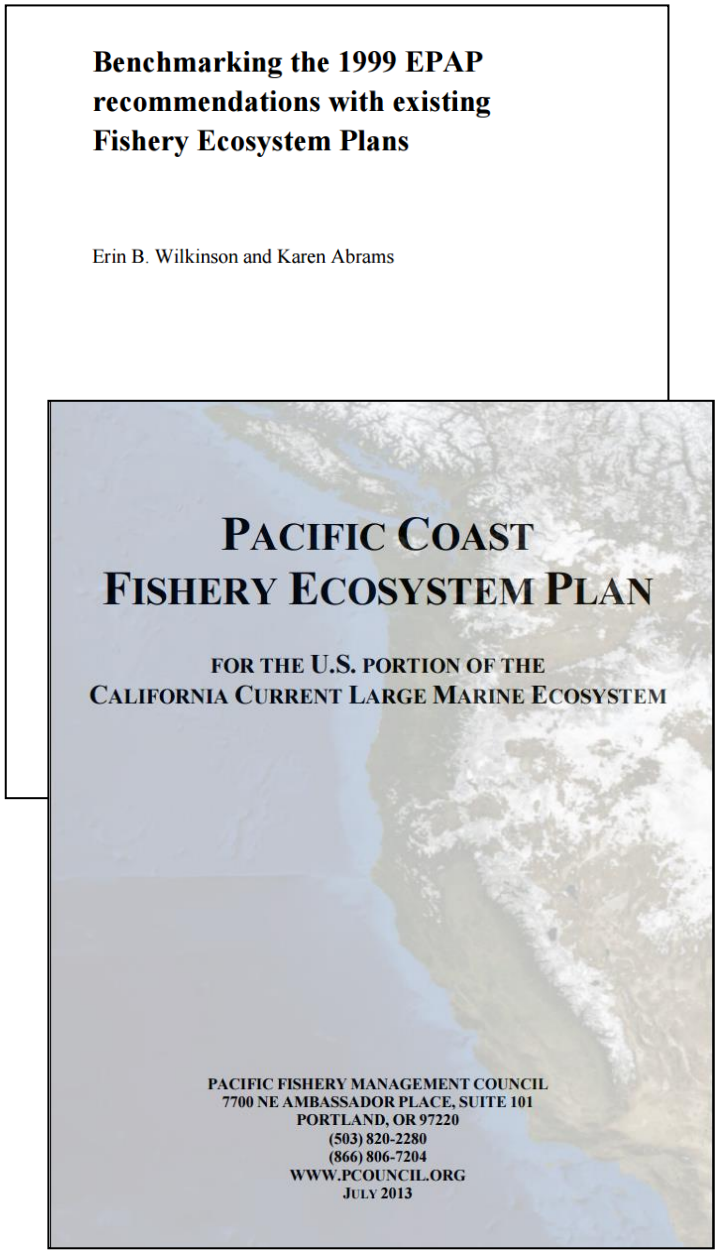
ECOSYSTEM STATUS REPORT FOR THE GULF OF MEXICO

Mandy Karnauskas, Michael J. Schirripa, Christopher R. Kelble, Geoffrey S. Cook and J. Kevin Craig

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, Florida 33149

December 2013

- Regional status reports emphasize FSC **ongoing habitat science needs/priorities**:
- AFSC – Examining trawl closure impacts on fisheries, and **climate effects** on salmon spawning habitat.
- NEFSC/California – Impacts of habitat loss & improving resolution to examine the relations of habitat-production.
- GOM – More available information on habitat, but need finer-scale spatiotemporal data, and need to consider effects of loss/degradation with population growth and climate.



