***California Ocean Protection Council***
***California Department of Fish and Wildlife***
***Moss Landing Marine Laboratories***

# Meeting Summary

## Deep-Water Marine Protected Area Monitoring Workshop

**April 19, 2017; 10:00 AM – 6:00 PM**
**April 20, 2017; 8:00 AM – 2:00 PM**
**Seminar Room**
**Moss Landing Marine Laboratories**
**8272 Moss Landing Drive, Moss Landing, CA 95039**

**WORKSHOP ATTENDEES**

| Name | Organization | Attendance |
|---|---|---|
| Carrie Bretz | California State University Monterey Bay | Wed |
| Rachel Brooks | MLML | Wed/Thurs |
| Mark Carr | Department of Ecology and Evolutionary Biology - Long Marine Laboratory | Wed/Thurs |
| Jenn Caselle | Marine Science Institute - University of California, Santa Barbara | Wed/Thurs |
| Cyndi Dawson | Ocean Protection Council | Wed/Thurs |
| E.J. Dick | NOAA NMFS SWFSC - Santa Cruz Laboratory | -- |
| Ryan Fields | MLML | Wed/Thurs |
| Mary Gleason | TNC | Wed/Thurs |
| Kristen Green | Stanford University | Wed |
| Scott Hamilton | MLML | Wed/Thurs |
| Katie Kaplan | OPC | Wed/Thurs |
| Tom Laidig | NOAA NMFS SWFSC - Santa Cruz Laboratory | Wed/Thurs |
| Andy Lauerman | MARE | Wed/Thurs |
| James Lindholm | California State University Monterey Bay | Wed/Thurs |
| Melissa Monk | NMFS - Santa Cruz Laboratory | Wed/Thurs |
| Steven Morgan | UCD - Bodega Marine Laboratory | Wed/Thurs |
| Becky Ota | CDFW Marine Region | Wed/Thurs |
| Nick Perkins | OPC | Wed/Thurs |

| | | |
|---|---|---|
| **Mike Prall** | **CDFW** | Wed/Thurs |
| **Dirk Rosen** | **MARE** | Wed/Thurs |
| **Ben Ruttenberg** | **Cal Poly** | Wed/Thurs |
| **Rick Starr** | **MLML** | Wed/Thurs |
| **Brian Tissot** | **Humboldt State University** | -- |
| **Jessica Watson** | **ODFW** | Wed/Thurs |
| **Steven Wertz** | **CDFW** | Wed/Thurs |
| **Lauren Yamane** | **OPC - UC Davis** | Wed/Thurs |
| **Eric Poncelet** | **Kearns & West (facilitator)** | Wed/Thurs |
| **Zach Barr** | **Kearns & West (facilitator)** | Wed/Thurs |

## INTRODUCTION

The California Ocean Protection Council, the California Department of Fish and Wildlife, and Moss Landing Marine Laboratories convened a two-day workshop in Moss landing on April 19-20, 2017 engaging deep water ecosystem monitoring experts in discussions around developing a deep-water ecosystem monitoring framework to support statewide marine protected area (MPA) monitoring, including monitoring of both individual MPAs and California's MPA Network.

The objectives of the workshop were to: 1) discuss and identify the most important MPA monitoring questions to address, including adaptive management questions; 2) identify which taxa and habitats are most important to monitor to address the monitoring questions; and 3) limit the range of possible objectives related to monitoring.

The workshop was structured into discussions of the following four main topic areas (see Appendix A for the full agenda):

1. Structure, function, and integrity of ecosystems
2. Taxa
3. Metrics
4. Adaptive management

The sections below capture the key outcomes of the workshop's breakout session and plenary discussions.

## KEY OUTCOMES

### Topic 1: What does "Protecting the structure, function, and integrity of ecosystems" mean with respect to MPA monitoring?

