

**California MLPA Master Plan Science Advisory Team**  
**Approved Responses to Science Questions Posed during the**  
**June 29-30, 2010 MLPA Master Plan Science Advisory Team Meeting**  
*Revised July 28, 2010*

This document contains science questions posed to the Marine Life Protection Act (MLPA) Master Plan Science Advisory Team (SAT) during its June 29-30, 2010 meeting. The SAT reviewed, revised, and approved these responses during its July 28, 2010 meeting held via teleconference and webinar.

**1. Would the SAT evaluate the three proposed MPAs in the Petrolia area as a cluster during the SAT evaluation process?**

**Response:** During the evaluations process for the Round 2 draft marine protected area (MPA) proposals, the SAT Evaluation Work Group received a request from members of the public in the Petrolia area to evaluate closely spaced MPAs proposed near Petrolia as a single cluster for the habitat replication and representation analyses. All draft MPA proposals contained three MPAs in this area (South Cape Mendocino, Mattole Canyon [or Mattole Canyon Offshore], and Petrolia Lighthouse) that were relatively closely spaced (three to five miles apart) and included a wide range of habitats. The SAT Evaluation Work Group held a meeting via conference call during which a number of issues related to the habitat evaluation process were discussed, including whether or not to consider the Petrolia-area MPAs as a cluster. After a thorough discussion, the work group concluded that the MPAs should not be evaluated as a cluster.

The main reason behind the work group's decision was that the minimum amount of habitat needed to meet the habitat representation requirement is based on the assumption that the entire area of habitat will be contiguously protected. Although the MPAs in the Petrolia area are closely spaced, they do not provide contiguous protection of habitats, and individual organisms moving between them are subject to fishing pressure. Therefore, the work group decided to evaluate the Petrolia-area MPAs on an individual basis, rather than as a cluster.

However, at the June 29-30, 2010 SAT meeting in Eureka, members of the SAT Evaluation Work Group made clear that although the Petrolia-area MPAs were not evaluated as a cluster, they each provided protection to a range of habitats and made strong contributions to a "backbone" of MPAs at higher levels of protection. Furthermore, placing all three MPAs in the area could provide ecosystem benefits that might not occur if one or more of the MPAs were removed from the proposal.

Finally, the decision to evaluate the Petrolia-area MPAs on an individual basis rather than as a single cluster had little impact on the evaluation results. Most habitats that would have been replicated by the clustered MPAs were already replicated in one or more of the free-standing component MPAs. The one exception is rock 0-30 meter (m) habitat which was not replicated in any individual MPA in the Petrolia region, but would have been replicated in one or more draft proposals if the three MPAs were combined as a single cluster. In draft MPA proposals Ruby 1, Sapphire 1 and Sapphire 2, the combined extent of rock 0-30m in the three Petrolia-area MPAs would have been sufficient to achieve the habitat replication guideline of 1.1 miles if the three MPAs were clustered. Although the habitat replication guideline for rock 0-30m was not met in any individual MPA in the Petrolia region, the Petrolia Lighthouse SMR in Ruby 1,

Sapphire 1, and Sapphire 2 was very close to achieving the habitat replication guideline for 0-30m rock (less than 1/10<sup>th</sup> of a mile below the guideline) and could achieve replication of this habitat with minor boundary modifications.

**2. Can the SAT reevaluate the proxy line in MPAs that get credit for rocky shores and 30-100m rock but not for 0-30m rock (i.e. South Cape, Petrolia, and Ten Mile)?**

**Response:** The 0-30m proxy line represents the proportion of hard and soft bottom habitat in the entire 0-30m zone, and is based on the best readily available habitat information including mapped shoreline habitats, offshore rocks, and high-resolution substrate mapping within the 0-30m zone. Shoreline habitat data is already incorporated into the estimate of substrate within the unmapped portion of the 0-30m zone. In most sections of the coast, the unmapped zone extends from the shore out to 10m depth with high resolution substrate mapping data available from 10m depth out to the boundary of state waters.

