

### **3. Introduction to Workshop Sessions**

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This discussion highlighted the intended flow of the workshop and introduced the three workshop sessions. Each session was designed to build on previous sessions. In addition, to facilitate discussions, the four aforementioned nearshore focal species/fisheries were used to represent the wide range of life histories, scientific knowledge, and management approaches for fisheries that are expected to be impacted by MPAs. Session 1 participants identified the interaction between MPAs and fisheries, explored the potential effects of MPAs to fisheries, including the scale at which these effects might influence fisheries management, and discussed some of the MPA monitoring that occurs or could occur to measure specific metrics that are most useful for fisheries management. Session 2 explored fisheries management responses to MPAs. In this session, participants discussed in more detail some of the effects identified in Session 1, and whether or not management decisions should change based on those effects. Participants also discussed what might trigger a management response on that decision or management action, and the degree to which scale may also influence that decision or management action. Session 3 addressed how to incorporate MPA monitoring information into action. In this session, participants investigated information that might be useful to inform stock assessments and harvest control rules, and how that information could be applied. A key component of this session was a discussion about dealing with risk and the role MPAs might play when assessing risk.

#### **3.1. Session 1: What are the expected effects of the network of MPAs along the California coast on California's marine fisheries? What are the best ways to monitor for these effects?**

##### **3.1.1. Rationale**

MPA monitoring is designed to detect changes to certain species and fisheries in response to MPAs through the collection of biological and socioeconomic information. However, current efforts focus on assessing MPA efficacy and understanding the dynamic between MPAs and ecosystem condition and thus may not provide all of the information necessary to develop fisheries management recommendations. In an effort to integrate MPA information into fisheries management action(s), the CDFG seeks to better understand how MPAs affect local fisheries and fishery resources both inside and outside MPAs. This session was an opportunity to provide guidance on the type of research and monitoring that may be useful or necessary for determining MPA effects, and evaluating these for incorporation into fisheries management strategies, including adaptive management responses.

##### **3.1.2. Prelude to Session 1**

This session began with a presentation from Dr. Liz Whiteman, Program Director for the MPA Monitoring Enterprise whose charge is to lead the development of monitoring plans for California's network of MPAs to meet MLPA goals. In the presentation titled "Informing Fisheries Management through MPA Monitoring", Dr. Whiteman provided an overview of the approach and framework underpinning MPA

monitoring designed to meet MLPA requirements. She provided examples of how MPA monitoring data might be directly useful to fisheries management as well as how monitoring might be extended to collect information that informs fisheries management. This presentation illustrated unique characteristics and overlap among monitoring for MPAs, climate change, water quality, and specific to this workshop, fisheries management. An important difference between MPA monitoring and fisheries monitoring is that MPA monitoring is an ecosystem-based and relatively localized spatial approach, while fisheries monitoring is stock based and focuses on individual species and populations. Nonetheless, significant opportunity exists to leverage MPA monitoring to inform fisheries management. Through this presentation, the MPA monitoring metrics relevant to fisheries management were highlighted, including those selected to track changes in ecosystems and human uses (e.g., consumptive uses—such as monitoring the number of fishing trips by recreational fishermen, or monitoring the abundance of select fished species). Specific MPA design and management questions (e.g., measuring the economic effects of MPA placement) were presented. These examples were used to illustrate how MPA monitoring might augment existing data or provide new data in a data-poor environment to help address some of the ecosystem-based fisheries management mandates in the MLMA. The MPA monitoring plans also include a chapter specific to collecting supplemental fisheries information; information extending beyond the needs to meet MLPA requirements (see the full presentation in Appendix H).

### **3.1.3. Overview**

The purpose of Session 1 was to explore the interaction between MPAs and fisheries and identify potential effects or interactions that should be considered for fisheries management. Following the initial session presentation, the group discussed potential effects of MPAs to fisheries, the scale at which these effects may influence fisheries management, and some of the MPA monitoring that occurs or could occur to measure specific metrics that are most useful for fisheries management (Session Topic Tables 1.1-1.5). These key topics were explored by discussing the following questions, and the outcomes of these discussions were used as foundational elements in the next session. Five main questions were asked during this session:

- 1) What are the potential negative impacts to the fishery (e.g., resource availability, behavioral, economic)?
- 2) What are the potential contributions MPAs may have to the fishery?
- 3) What are the biological/ecological responses (e.g., scale: regional, local, and population dynamics)?
- 4) What other system drivers should be considered (how and when)?
- 5) What other essential fishery information (EFI) can MPAs provide that is beneficial to management, and what types of monitoring/research could be conducted to acquire this information?