1. ***In individual MPAs across the network, do focal and/or protected species inside of MPAs stay the same or increase in size, density, and biomass relative to areas of similar habitat adjacent to and distant from MPAs?***
    - Our primary task is to determine if this question is sufficient to address the goals of the MLPA
    - Abundance and size of species can be measured in a reasonable way and are of interest. However, productivity is really important for ecosystem function/services
    - How we define habitat and function is important
        - Important to be able to justify species importance
    - Need to be able to answer stakeholder questions about MPA goals, is it more about what's inside or outside?
        - Effectiveness of MPAs is related to species abundance outside MPAs
    - Need a discussion on community metrics vs. focal species – Do we measure community level responses (e.g. diversity), or do we have focal species that we monitor through time as representative of the entire community
    - **Summary questions from South Coast Monitoring Plan (Jenn Caselle)**
        - ***"What is the current condition or state of communities inside and out of MPAs?"***
            - Use of focal species and ecosystem level patterns
        - ***"How does the baseline state of communities change over time?"***
            - Need for the use of the same metrics over time in order to monitor change
        - ***"Are there changes in community level dynamics inside and out of MPAs?"***
            - Important to look at how density and/ or mean are changing over time, or increasing/decreasing variance through time
            - Changes in focal species densities can relate to the ecosystem function that might change over time
        - **ULTIMATELY:** ***"What is it like now? How are things changing over time, and can we look at other metrics other than density or mean counts"***

2. ***Do species richness and/or diversity stay the same or increase in MPAs relative to areas of similar habitat adjacent to and distant from MPAs?***
    - **Key question**: ***Should we focus on focal species or species composition?***
        - Target focal species but collect additional community data, habitat data, etc. secondarily
        - If the right sample design is chosen, can approximate a full community study without having to invest in one
            - Video surveys provide the opportunity to go back and get more information when new questions come up
        - Functional diversity and functional richness provides a better means of assessing ecosystem health compared to taxonomic diversity
        - Need to have the capacity to capture unanticipated environmental stressors (long term) as well as fishing pressure (short term)

        - Need to collect info on additional species beyond fisheries species –design study to collect a variety of data
    - Size and density are tractable, measureable, and more likely to see a change-so should be included

### 3. *Can we monitor a series of MPAs (distributed along the coast) and consider results to be representative of the overall MPA network performance?*

- Sampling intensity in a few MPAs vs. sampling less intensively in lots of MPAs?
- Instead of sampling each MPA individually selectively sample and then characterize regions as a whole
- Look at change over time and space – in/out differences should be detectable
- Target habitat focus → rocky reefs, justification: concerns with fishing, state guidelines prioritize rock, however, context of habitat around any rocky reef is important
    - Secondary habitat focus include sandy bottoms

### 4. *What other ways can the state determine if MPAs are protecting the structure, function, and integrity of ecosystems?*

- Need to come up with approximate measure of fishing pressure and human impact → compare MPAs to areas outside MPAs
    - Important to estimate local F (fishing mortality) – can help with site section in terms of where we would see the greatest response
    - Match ROMS modeling with MPA sampling – better understand fish recruitment data (paucity of recruitment data in deep water habitats)

## Topic 2: Which taxa are best used to assess the performance of the CA MPA Network at protecting marine wildlife, rebuilding depleted populations and protecting the structure, function, and integrity of ecosystem?

### Breakout Group Discussion:

**Region 1 North Coast Participants**: ***Cyndi Dawson, Katie Kaplan, Andy Lauerman, Nick Perkins, Jess Watson, Steven Morgan, Melissa Monk***

**Region 2 Central Coast Participants:** ***James Lindholm, Scott Hamilton, Becky Ota, Kristin Green, Mary Gleason, Steven Wertz, Mike Prall, Rick Starr***

**Region 3 Southern Coast Participants:** ***Carrie Bretz, Jenn Caselle, Ben Ruttenberg, Steve Wertz, Lauren Yamane***

### 1. *Which taxa are sufficiently abundant to enable statistically significant estimates of changes in the metrics identified in Appendix 1?*

## Region 1 North Coast:

- Suggested taxa (with rationale):
  - Metridium and hydrocorals, seawhips – Structure/function species, some are groups of multiple species but fill the same functional role
  - **Commercially important species**:
    1) Gopher Rockfish
    2) Lingcod
    3) Quillback Rockfish
    4) Vermilion Rockfish
    5) Canary Rockfish
    6) Yelloweye Rockfish
  - Avoid destructive sampling (trawl, hook-and-line) instead use video survey tools