Fishery Ecosystem Plans*

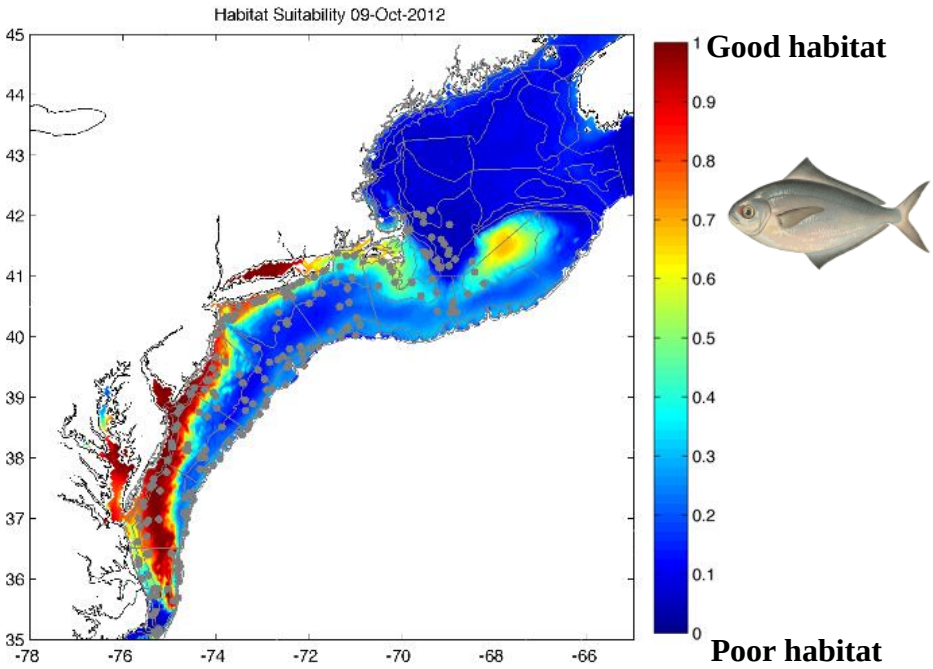
- Many FEPs still lacking information on basic habitat needs for life stages of significant food web species.
  - 0% have fully incorporated habitat descriptions, although 100% partial incorporation.
- FEPs still need to consider how habitat needs should be addressed in conservation and management.
- Key to enhancing these plans is continued information on foundational habitat delineation, status, and trends – **for which more data are needed**.

*Not all Councils have FEPs

Funded Study (TOR 3)

2012/14: John Manderson et al. (NEFSC)

- Inserted temperature-dependent butterfish fluctuations into population estimates.
- Accounts for abundance shifts & habitat-dependent survey error.
- Stock was not overfished, and overfishing was not occurring.
- **2014-15**: Butterfish landings quota was increased 7-fold, from **3.2 million** pounds to **22.5 million** pounds



Butterfish plentiful: Mid-Atlantic council green lights 22,530-mt directed fishery

12 • COMMERCIAL FISHERIES NEWS • SEPTEMBER 2014

There's a promise that butterfish markets are being developed now and there's a place for these fish.

—Laurie Nolan

Funded Study (TOR 3)