Presence of rocky habitat both along the shoreline and in deeper water does not necessarily indicate presence of rocky reef in the 0-30m zone, due to varying patterns of habitat distribution and the differences in habitat replication guidelines for different habitats (0.55 miles for rocky shores versus 1.1 miles for 0-30m rock and 0.13 square miles for 30-100m rock). Thus it is possible for an MPA to achieve replication of rocky shores and 30-100m rocky reef without encompassing sufficient 0-30m rocky reef to comprise a replicate of that habitat. Furthermore, the distribution of species that utilize the 0-30m depth zone is highly depth-dependent, thus rocky reef that extends across only a portion of the 0-30m depth zone is unlikely to encompass the full biodiversity associated with 0-30m rocky reef habitat. The three MPAs discussed above in question 1 illustrate some of the variability in habitat distribution along the coast. The South Cape and Petrolia MPAs encompass substantial rocky shoreline, but high-resolution substrate mapping clearly shows that rocky habitat in the very nearshore is not contiguous with the expansive rocky reefs found further offshore. The Ten Mile MPA, on the other hand, contains substantial rocky shoreline and substrate mapping shows the extension of more-or-less contiguous reefs from the nearshore to greater than 50m depth.

MPAs in the South Cape, Petrolia, and Ten Mile areas are all located in regions where sufficient 0-30m rock is available to constitute a replicate. In fact, the Ten Mile configurations in some Round 2 draft MPA proposals achieved replication of 0-30m rock, and configurations in the Petrolia area for most proposals were extremely close to meeting the replication guideline for 0-30m rock (less than 1/10<sup>th</sup> of a mile below the guideline). In order to replicate 0-30m rock in these areas and across the study region, MPAs should be configured to encompass 1.1 miles of 0-30m rock as measured by the proxy line.

**3. Can the SAT evaluations take into account the unique aspects of the north coast study region?**

**Response:** Throughout the MPA planning process, the SAT and other bodies of the MLPA Initiative have continually taken into account the unique aspects of each study region. A prime

example of this is the division of each study region into smaller “bioregions.” These bioregions take into account the unique biological and oceanographic characteristics of each study region, and are determined after extensive literature reviews and discussions with local experts. In the MLPA North Coast Study Region (NCSR), the SAT determined that there are two bioregions, one north of the mouth of the Mattole River and one south of the river; these two bioregions are used in almost all SAT evaluations.

In addition to using the bioregions, SAT evaluations use data specific to the NCSR. For example, the SAT reviewed data and established new minimum habitat requirements that are specific to the study region. These habitat requirements are used in the SAT habitat representation, habitat replication and MPA spacing evaluations. The evaluation of potential economic impacts to commercial and recreational fisheries conducted by Ecotrust is also based on local data collected from fishermen throughout the study region. The SAT also reviewed key and unique habitats specifically for the NCSR and created a unique list of species likely to benefit from MPAs in the NCSR.

The bioeconomic model for the NCSR takes into account the unique oceanography by using information from a ground-truthed computer model of ocean currents in the region to predict larval dispersal patterns. The bioeconomic model also utilizes the habitat map data used in the other SAT evaluation. The model outputs show data for seven species that were specifically selected as being important species in the NCSR, including Dungeness crab, a species for which the work group had to redesigned portions of the model due to the unique aspects of the male-only fishery.

Finally, all data layers in MarineMap were developed specifically for the NCSR, and the oceanographic features data layers (upwelling areas and river plumes) are the first of their kind in the MPA planning process under the MLPA. Though not specifically used during the evaluations process, SAT members believe it is important to include information about the unique oceanography of the NCSR in MarineMap so that stakeholders may consider it while designing MPA proposals.

**4. Is there a shortage of barnacle larvae in the north coast study region? Does removing species to which barnacles attach (such as crabs and mussels) negatively impact their populations?**

**Response:** Determining whether or not a “shortage” of barnacle larvae exists in the north coast study region requires having both a reference point against which larval abundances can be compared and an extensive time series to establish what an “average year” looks like. No studies from the NCSR have attempted to establish the long-time series that would be required to determine if the number of barnacle larvae has decreased over time.