## Region 2 Central Coast:

- **Exclude black corals** – *not sufficiently present, mostly in southern habitats*
- **Soft Bottom Habitat:**
  1) Sea whips
  2) Sea pens
  3) Brittle stars
  4) Sea cucumbers
  5) Halibut
  6) Starry flounder
  7) Sanddabs
- **Hard Bottom Habitat**:
  1) Large sponges – fish habitat
  2) Large solitary – fish habitat
  3) Sea cucumbers
  4) Rockfishes – Vermillion, Canary, Olive, Yellowtail, Blue, Kelp, Rosy, Boccacio, Dwarf Rockfishes, Greenspotted, Greenstriped, Brown
  5) Ratfish
  6) Spot prawns
  7) Thornyheads
  8) Long nose skates

## Region 3 Southern Coast:

- **Developed a criteria for high priority fish:**
  - Fished (1)
  - Non-fished (2)
  - Threatened/endangered (3)
  - Ecosystem engineers/habitat forming (4)
  - Important prey species (5)
  - Trophic function (6)
  - Aggregations (7)

- Cross depth (8)
- Climate change sentinels (9)
- Abundant enough to statistically assess (10)
- Identifiable on video (11)
- Keystone (12)
- Large range (13)

- **Assigned species to different tiers**
  - ***Tier 1 (T1)*** – high importance, contribute economically
  - ***Tier 2 (T2)*** – secondarily captured, wouldn't necessarily design a monitoring project around them
- **Hard Bottom Species:**
  1) CA Sheephead (1,8,10,11,12) T1
  2) Lingcod (1,8,10,11,13) T1
  3) Gopher/Copper Rockfish (1,5,8,10,11,13) T1
  4) Vermillion/Canary/Yelloweye Rockfish (1,10,11,13, Canary and Yelloweye also 3) T1
  5) Halfbanded and Squarespot Rockfish (2,5,10,11,13) T1
  6) Aurora/Splitnose Rockfish (1,13,10,11) T1
  7) Cowcod/Bocaccio (1,3,11,13) T2
  8) Abalone (3) T3
  9) Sea cucumber (1,8,10,11) T1
  10) Lophelia (coral) (9,4,11) T2 not habitat forming, limited MPA effects
  11) Habitat forming inverts (sponges, anemones, etc)(4,10,9,8,11 at least to group,13) T1
  12) Box crabs (1) T2
  13) Sheep crab (1,10) T2
  14) Rock crab (1) T2
  15) Lytechinus (urchin) (5, Sheephead prey) T2
  16) Brittle stars (4) T2
  17) Sea stars (Pycnopodia, Arastia, Bat star, Henricia, Solaster)(12, Pycnopodia is 8) T2
  18) Black seabass (3) T2
  19) Ocean whitefish (1,11) T2
  20) Scorpionfish
  21) Elk kelp T2
- **Soft Bottom Species:**
  1) Barred sandbass T1
  2) Sanddabs T2
  3) Pink surfperch
  4) Angel shark T2
  5) Ridgeback prawns
  6) Angel sharks

## *2. Which taxa are not sufficiently abundant but should be monitored anyway, and why?*

### Region 1 North Coast:

- Response nested in question one

### Region 2 Central Coast:

- **Hard Bottom Habitat*:***
  1) Yelloweye Rockfish
  2) Cowcod

### Region 3 Southern Coast

- Response nested in question one

## 3. *Which of the above taxa can be used to aid in fisheries management?*

### Region 1 North Coast:

- Large commercially important Rockfish and Lingcod
  - These are fished species that are most likely to be impacted by spatial closures

### Region 2 Central Coast:

- Everything listed above as a targeted species – *Especially* species that lack a stock assessment

### Region 3 Southern Coast:

- No response

## 4. *What other taxa will be surveyed in the process of monitoring the focal species?*

### Region 1 North Coast:

- Habitat forming species (gorgonians, hydrocorals, metridium or other invertebrates (sea stars)
- All small fishes that are not focal species – most likely observed

### Region 2 Central Coast:

- Criteria for species selection (assuming the use of a video tool)
  - **Primary target –** Species that are in high enough abundances to be valid under all statistical tests and are economically important
  - **Secondary target –** Species that are rare and patchy enough leading statistical analysis to be difficult
    - "*Secondary*" means sampled opportunistically as an environmental indicator, not of direct importance
  1) Sheephead – Secondary target
  2) Wolfeel – Secondary target
  3) Sablefish – secondary target

