California MLPA Master Plan Science Advisory Team
Responses to Science Questions Posed during the July 29-30, 2010 North Coast Regional Stakeholder Group Meeting

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This document contains science questions posed by the Marine Life Protection Act (MLPA) North Coast Regional Stakeholder Group (NCRSG) during its July 29-30, 2010 meeting and responses developed by work groups of the MLPA Master Plan Science Advisory Team (SAT). These responses were presented in draft form to the NCRSG during its meeting on August 30, 2010. The SAT reviewed, revised and approved these responses during its October 13-14, 2010 meeting.

1. **Is it possible for the minimum threshold for a replicate of hard substrate 0-30 meter (m) proxy to be less rigid than the thresholds for other habitats since there is some uncertainty associated with the proxy line?**

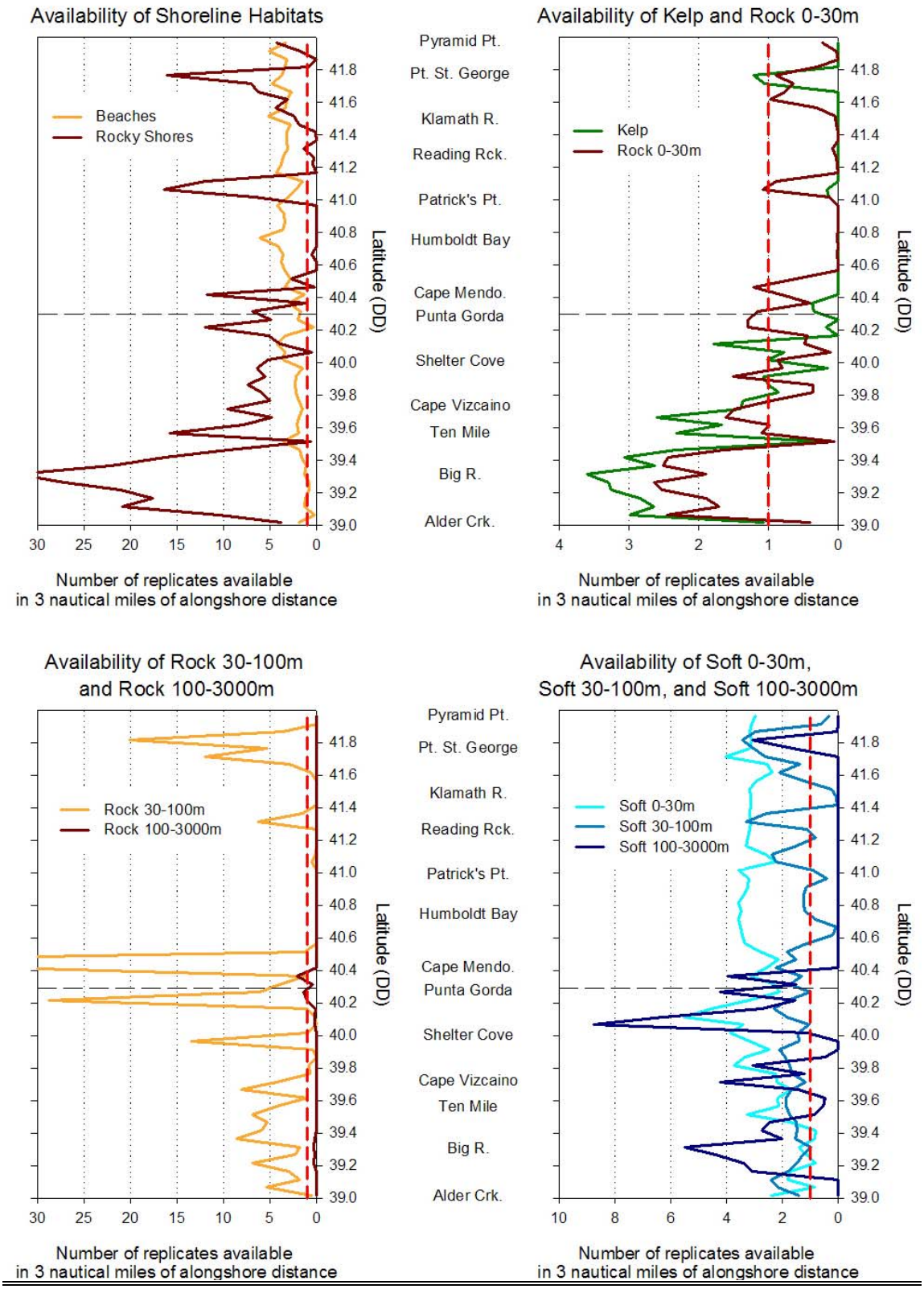
Response: In the MLPA North Coast Study Region, about 70% of the 0-30 meter depth zone is mapped with high-resolution substrate data and 100% of the open coast shoreline is classified by substrate type, including numerous mapped offshore rocks. These information sources are used to estimate the substrate composition in the approximately 30% of the 0-30 meter zone that is not directly mapped with high resolution substrate data. Both mapped and estimated substrate information are used to attribute the 0-30m proxy line, resulting in a proxy line with no more than 30% uncertainty region-wide. The actual uncertainty associated with the proxy line varies by geography and may be substantially less than 30% in areas where strong correlation between shoreline type (i.e. beaches or rocky shores at the onshore border of the unmapped area), and mapped substrate (i.e. substrate at the offshore border of the unmapped area) strongly suggest continuous substrate type across the unmapped zone.