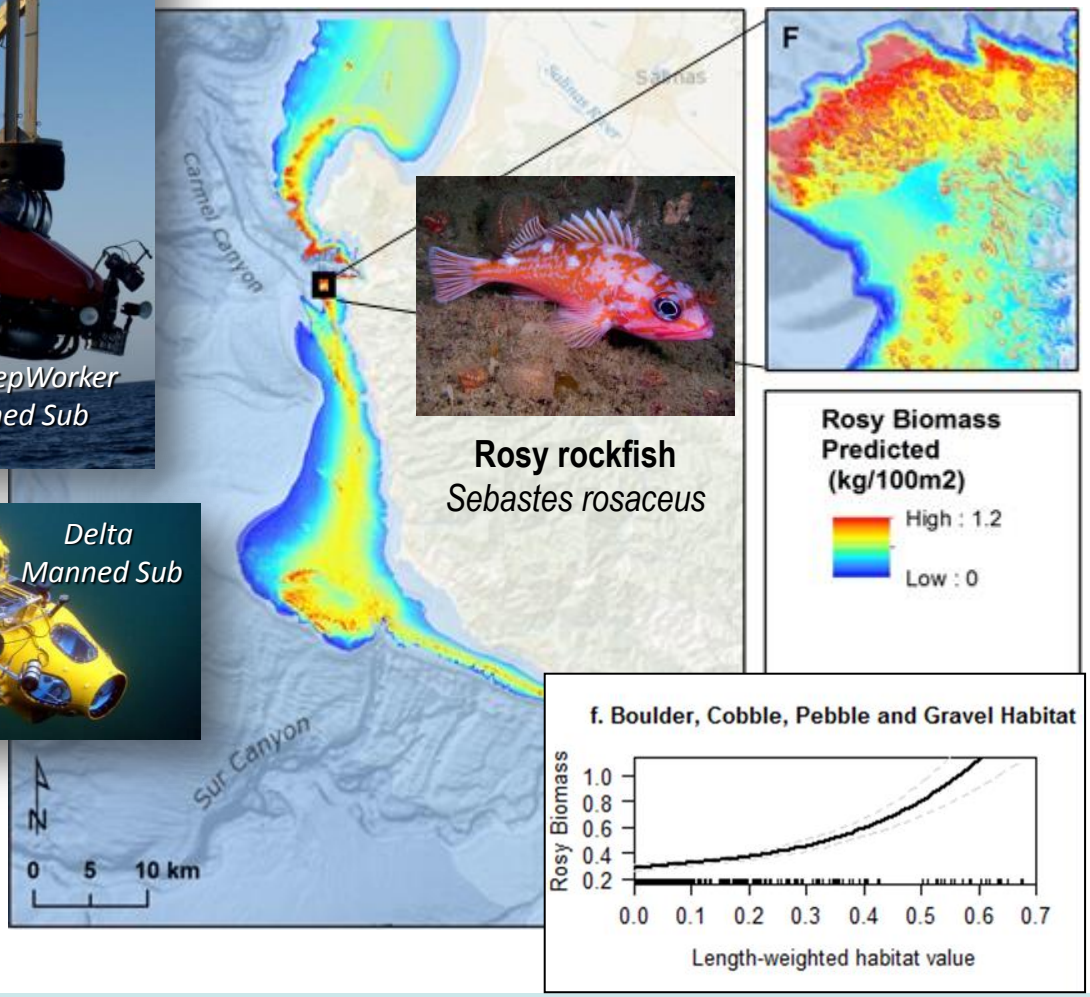
2010/12: Mary Yoklavich et al. (SWFSC)

Examined habitat-specific relationships

Habitat-based predictive models of groundfish abundance.

- Estimate total biomass
- Habitat capacity
- Prioritize habitats for conservation
- Evaluate risks to rockfish stocks.