4) Dungeness crab – secondary target
5) Basket stars and crinoids – secondary target
6) Colonial anemones – secondary target

### Region 3 Southern Coast:

- No response

## 5. *Are there specific taxa that occur in all parts of the MPA network and that should be monitored to enable an understanding of differences in MPA response across the state?*

### Region 1 North Coast:

- Habitat invert metrics: Counted for density only, no sizing – using categorical approach to measure large groups of inverts
- Rockfish metrics: Density and size
- What are the criteria for choosing fish?
  - Targeted/overfished and depleted species
  - Abundant
  - Expected response to MPA
- Invertebrate criteria:
  - Indicator of structure and function
  - Sensitive to environmental changes
  - Abundant and widespread
- **OVERALL:**
  - Focusing on a few particular commercially and recreationally important rockfish species, we would be able to collect data on many of the other species in the surveyed areas (smaller species and inverts.
  - How about greater than 100 meters? Deeper Canyons were agreed to be difficult to survey. Many people thought they possibly should be avoided by these surveys.
  - Hard to justify direct sampling effort for soft bottom species. Soft bottom species move around so much – and soft bottom habitat shifts too. The power of a soft bottom study would be low.

### Region 2 Central Coast:

- Suggested taxa:
  1) Lingcod
  2) Bocaccio
  3) Widow Rockfish
  4) Kelp Greenling
  5) Black Rockfish

6) Vermillion Rockfish
7) Canary Rockfish
8) Sanddabs
9) Slender Sole
10) Dover Sole
11) Rex Sole
12) Dwarf Rockfish
13) Sea Cucumber
14) Metridium

- Include functional groups that persist across the whole state, even if the members of that group change over time

### Region 3 Southern Coast:

- No response

## Overall Group Report:

***Summary***: **A consensus was that rocky reef should be the focus, with the possibility of some soft bottom sampling. The way to adequately sample soft bottom was not decided upon – because soft bottom habitats are highly variable and may require multiple approaches. The group agreed that monitoring could be conducted using a tiered approach, which focuses primarily on benthic groundfish species such as key Rockfishes and Lingcod. Dwarf Rockfish species were included to measure overall ecosystem health, and some large invertebrates were included as critical habitat forming species. It was assumed that a visual tool would be used so that research teams could go back at a later date and pull out additional information on other species if needed.**

| **Tier 1 Species List**<br>Species with statewide distribution that are of particular interest around which sampling methodology is designed for all regions |
|---|
| Yelloweye Rockfish |
| Vermillion Rockfish |
| Canary Rockfish |
| Copper Rockfish |
| Dwarf Rockfishes |
| Aurora/Splitnose Rockfish (Deeper sampling required) |
| Lingcod |
| CA Sheephead (Regional importance – Southern CA) |

| |
|---|
| Barred Sandbass (Regional importance – Southern CA) |
| Sea Cucumbers (Southern CA fishery) |
| Structure/Habitat forming invertebrates (Large solitary anemones and sponges) |

| **Tier 2 Species List**<br>Species that will be opportunistically surveyed when designing sampling for Tier 1 species (This is not a complete list of possible species). |
|---|
| Bocaccio |
| Cowcod (May require higher rates of sampling to adequately survey) |
| All other Rockfishes (Brown, Gopher, Quillback, Green Spotted, Green Stripped, Widow Rockfish, etc.) |
| Sablefish |
| Ratfishes |
| Long nose skate |
| Black Seabass |
| Ocean whitefish |
| Scorpionfish |
| Sanddabs |
| Angel Shark |
| Starry flounder |
| Halibut |
| Mobile invertebrates (Sea stars, Crinoids, Urchins, Ridgeback prawns, Rock crab, Sheep crab, Box crab) |
| Sessile invertebrates (Lophelia corals, brittle stars) |

# Topic 3: Metrics

## Breakout Group Discussion:

**Group 1:** ***Ben Ruttenberg, Cyndi Dawson, Rick Starr, Andy Lauerman, Steven Morgan, Mary Gleason, Mike Prall, Tom Laidig, Mark Carr, Ryan Fields, Jimmy Williamson***