### **3.1.4. Key Discussion Points**

During Session 1, a number of potential fisheries impacts and contributions resulting from the statewide network of MPAs were identified. Expected impacts included but were not limited to effort shifts and localized and serial depletion. However, the scale, duration, and magnitude of expected impacts are likely to vary drastically among fisheries and geographies. For example, it was noted that due to the scale at which fishery stocks are managed, it is important to identify major shifts in effort, whereas moderate shifts are less likely to affect the population or fishery in a detectable manner. Expected contributions that MPAs may have to the fisheries discussed by workshop participants included spillover (adult and larval), increased biomass, and changes in age and size structure. However, workshop participants noted that larval spillover is difficult to measure, and a more useful and cost effective focus might be on simple metrics (e.g. density and size inside/outside of MPAs) for adult fish and invertebrate species.

Many of the metrics that should be monitored (e.g., abundance, size, sex ratios) may provide useful information for stock assessments or informing specific fishery management strategies such as setting harvest limits by comparing density and size structure inside and outside of MPAs. It was noted that monitoring metrics such as abundance, size, and sex ratios, to support management strategies based on fished and unfished ratios, should be conducted from the point of MPA implementation (preferably before an MPA is established). Workshop participants also noted that MPAs may help to provide important information used in stock assessment models, such as improving estimates of natural mortality by focusing on primarily sedentary species (as accuracy is related to how much a species moves), and by enhancing estimates for unfished density.

## **3.2. Session 2: Do our management strategies need to change in response to a network of MPAs? How should these strategies change?**

### **3.2.1. Rationale**

While the objectives for a network of MPAs within California primarily focus on resource conservation, these objectives also encompass the MLPA goals of helping to sustain marine life and rebuild depleted populations. A growing body of scientific evidence suggests that the success of a network of MPAs in providing benefits to fished populations (i.e., helping to sustain and rebuild these populations) is tied to the effective management of fisheries outside of the MPAs. Various studies indicate that the management of fishing effort is particularly important for achieving beneficial outcomes from MPAs. Therefore, with the implementation of the statewide network of MPAs, it is important to consider whether California may need to revise existing management strategies on current or future fisheries.

### **3.2.2. Overview**

The purpose of Session 2 was to consider what potential management actions might be advisable given the implementation of the California MPA network. Specifically, participants were asked to provide their perspective on what effects and/or

characteristics of an MPA network might potentially occur for the focal species/fisheries (building upon the Session 1 discussions). Three main questions were asked during this session:

- 1) What conditions might result from these effects or characteristics?
- 2) Should management strategies change in response to these conditions?
- 3) What the risks might be with or without implementation of management actions?

Participants provided their perspectives for three of the four focal species/fisheries. Potential effects and management actions for red abalone had already been touched upon during discussions of the fishery in Session 1, so this fishery was not discussed further during Session 2. Prior to the discussion of each species/fishery, specifics of its life history and management were quickly reviewed.

Participants also were provided with a list of nine effects/characteristics (which was generated using results from Session 1), and asked to focus their discussions for each fishery on three from this list (although in the ensuing discussions, the number chosen varied between two and four effects/characteristics). The nine effects/characteristics presented to the participants were:

- 1) Effort shift/depletion
- 2) MPA design/configuration
- 3) Spillover/movements
- 4) Sequestering biomass
- 5) Stock stability
- 6) Compliance
- 7) Environmental conditions
- 8) Life history characteristics
- 9) Fishery characteristics

Some of the points were applicable to many fisheries (Session Topic Tables 2.1.A-2.1.B, “general fisheries”), while most of the discussion focused on the specific species/fisheries (Topics 2.2A-2.4.B, two tables per species/fishery). Discussion highlights from the four sets of tables are provided in the subsection below as well as Session 1 discussion points on red abalone that are applicable to Session 2 questions.