Maps of density and biomass predicted from environmental covariates

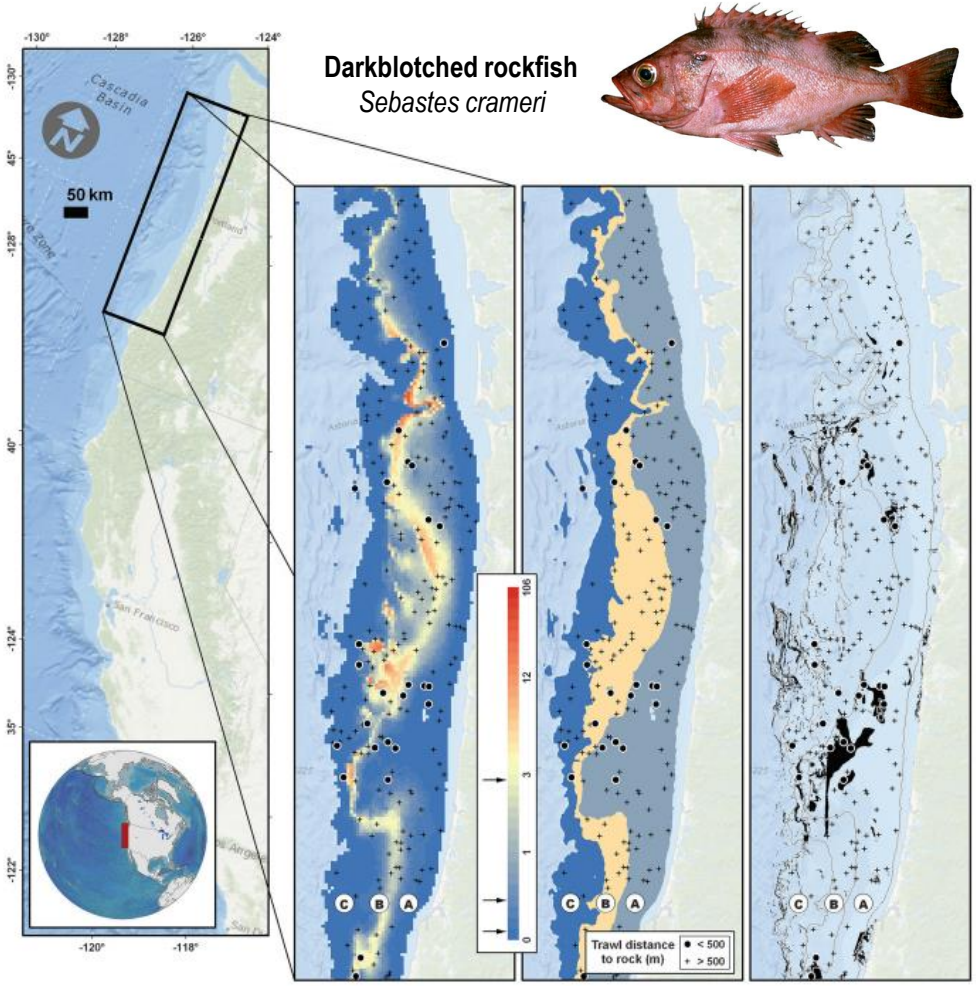


Rosy rockfish
Sebastes rosaceus

Funded Study (TOR 3)

2013-14: Andrew Shelton et al. (NWFSC)

- Integrated spatial habitat & fisheries effort data.
- Improves abundance estimates for west coast groundfish species.
- Precise habitat models improve estimates of SA biological parameters, and more accurate stock status.
- Study applied to large-scale Integrated Ecosystem Assessment for the California Current.