Because the 0-30m proxy line is generated using an objective calculation, the proxy line is equally likely to overestimate or underestimate the extent of 0-30m rock. How this uncertainty is incorporated into the marine protected area (MPA) design and decision-making process is beyond the purview of the SAT.

2. **What is the spacing for key habitats across the north coast study region?**

Response: The abundance of key habitats in the north coast study region varies by geography; in some extreme cases, the natural distribution of habitats includes gaps that exceed the SAT spacing guidelines of 31-62 miles. Information about the geographic distribution of habitats may facilitate MPA design by allowing stakeholders to target areas where habitats are abundant. Figure 1 illustrates the geographic distribution of habitats including specific information about where habitats occur in sufficient abundance to constitute a replicate within 3 nautical miles of alongshore distance. With the exception of kelp, 100-3000m rock, and 100-3000m soft bottom, all habitats are distributed such that the spacing guidelines can be met. The natural habitat gaps that exceed the spacing guidelines are: kelp = 115 miles, 100-3000m rock = 110 miles, and 100-3000m soft bottom = 95 miles.

Figure 1. Geographic Availability of Open Coast Habitat Replicates in the North Coast Study Region



3. If spacing between habitats exceeds the spacing guideline, what is gained by placing an MPA closer versus further away from the next adjacent MPA that protects that habitat?

Response: Larval connectivity decreases gradually with distance. While the SAT has provided a range of distances (31-62 miles) as a guideline for MPA spacing, this does not imply that connectivity drops to zero for all species once MPA spacing exceeds a distance of 62 miles. Rather, those distances were chosen to provide a reasonable level of connectivity between MPAs for a large proportion of species. When spacing guidelines cannot be met for a given habitat (e.g. kelp habitat has a 115 mile minimum gap between nearest replicates in the north coast study region), larval connectivity between those MPAs (goal 6 of the MLPA) is likely to be improved by having the MPAs as close together as possible. The graphical representation of this improvement is reflected in the SAT spacing evaluation, which measures the size of the maximum gap even if it exceeds the guidelines, as well as the SAT modeling evaluation, which uses information on the actual distance between MPAs and the dispersal pathways connecting them.

4. For seabird protection in special closures, is it more important to capture greater species diversity and abundance, or special-status species?

Response: The SAT Marine Birds and Marine Mammals Work Group does not give more importance to species diversity, species abundance, or special status species, but does consider all of them in its evaluation. Certainly, species with special status deserve attention , and places that have high species diversity and abundance are important because of the number of species and individuals that may be protected. Note that the species most likely to benefit at breeding colonies from special closures are surface nesting colonial species, namely Common Murres and all cormorant species. Rhinoceros Auklet, Tufted Puffin, and Storm Petrels, the special status species in the north coast, are burrow nesters and generally forage far from colonies, and thus are not as likely to benefit. That said, special closures will restrict actual landings on islands used for breeding as well as close approaches, and this protection will benefit all species at special closure locations. Each site is unique for various reasons, which is the main reason both special status and diversity and abundance criteria were used to identify “hot spots” (for criteria and list of hot spots see Chapter 9, *Draft Methods Used to Evaluate Marine Protected Area Proposals in the MLPA North Coast Study Region*).

5. What is the confidence associated with the bioeconomic models and do the models predict within 10% what the model species and fishery will look like in 50 years?

Response: SAT analyses using the bioeconomic models are based on running the models under constant conditions (e.g., a constant larval dispersal pattern based on ocean circulation patterns averaged over several years, constant biological parameters) or that are set to yield a particular future fishery scenario (e.g., harvest needed to reduce stock to a specified level). By holding these parameters constant, the model is allowed to reach a steady-state from which conservation and economic metrics can be extracted and used to compare MPA proposals. These results represent the expected consequences for each MPA proposal under each future fishing scenario, assuming that the constant conditions used to drive the model are reasonable approximations to average conditions. As discussed in a previous response (Question 5 in

Briefing Document G.1 delivered to the NCRSG on March 24, 2010), sensitivity analysis suggests that rankings of MPA proposals and comparisons relative to the P0 ('no-action') alternative are robust to changes in assumptions regarding the value of various parameters. In particular, ranks of MPA proposals are robust to changes in biological movement parameters, which are the key factors that underlie the effect that MPAs have on a modeled stock. The scientific basis for these predictions derives from prior SAT modeling work group deliberations in the north coast study region, builds on the science developed as a result of implementing the MLPA in previous study regions, incorporates information from the scientific literature, and has been well vetted by the SAT.