**Group 2:** ***Nick Perkins, Jenn Caselle, Scott Hamilton, James Lindholm, Becky Ota, Dirk Rosen, Jessica Watson, Lauren Yamane, Katie Kaplan, Melissa Monk, Christian Denny, Rachel Brooks***

## 1. *Assuming some kind of visual tool is used, what metrics (e.g., density, abundance, percent cover, length, biomass, recruitment events, invasive species, marine debris) allow the state to assess the performance of the MPA Network?*

### Group 1:

- **Suggested metrics ranked by importance:**
  1) Density
  2) Biomass
  3) Length distribution
  4) Geospatial location (varying degree of resolution dependent upon tool)
  5) Percent cover and categorical data (Invertebrate and biogenic habitat data)

### Group 2:

- **Suggested metrics ranked by importance:**
  1) Biomass – Assess response or lack of response
  2) Percent cover – Sessile invertebrates
  3) Relief – Physical and biogenic (quantitatively/categorically)
  4) Position – animal relative to habitat
     - Secondary metric, indicative of density changes
  5) Invasive species
     - Secondary information
  6) Marine debris
     - Secondary information
  7) Recruit estimates – Counting number of Young-Of-Year (YOY)
     - Secondary metric – opportunistically

## 2. *What level of accuracy of sizing of individuals is needed?*

### Group 1:

- Strive for 1cm resolution – functionally as close as possible to real life
- Bin later for higher groups
- 1cm resolution needed for newer models

### Group 2:

- No definitive answer
- Need to know precision and error of size measurements
- Transparency of tools limitations when presenting results

## 3. *Should recruitment be measured?*

### Group 1:

- Identify YOY's whenever possible
    - Secondary measurement – return to video recording later

### Group 2:

- Measure YOY clouds and attempt to count individuals
    - Secondary measurement – return to video recording later

## 4. *What analytical/statistical approaches to handling the data provide the highest likelihood of detecting change?*

### Group 1:

- **Two conflicting issues:**
    1) Need statistically rigorous design that may require long timelines to collect data, but will be the most defensible (rigorous regional study every few years)
    2) Political tension to have data quickly in order to show stakeholder that there is progress being made and that the MPAs are having some effect
- **Solution:**
    - Start sampling sites that have time series data – subset those by which sites we will see MPA effects
        - Most likely sites closer to ports and easier to sample
        - Less likely to see responses up North – potentially allocate less resources

### Group 2:

- Randomly sample quadrats along transect
- Aggregate analysis across species
- Habitat suitability analysis – Model habitat associations and perhaps look at how particular MPA's are likely to impact fish populations based on available habitat

## 5. *What is an effective yet cost efficient, frequency of sampling needed to detect significant changes over time?*

### Group 1:

- Start sampling sites that have time series data – subset those by which sites we will see MPA effects
    - Most likely sites closer to ports and easier to sample
    - Less likely to see responses up North – potentially allocate less resources

### Group 2:

- Subregion approach to sampling: Rotate sites within the subregion
    - Core sites – sample multiple times and consistently (not every year)
    - Ancillary sites – rotating between sites (sampled less frequently)

- All MPA's would eventually be sampled – Fisherman less likely to be angry

## Topic 4: Adaptive Management questions to address in a long-term monitoring plan: which questions would require specific studies, and which ones could be answered by any monitoring design?

1. ***What is the minimum number of MPAs that should be monitored?***
   - **Two different models proposed, based on $500,000 budget:**
     - **1)** 6 core sites spread across regions
       - Use similar tools across all 6 sites
     - **2)** Separate coast into two regions
       - Core sites sampled each year alternating between the two regions
         - 8 sites per region
         - Use cheaper tools to sample other sites within region

   Note: these numbers were based on the assumption of limited available funds for monitoring, the group agreed that more funding is needed and warranted for deep-water surveys and $500,000 is not enough to survey the entire coast annually.