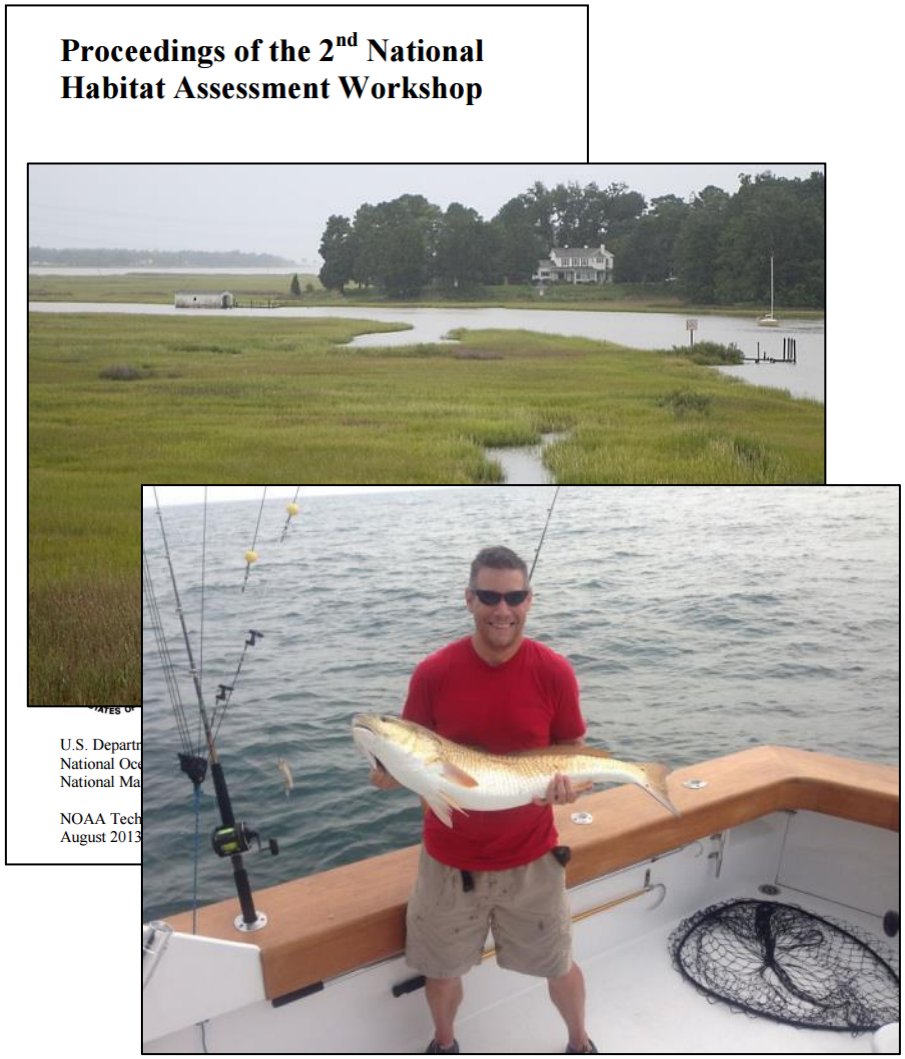


TOR 4 - Habitat Information in Stock Assessments

A more strategic approach for the proposal request process:

- Currently for short-term, small-scale habitat studies
- Difficult for data-poor regions to be successful
- Suggestion - Strategic initiatives for broader studies that complete a project, not just steps toward completion
  - >2 years
  - Cross-subject collaboration (FATE, ISA, COCA, etc.)

Advancing Habitat Science, Conservation, Management



- **At NHAW II:**
  - The **quantitative** link between **inshore habitat and offshore fisheries production** was identified as a high priority knowledge gap.
- **Three pilot projects were supported to examine these relationships upon:**
  - N Atlantic Diadromous Fish
  - Mid-Atlantic Summer Flounder
  - W Coast Nursery Habitat
- Results have been presented at conferences including RAE, AFS, and CERF.

Inshore-Offshore: North Atlantic Pilot Project

Restoring Access to Diadromous Fish Habitat and Linkages to Forage Fish Biomass in the North Atlantic Large Marine Ecosystem

W. Patrick (NMFS-SF), T. Miller (U Maryland), and J.P. Walsh (E Carolina Univ.)

Goal:

- Predicting long-term ecological/economic benefits of restoring diadromous fish habitat & estimating pristine population abundances.

Progress:

- Large declines of American Shad and River Herring from original conditions.

- Resulted from loss of habitat quality and accessibility over time (damming).

Inshore-Offshore: Mid-Atlantic Pilot Project

Parameterizing the Relationship Between Inshore Habitat Quantity & Quality and Summer Flounder Production

H. Townsend (NCBO), T. Ihde (NCBO), D. Stevenson (GARFO), J. Manderson (NEFSC)

Goal:

- Quantify **cumulative impacts of inshore habitat loss & degradation** on survival/production **of juvenile summer flounder**.

Progress:

- Incorporating ASMFC Fish Habitat Program data into **Chesapeake Atlantis Model (CAM)**.
- Strong impacts of salt marsh loss on forage fish
- Broad-scale effects habitat change on summer flounder.

Inshore-Offshore: West Coast Pilot Project

Pacific Marine and Estuarine Fish Habitat Partnership Nursery Assessment

PMEP Steering Committee and Assessment Team
(K. Blackhart, C. Greene, K. Schaefer, J. Bragg et al.)