In reality, the future state of the marine ecosystem will depend on actual recruitment dynamics (which will reflect variability in stock status, climate, ocean circulation, etc.), variability and trends in fishery management, success in enforcing management, including enforcement of protections within MPAs, as well as factors not currently accounted for explicitly in the models, such as species interactions (but see Question 5 in Briefing Document G.1 delivered to the NCRSG on March 24, 2010). Environmental variability reduces the likelihood of a close match between long-term observations and steady-state predictions from the bioeconomic model made now, without the benefit of knowing how future conditions will develop over time. However, the model rankings remain consistent when various model parameters are changed, which strongly suggests that these rankings will remain robust for any reasonable future environmental conditions. That is, each MPA proposal, evaluated under a particular time series of climate variability, etc., may be expected to retain the same ranking as if run under a constant climate. This assumes that all MPA proposals are being compared under the same specific time series of climate variability. Comparisons in which each proposal experiences a different climate time series are not valid.

Of course, this argument rests on the assumption that the constant conditions used in the current analysis are a reasonable approximation for average conditions expected in the future, and that future conditions will not differ radically from recent observations or from our current understanding of how the coastal ocean and marine populations function. Severe departure from the average conditions used in the model runs (e.g., radical changes in spatial structure of dispersal patterns) might yield rankings that differ substantially from those based on model predictions.

6. Can the SAT use the bioeconomic model to assess how limited access points in the north coast study region may affect harvesting patterns and, thus, contribute to protection of coastal and marine ecosystems?

Response: In principle, it is possible to account for challenges to accessing different areas of coastline in the bioeconomic model. The fleet model developed for the MLPA South Coast Study Region (SCSR) was a preliminary effort to account for relative intensity of fishing effort. The fleet model assigned different costs to fishing in each location as a function of the distance from that location to the nearest port, reflecting increased travel costs associated with fishing more remote locations. However, this type of fleet model requires specific information about fleet behavior, specifically, information about how fishers are affected by increased travel costs. By the end of the south coast MPA planning process, modeling results using the fleet

model still were considered ancillary because of uncertainty about parameterization of the fleet model. Ultimately, the SAT modeling working group was not satisfied that incorporating the differential costs of accessing different areas added much to the evaluation, given uncertainties in the parameterization and only modest changes in the results.

For the MLPA North Coast Study Region (NCSR), the SAT modeling work group focused on integrating the two existing bioeconomic models and ensuring that the core modeling results were completed on time, given the available time and resources. Although the SAT modeling work group is not incorporating limited access in the bioeconomic model for the NCSR, in our experience, these effects are less important to results of the modeling evaluation than the total amount of fishing assumed outside of the MPAs. The modeling evaluation is conducted under three scenarios: conservative management, maximum-sustainable yield (MSY)-type management and unsuccessful management. If one believes that limited access severely restricts the distribution of fishing effort, we would expect the effects of fishing to have a spatial pattern not currently captured in the bioeconomic model, and we would expect a greater likelihood of depletion closer to ports.

7. Would the SAT evaluate how characteristics of the north coast study region affect the levels of protection assigned by the SAT? Characteristics to consider include limited access points, topographical limitations to access such as cliffs, and composition of intertidal boulders impeding pedestrian access, opacity of the ocean discouraging skin and scuba diving, and the large coastal extent included in the national and state park system and wildlife distribution patterns (e.g. rattlesnakes, bears, and sharks).

Response: Levels of protection assigned by the SAT are explicitly designed to be applicable across a range of geographies and future fishing scenarios. When assigning a level of protection, the SAT considers the role that the target organism plays in the marine ecosystem and the extent to which its removal has the potential to alter the marine community. This potential change to the marine community may not be realized in all areas; however, the SAT assigns levels of protection conservatively, so that fishing activities that receive a high or moderate-high level of protection are unlikely to impact the marine community even if fishing effort is locally intense or increases to high levels in the future. Because most fishing regulations are not spatially explicit, even a low level of fishing pressure may result in locally intense fishing, as effort is concentrated in accessible areas. For this reason, limited coastal access in the north coast increases the likelihood that accessible areas will experience high fishing pressure.

8. How are proposed special closures considered in the SAT evaluations?

Response: MLPA Initiative staff provided Document I.1 for the NCRSG meeting on July 29-30, 2010 with maps of the proposed special closures from Round 2 and tables indicating the sizes of proposed special closures and amount of each habitat included. Because of the small sizes of the proposed special closures, it is not possible to include a sufficient amount of any habitats to equal or exceed the minimum replicate size. However, proposed special closures were included in some of the Round 2 evaluations conducted by the SAT.

The proposed special closures were an important component of the Round 2 evaluation of marine birds and marine mammals (Documents O.1, O.2 and O.3 from the July 29-30, 2010 NCRSG meeting), particularly with respect to breeding, resting and foraging areas. The evaluation of potential impacts to commercial and recreational fishing did not include proposed special closures in Round 2 because the maximum potential impacts of the proposed special closures to commercial and recreational fisheries did not exceed 0.02%.

The bioeconomic modeling evaluation uses a 1 x 1 square kilometer grid. Due to computational limitations, the model does not account for MPAs or special closures (or portions of an MPA or special closure) that cover less than 25% of a grid cell. Because all of the proposed special closures are considerably smaller than this threshold (less than 3% of a grid cell), they were not included in the bioeconomic modeling evaluation.