Regarding what potential management response(s) might be advisable, the consensus of the participants was that no action is needed at this time to address effort shifts in the three focal species/fisheries discussed. For cabezon and brown rockfish, effort redistribution outside of the MPAs was not considered a concern due to increased harvest targets for cabezon and for the southern nearshore rockfish complex (which includes brown rockfish). Consequently, the risk of no management action was

considered low. For the California spiny lobster, some participants noted that the supply of recruits into the fishery might be independent of the spawning stock size. Discussion points touched on both its life history characteristics (e.g., long pelagic larval stage) and its catch history (relatively steady recruitment into the fishery) as support for this notion. If true, then as long as the spawning stock biomass remains above a critical level (e.g.,  $B_{20\%}$ ), higher fishing effort outside of MPAs would not impact recruitment and the risk of no management action would be low. Early results from the spiny lobster stock assessment suggest that the fishery might be near its Maximum Sustainable Yield. However, the shape of the yield curve was not available at the time of the workshop. If the curve is relatively flat, then effort shifts in the fishery should not have much effect on overall yield, but local shifts may result in noticeable changes in catch rates. It was recommended that the distribution of California spiny lobster fishery effort be monitored in the south coast region (Point Conception to the US/Mexico border) before and after the MPAs in this region are implemented.

However, the group did view establishment of the MPA network as duplicating the precautionary intent of the lower threshold of the NFMP 60-20 harvest control rule (<http://www.dfg.ca.gov/marine/nfmp/index.asp>). Specifically, the 20% cutoff level could be reduced to a value of 10% (the cutoff used by the Pacific Fishery Management Council) because of the protection from overfishing provided by the MPA network. Of the three focal species/fisheries, this change would only affect cabezon, which is under single-species management by both the state and federal systems. Brown rockfish is also managed by both state and federal authorities, but is presently unassessed and is treated as a member of a multi-species assemblage.

In addition to the above points, participants noted that certain life history gaps need to be addressed so that the effects of the MPAs on the focal species/fisheries can be better evaluated. Participants also recognized that MPA effects may not initially be distinguishable from background variation, and as a consequence, it may be some time before such effects can be identified. Some participants pointed out that models could initially be used in lieu of long-term data. However, it was also noted that models need to meet the informational requirements for developing management actions (e.g., include the necessary types of data at the appropriate scales) and cannot be based only on assumed properties.

### **3.2.3. Key Discussion Points**

Session 2 information was assimilated and standardized into the following categories shown in sections 3.2.4.-3.28.

### **3.2.4. General Fisheries**

#### *Potential conditions*

- MPAs may provide a way to examine the nature of fish assemblages that are currently managed together.
- Due to various constraints, the assemblages that form within MPAs may not represent the “natural” states for those assemblages.

- It is unknown whether current MPA placement will actually increase the number of larvae and young of different target species.

*Potential scale of effects*

- Even though the scale of effects may be local or regional, management resource availability may constrain the scale of management response.

*Potential management actions*

- The amount of spillover from MPAs may not be enough to matter to fisheries.
- Many factors need to be investigated before MPAs can be considered a replacement for the precautionary model.
- Multiple management changes at once will not inform us on what is working.

*Potential risks*

- Waiting for sufficient data to be available to examine effects of MPAs may be risky; modeling approaches should be considered in lieu of long-term data sets. Resulting information, however, must be sufficient data to justify management changes.
- If MPAs are assumed to buffer against fishery management uncertainties, then MPAs provide a means of precaution which can increase the risk tolerance; this risk tolerance may be further increased if traditional management measures are also in place.

**3.2.5. Cabezon**

*Potential conditions*

- Total Allowable Catch (TAC) was recently increased because of an updated stock assessment; consequently, effort shift is not considered a concern.
- More information is needed on the movement of different life stages and the distribution of large females and nest guarding males.
- Sequestering biomass may be beneficial if nesting is also protected.

*Potential scale of effects*

- If most of the nesting area resides outside of MPAs, and effort is concentrated into these nesting areas, then there is potential for an impact at the local population (substock) level.

*Potential management actions*

- It is recommended to keep status quo for now until more information becomes available, although if most of the nesting areas are outside of MPAs, then managers could consider commercial winter closure to protect nesting males.
- Less precaution might be possible, such as changing from the NFMP 60/20 harvest control rule to a 60/10 rule.

*Potential risks*

- The risks associated with no management response will probably be more social in nature than biological.
- Changing the harvest rule would result in a small increase to the TAC, which would be of minimal risk given the current status of the stock.