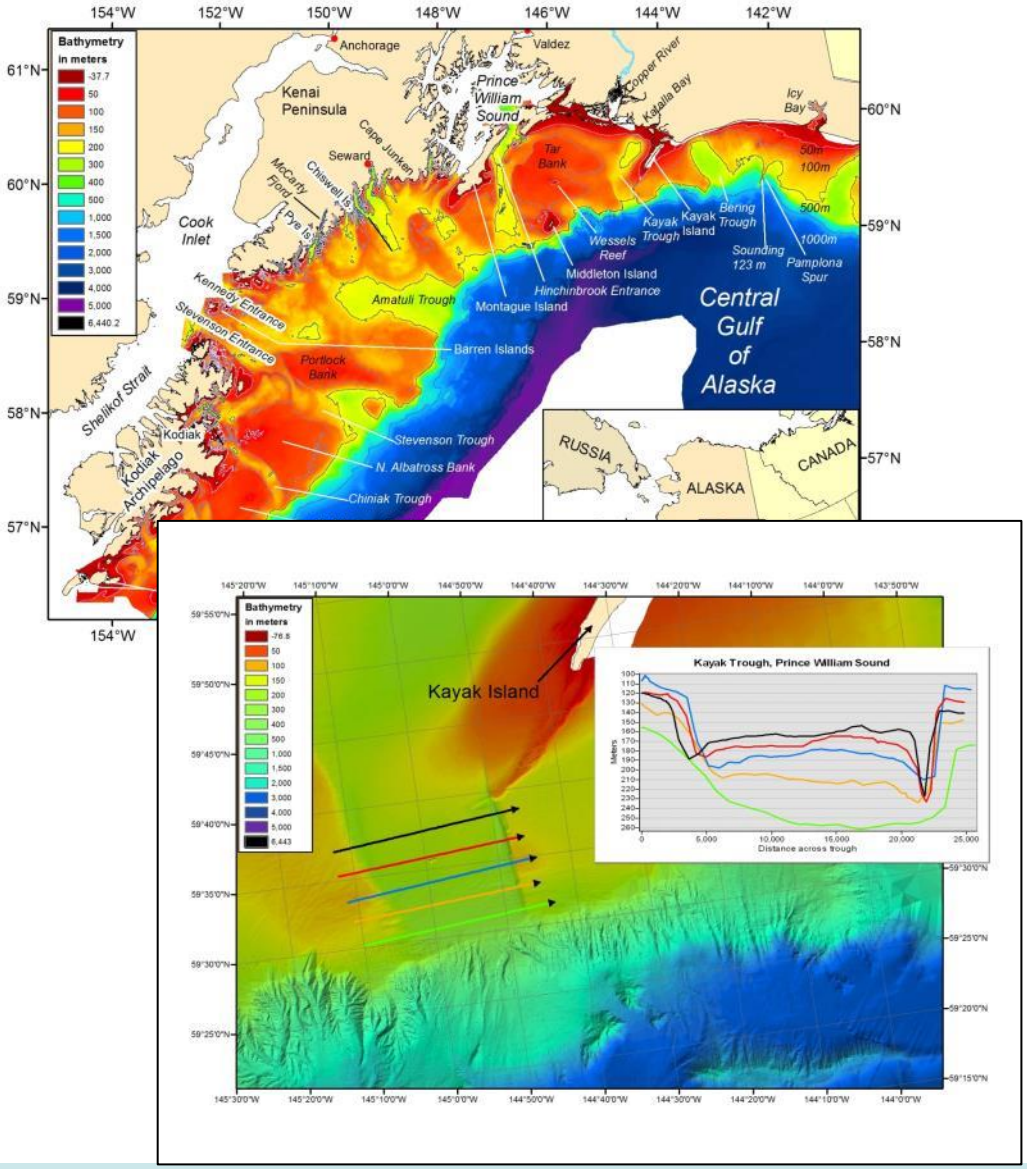
Pacific Marine & Estuarine Fish Habitat Partnership

Goal: Identify key threats and limiting factors to juvenile fish, and describe the role of nearshore habitats to offshore stock recruitment.