2. ***Are there differences in ecosystem responses based on clusters of MPAs vs. stand-alone MPAs?***
   - Do clusters vs. non-clusters react differently? (A cluster of MPA's here is defined as two MPA's paired together like an SMR and SMCA next to each other)
   - Won't be able to answer this question in deep water ecosystem – Doesn't make sense to design long-term study for this question

3. ***What are the population effects of siting MPAs in larval source or sink locations and what are the implications for MPA siting?***
   - Yes, there will be effects—need to wait for ROMS model results before discussion
     - Secondary consideration

4. ***How do size, biogeographic location, the degree of protection (i.e., no-take or limited take), the life history characteristics of target species, habitat, fishing intensity outside MPAs, and environmental factors such as complex oceanographic patterns or other indirect effects affect MPA success?***
   - Question Tabled – Too many components to adequately address

5. ***How do ecosystem structure and function change through time and space?***
   - Potentially not enough variation within biogeographic area to answer

6. ***Can we design the monitoring program to monitor a wide variety of MPA sizes to evaluate the question of size vs. value? If so, what are the categories and what is the minimum replicate number to do so?***
   - MPA system not designed to answer this question, not enough variation

7. ***Can we design the monitoring program to sample a collection of MPAs with a range of habitat complexities and areas to evaluate the question of the value of habitat patch size? If so, what are the categories and what is the minimum replicate number to do so?***
    - Habitat complexity is going to fall into place, no need to design monitoring program around habitat but rather collect data opportunistically

8. ***Can we design the monitoring program to specifically answer questions about the type, amount, and reasons for spillover from MPAs to adjacent areas?***
    - Separate study design/program would have better results – but could design if needed to answer question
        - Tagging provides good estimate of spillover

9. ***What types of monitoring information can be used for other resource management needs (e.g., fisheries, water quality)?***
    - Additional sensors applied to ROVs (ex: CTDs, etc.)
    - Opportunistically collect other data to go along with primary objectives

## Closing Remarks and Timeline:

- Next workshop (late June) – Talk methods, tools, details of the two different design models
- Shooting to have draft of action plan complete by midyear next year (12 months away)
    - RFPs, RFQs, etc. due next Fall
- Need narrative around decision points made – all tradeoffs

# APPENDIX A

***California Ocean Protection Council***
***California Department of Fish and Wildlife***
***Moss Landing Marine Labs***

# Agenda

## Deep-Water Marine Protected Area Monitoring Workshop

**April 19, 2017; 10:00 AM – 6:00 PM**
**April 20, 2017; 8:00 AM – 2:00 PM**
**Seminar Room**
**Moss Landing Marine Laboratories**
**8272 Moss Landing Drive, Moss Landing, CA 95039**

***Meeting Purpose/Objectives***:

- Inform the development of an appropriate deep-water ecosystem monitoring framework to support statewide MPA monitoring, including monitoring of both individual MPAs and California's MPA network. To this effect:
  - Discuss and identify the most important monitoring questions to address, including adaptive management questions
  - Identify which taxa and habitats are most important to monitor to address the monitoring questions
  - Limit the range of possible objectives related to monitoring

**Day 1: April 19, 2017**

| TIME | ITEM | PRESENTER/ MATERIALS |
|---|---|---|
| *9:30 AM* | *Arrivals* | |
| 10:00 | **Welcome, Objectives, and Introductions**<br>● Welcome by MLML<br>● Introductions<br>● Review of meeting objectives, agenda, and ground rules | ● Rick Starr<br>● Eric Poncelet<br>*Materials: Agenda, Participant Roster* |
| 10:15 | **Background and Orientation**<br>● Status of MPA monitoring in CA<br>○ Shift from regional plans to statewide program<br>● What has been accomplished to date? | ● Cyndi Dawson, Becky Ota<br>● Steve Wertz<br>*Material: PPT* |
| 10:30 | **Topic 1:** What does "Protecting the structure, function, and integrity of ecosystems" mean with respect to MPA monitoring?<br><br>A. Identify questions to address in a long-term monitoring plan<br>1. Proposed questions (discuss and confirm) | ● All (plenary) |