### **3.2.6. California Spiny Lobster**

#### *Potential conditions*

- The spiny lobster fishery is almost fully capitalized; changes in the distribution of effort are expected and will likely depend on availability of lobster habitats outside of the MPAs.
- The quality, diversity, and distribution of habitats inside and outside MPAs could affect spiny lobster movement.
- The effect of movement/spillover on the overall fishery is likely to be minimal.
- Recruitment increases from MPAs are not expected due to this species' larval duration and the steady supply of recruits each year into the fishery.
- Evaluations of MPA effects on lobster will need to take into account environmental changes (e.g., temperature).

#### *Potential scale of effects*

- Behavioral responses may result in distribution changes of spiny lobster at a local scale over the short term.

#### *Potential management actions*

- No management response is suggested; monitoring of fleet effort after MPA implementation is recommended.

#### *Potential risks*

- No risks were noted during the discussion.

### **3.2.7. Brown Rockfish**

#### *Potential conditions*

- Brown rockfish is a member of the nearshore rockfish complex south of 40° 10' N. latitude; harvest levels for this complex were increased for 2011-2012.
- Commercial fishing for nearshore rockfish is covered under a restricted access program. Commercial fishing for brown rockfish requires a Deeper Nearshore Fishing Permit. The number of these permits is capped, and they are non-transferable.
- More information is needed on movement of different life stages before the benefits of MPA design/configuration and the potential of biomass sequestering can be assessed.

#### *Potential scale of effects*

- There may be a potential benefit from the MPA network at the stock scale.

#### *Potential management actions*

- No management response is suggested.

#### *Potential risks*

- Given that brown rockfish is covered under a restricted access program, and the harvest levels for the nearshore rockfish complex have been increased, risk from the redistribution of effort is considered minimal.
- With the implementation of the MPA network, there may be less risk of overfishing for the individual species within the nearshore rockfish complex.

### **3.2.8. Red Abalone**

#### *Potential conditions*

- Recreational fishermen can only take abalone north of San Francisco Bay; SCUBA and surface-supplied air devices are prohibited.
- Since free-divers are limited to how deep they can dive, abalone have a refuge from legal fishing in deeper waters.
- Adult abalone movement is limited; larval duration is short, so larval dispersal is also limited.
- Shifts in effort could occur, particularly in the short term in fishing locations closer to dense population areas. If effort shifts result in lower densities or localized depletion, then serial shift in effort may later be seen (e.g., fishermen traveling ever increasing distances from population areas).

#### *Potential scale of effects*

- Any measurable effects from implementation of the MPA network probably will only be observed at the local level (individual MPAs instead of the MPA network).

#### *Potential management actions*

- With the ongoing monitoring of the fishery, traditional management tools in place (e.g., size and bag limits, harvest level triggers), and the presence of the MPAs as well as the deep water refuges, managers do not need to consider an initial change to management in response to MPA implementation; they can wait to see how conditions change once the MPA network is implemented.
- Managers may want to keep density levels up to keep the fishing experience satisfactory.

#### *Potential risks*

- Illegal activities such as poaching and compliance with current regulations are current concerns for the stock. The total impact of these illegal activities is unknown and adds uncertainty to any management response. With the implementation of the MPA network, managers also need to consider the uncertainties associated with MPA regulation compliance.

### **3.3. Session 3: Can we incorporate the presence of a network of MPAs into stock evaluation, designation of harvest control rules, and other processes related to defining fishery yields? When should we do so?**

#### **3.3.1. Rationale**

Traditional stock assessments and fishery management actions are typically based upon the unit-stock approach, which ideally encompasses an entire reproductive population and attempts to understand the stock's status. The existence of a network of MPAs raises numerous questions that may challenge some underlying assumptions within traditional stock assessments and requires rethinking existing management approaches. Sequestering some biomass of a specified stock within a network of MPAs may alter the basis for dealing with management risk, and influence the population dynamics of the stock in ways that should be built into stock assessments. For example, the presence of MPAs might result in an adjustment to harvest control rules

because of changes in lifetime egg production. However, uneven spatial distribution of fishing pressure due to MPAs could create localized conservation issues, despite total catches that remain within acceptable levels for the stock as a whole. The need for precautionary management, especially for un-assessed stocks, may be influenced by MPAs. Clearly, there is an opportunity for this workshop to provide guidance on the effect of MPAs on fishery management, including recommended modifications to existing management strategies to adjust for these effects.