Progress:

- Inventory/classification of W Coast estuaries.
- Refined spatial framework to support modeling efforts.
- Ongoing collection of fish abundance and habitat quantity/quality data.
- **State of the Knowledge Report** on 15 species that utilize estuary nursery habitats

Science for EFH Consultations

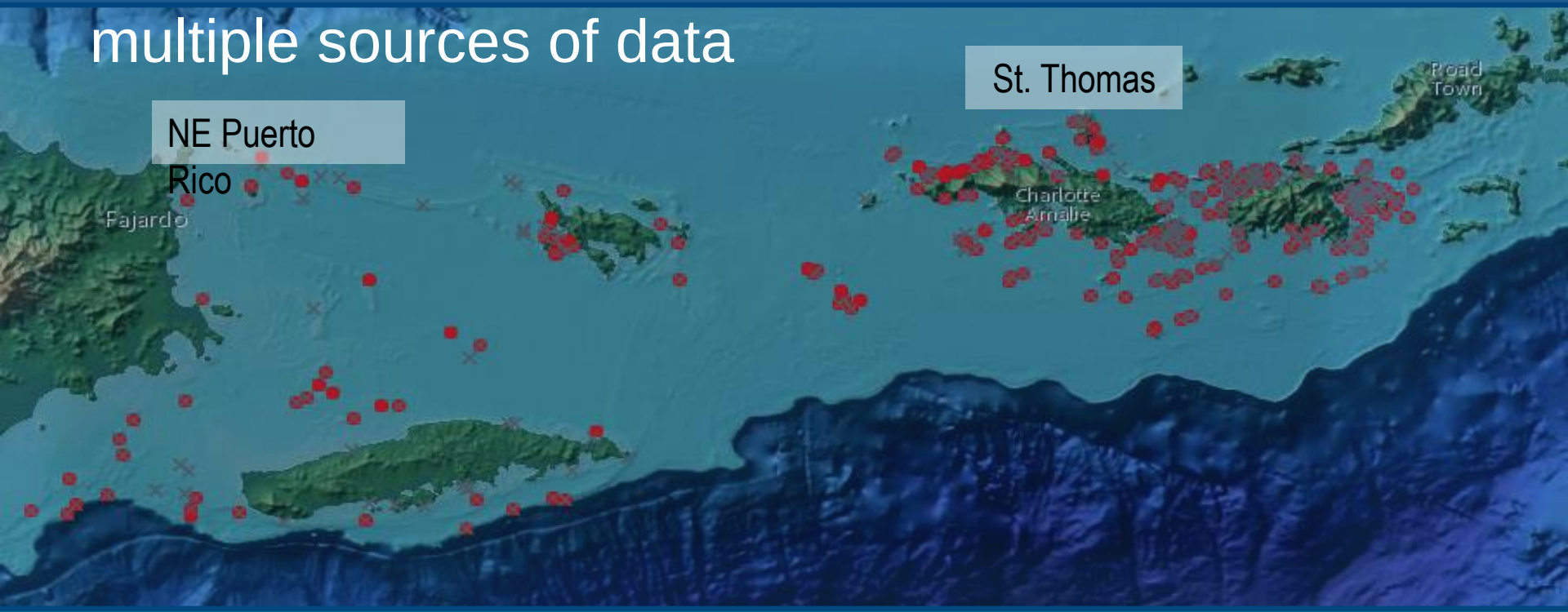


2014 Eagleton et al. (AKRO)

- Surveyed Gulf of Alaska and Norton Sound fish habitat & benthic substrate
- Biogenic information incorporated into habitat impacts models:
  - **refined Alaska EFH** and moved species descriptions to **Level 2 density information**.
- Resulted in data-driven predictions of the 95% species distribution range.
- Enhanced habitat-based modeling for Stock Assessments.