| | | |
|---|---|---|
| | a. In individual MPAs across the network, do focal and/or protected species inside of MPAs stay the same or increase in size, density, and biomass relative to areas of similar habitat adjacent to and distant from MPAs?<br>b. Do species richness and/or diversity stay the same or increase in MPAs relative to areas of similar habitat adjacent to and distant from MPAs?<br>c. Can we monitor a series of MPAs (distributed along the coast) and consider results to be representative of the overall MPA network performance?<br>2. What other ways can the state determine if MPAs are protecting the structure, function, and integrity of ecosystems? | |
| *12:15* | *Lunch (sandwiches will be brought in)* | |
| 1:15 | **Topic 2:** Which taxa are best used to assess the performance of the CA MPA Network at protecting marine wildlife, rebuilding depleted populations and protecting the structure, function, and integrity of ecosystems?<br><br>A. Breakout groups discuss the following questions:<br>1. Which taxa are sufficiently abundant to enable statistically significant estimates of changes in the metrics identified in Appendix 1?<br>2. Which taxa are not sufficiently abundant but should be monitored anyway, and why?<br>3. Which of the above taxa can be used to aid in fisheries management?<br>4. What other taxa will be surveyed in the process of monitoring the focal species?<br>5. Are there specific taxa that occur in all parts of the MPA network and that should be monitored to enable an understanding of differences in MPA response across the state? | ● All (three breakout groups, by region)<br><br>*Materials:*<br>*List of deep-water species for all regions* |
| *3:15* | *Break* | |
| 3:30 | **Topic 2:** cont.<br><br>B. Breakout group reports back<br>C. Plenary discussion: identify common themes | |
| 5:15 | **Wrap Up and Preview of Day 2** | |
| *5:30 PM* | *Adjourn; no-host dinner at The Whole Enchilada* | |

**Day 2: April 20, 2017**

| TIME | ITEM | PRESENTER |
|---|---|---|
| 8:00 AM | **Overview and Reflections on Day 1** | |
| 8:10 | **Topic 3:** Metrics | ● All (two breakout |

| | | |
|---|---|---|
| | A. Breakout groups discuss the following questions (90 min):<br>1. Assuming some kind of visual tool is used, what metrics (e.g., density, abundance, percent cover, length, biomass, recruitment events, invasive species, marine debris) allow the state to assess the performance of the MPA Network?<br>2. What level of accuracy of sizing of individuals is needed?<br>3. Should recruitment be measured?<br>4. What analytical/statistical approaches to handling the data provide the highest likelihood of detecting change?<br>5. What is an effective, yet cost-efficient, frequency of sampling needed to detect significant changes over time?<br>B. Breakout group reports back<br>C. Plenary discussion: identify common themes | groups)<br><br>*Materials: Proceedings of the Marine Protected Areas and Fisheries Integration Workshop* |
| *10:30* | *Break* | |
| 10:45 | **Topic 4:** Adaptive management questions to address in a long-term monitoring plan: Which questions would require specific studies, and which ones could be answered by any monitoring design?<br><br>A. Discuss possible adaptive management questions:<br><br>1. What is the minimum number of MPAs that should be monitored?<br>2. Are there differences in ecosystem responses based on clusters of MPAs vs. stand-alone MPAs?<br>3. What are the population effects of siting MPAs in larval source or sink locations and what are the implications for MPA siting?<br>4. How do size, biogeographic location, the degree of protection (i.e., no-take or limited take), the life history characteristics of target species, habitat, fishing intensity outside MPAs, and environmental factors such as complex oceanographic patterns or other indirect effects affect MPA success?<br>5. How do ecosystem structure and function change through time and space?<br>6. Can we design the monitoring program to monitor a wide variety of MPA sizes to evaluate the question of size vs. value? If so, what are the categories and what is the minimum replicate number to do so?<br>7. Can we design the monitoring program to sample a collection of MPAs with a range of habitat complexities and areas to evaluate the question of the value of habitat patch size? If so, what are the categories and what is the minimum replicate number to do so?<br>8. Can we design the monitoring program to specifically answer questions about the type, amount, and reasons for spillover from MPAs to adjacent areas?<br>9. What types of monitoring information can be used for other resource management needs (e.g., fisheries, water quality)?<br>B. Overarching reflections | ● All (plenary)<br><br>*Materials: Master Plan for MPAs* |

| | | |
|---|---|---|
| 12:45 | **Wrap Up and Next Steps** | |
| *1:00 PM* | *Adjourn* | |

***Meeting Materials****:*

1. Agenda
2. Roster of participants
3. List of deep-water species for all regions
4. Master Plan for MPAs (key sections: Chapter 4, Appendix A, pp A32-A37)
5. Proceedings of the Marine Protected Areas and Fisheries Integration Workshop, 2011 (key sections: tables on pp. 20-52)