### **3.3.2 Prelude to Session 3**

The field of MPAs and fishery management is a topic of current interest that has received considerable attention from innovative researchers, and it is a subject of rapid scientific development. Accordingly, as an introduction to this session, Dr. Alec MacCall, representing the NMFS Southwest Science Center, presented “How Information from MPAs can be used to Assess and Manage Fisheries? Density ratios and other ideas” (see the full presentation in Appendix I). The density ratio method, using fish densities in MPAs as an index of the potential unfished levels and comparing with fish densities in fished areas, could be a trigger to restrict a fishing season as densities in the open areas decline relative to the protected areas. Tracking the status of the resource using this method requires initial and ongoing monitoring. Density ratio harvest control rules applied to single-species management and multi-species management have been evaluated through Management Strategy Evaluation simulations. Other approaches using MPAs to assess and manage fisheries included the “decision-tree”, adjusting the allowable catch based on the relationship of catch-per-unit-effort (CPUE) inside and outside MPAs, as well as comparing length and/or age compositions inside and outside of MPAs to evaluate any change in growth.

### **3.3.3. Overview**

This session was focused on population assessments and how MPAs may affect stock assessment research, data, analyses, and the application of assessment results in decision-making. Following the presentation by Dr. MacCall, participants were asked to address the following three topics:

- 1) How do MPAs affect the way stock assessments are developed for both assessed and unassessed stocks? Consider risk. Do MPAs alter stock productivity?
- 2) Under what conditions should harvest control rules/strategies change, and what kind of data are needed to implement control rules? Do MPAs alter the risk of overfishing, or a stock becoming overfished?
- 3) How does the network of MPAs affect local populations, and what does that mean for management?

With the recent adoption of a coastwide network of MPAs along the California coast, their effects on fisheries, fish populations, and ecosystem function is transitioning from theoretical to tangible. However, it is clear that the effects will vary by species, accruing at different rates and time scales (e.g., localized effort displacement: almost immediate; population and ecosystem responses: more gradual). Since the exact response of populations to MPAs is unknown and it may take some time to be

measurable, the discussion did not indicate a need to modify traditional assessment methodologies until MPA effects become better understood.

#### **3.3.4 Key Discussion Points**

The discussion under each of the three topics included concepts that are applicable to California nearshore fisheries in general, as well as some specific comments regarding the focal species/fisheries (Session Topic Tables 3.1-3.3). The density ratio method was thought to be a strong candidate to help inform fishery management decisions. In addition, participants noted that logical arguments can be developed to alter the precautionary adjustment for data-poor stocks as a result of the coastwide network of MPAs, but the basis and magnitude for any such potential adjustment requires further investigation. The new network of MPAs also provides a reason to consider changing the 60-20 harvest control rule for assessed nearshore finfish to 60-10, but this concept would need to be fully explored as part of an amendment to the NFMP. Furthermore, a concern was expressed that MPAs have the potential to exacerbate effort shift and the risk of serial depletion, and consequently attention should be given to improving our understanding of effort shift.

## **4. Next Steps**

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Following Session 3, the workshop participants were asked to brain storm about what steps might be considered next to assist efforts on integrating MPAs into fisheries management (i.e., “What do we need to do next to get us where we need to go?”). The resulting discussion centered upon four themes:

- Necessity for more EFI
- Usefulness of MPA baseline survey data
- Necessity for more focused monitoring surveys that address MPA-fisheries questions
- Potential management actions

A summary of the discussion outcomes are provided below.

### **4.1.1 Necessity for More Essential Fishery Information**

No critical MPA-fisheries management issue arose during workshop discussions in regard to the four focal species/fisheries; however, participants noted that this result could be due to a lack of data. In particular, earlier session discussions pointed out that most of the focal species/fisheries lacked some EFI needed to effectively evaluate MPA effects.

### **4.1.2. Usefulness of MPA Baseline Survey Data**

Some MPA baseline survey data will be valuable for fisheries management, although the methods used to collect these data may limit their usefulness. Participants discussed some of the MPA baseline data that potentially could be used, the associated methodological requirements that would need to be in place for these data to be used,