Coral Demographics Toolbox

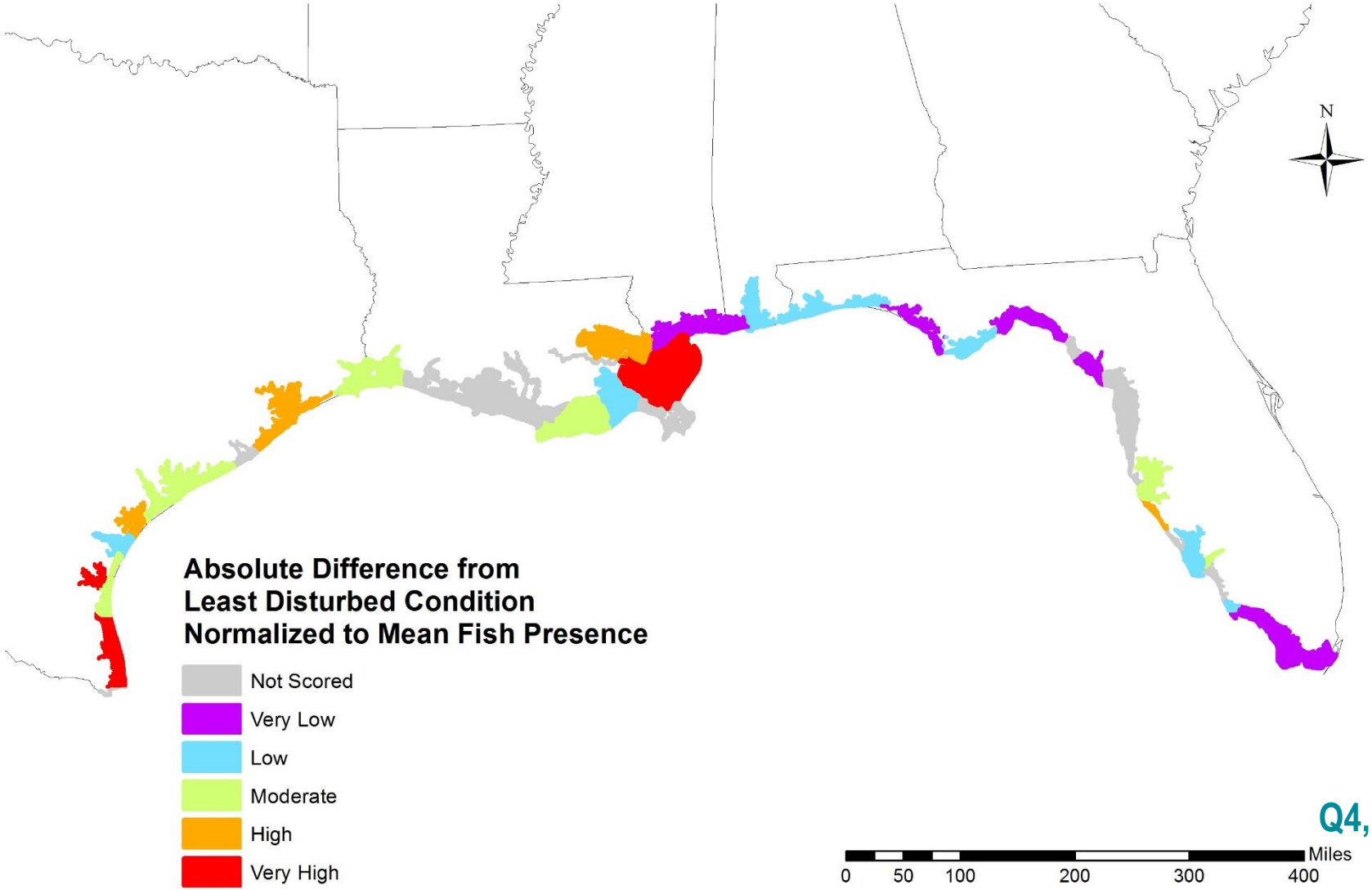
- Caribbean ESA-listed corals are primary reef builders
- $200,000 per year for three years
- Develops predictive, user-friendly tools to help access and visualize status and trends of corals based on multiple sources of data



Caribbean Coral Restoration Workshop

- Restoration is a key tool for long term preservation of shallow water coral reef ecosystems
- International, academic, agency, and NGO participants
- November 15-17, 2016 in Fort Lauderdale, Florida
- Primary objectives are to:
  - transfer scientific research into actionable restoration techniques,
  - transfer technical knowledge from experienced to budding nursery operators, and
  - scale up restoration activities to the ecosystem level
- Funded by multiple NOAA programs, in collaboration with The Nature Conservancy, Pew, Florida Fish and Wildlife Commission, Nova Southeastern University

TOR 4, 5 - NFHP 2015 Gulf Regional Estuary Assessment



Q4, Q5

NFHP 2010 Assessment

- Award for “Scientific Achievement in support of Fish Habitat Conservation”