However, the number of barnacle larvae in the water is not necessarily indicative of how many barnacles successfully settle onshore and become part of the breeding population. In fact, the coast of California is a well-known area of “recruitment limitation,” a situation in which

recruitment processes seem to play a more important role in structuring barnacle populations than do post-settlement interactions such as competition (Connolly et al. 2001, Frascchetti et al. 2002). Recent studies in north central California have shown that large numbers of barnacle larvae remain very close to shore during development, although there are not correspondingly high settlement rates compared to barnacle populations elsewhere on the Pacific coast (Morgan et al. 2009, Morgan and Fisher 2010). One study has suggested that the turbulence of the surf zone might contribute to limited recruitment onshore, forming a “semi-permeable barrier” to settlement (Rilov et al. 2008).

While some physical processes may limit the rate at which barnacle larvae move onshore to settle in the north coast, it is reasonable to expect that there is some relationship between overall larval output (i.e., adult barnacle abundance) and the availability and settlement of barnacle larvae, at least at the scale of the entire study region. That is, if adult barnacle abundances were severely reduced over a large spatial scale, there would be necessarily fewer larvae settling. However, the impact on barnacle populations of removing species to which barnacles attach is very difficult to quantify. For some barnacle species and in areas where biological substrates are more readily available than geological substrates, the removal of species such as crabs and mussels could potentially reduce their numbers. However, crabs and mussels covered in barnacles are usually considered less desirable by fishermen, who may release heavily encrusted crabs or search for “clean” mussels, leaving many epizooic barnacles unaffected by harvesting.

### **References**

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- Rilov, G., S.E. Dudas, B.A. Menge, B.A. Grantham, J. Lubchenco, and D.R. Schiel. 2008. The surf zone: a semi-permeable barrier to onshore recruitment of invertebrate larvae? *J. Exp. Mar. Biol. Ecol.* 361: 59-74.

### **5. If barnacles are conspicuous can they get the highest level of protection?**

**Response:** The SAT Levels of Protection Work Group assigns levels of protection (LOPs) to proposed allowed activities based on the best readily available scientific data and according to a decision matrix that has been refined through the MLPA Initiative’s MPA planning process. The decision matrix helps the work group elucidate how the removal of a species might impact the overall functioning of the ecosystem. In general, proposed allowed activities that do not

impact the habitat, remove only highly mobile species, and have little associated catch receive higher LOPs than proposed allowed activities that alter habitat, remove sessile or sedentary species, or have high levels of associated catch. Importantly, the work group assumes that take of a species could increase to the maximum extent allowable by law and does not base the assignment of LOPs on existing levels of take or current species abundances. During the next round of MPA proposals from the MLPA North Coast Regional Stakeholder Group (NCRSG), the SAT will assign LOPs to any proposed allowed activities that identify a species and gear type for which an LOP does not currently exist.

#### **6. Can the SAT evaluate how the proposed MPAs protect traditional tribal uses?**

**Response:** One of the SAT's primary charges is to evaluate how proposed MPAs meet the goals of the Marine Life Protection Act; part of this evaluation includes considering the potential socioeconomic impacts of an MPA network, but not how an MPA network will protect a particular group's uses. However, the SAT has investigated and invited input on a variety of topics, including traditional tribal uses. Additionally, the SAT adapted evaluation methods for Round 2 draft MPA proposals to address MPAs with undetermined LOPs that were intended to accommodate traditional tribal uses. The SAT summarized the methods used in Round 2 to take into account draft MPAs where traditional tribal uses were proposed by the NCRSG in the response to Question 6 in Briefing Document M.1 from the June 29-30, 2010 SAT meeting, as approved by the SAT on June 30, 2010. The SAT has not developed or conducted a formal evaluation of how proposed MPAs may affect traditional tribal uses for several reasons. The SAT did not evaluate how MPA proposals may affect traditional tribal uses because it does not have sufficient information about the types of traditional, non-commercial uses and the places where tribes and tribal communities engage in those activities. Some information about species or groups of species used was submitted by tribes and tribal communities in the north coast regional profile, Appendix E, and may be considered by the NCRSG, SAT and MLPA Blue Ribbon Task Force (BRTF). However, information about methods of take was limited and generally not linked to species or species groups in the regional profile. Further, the summaries or lists of species gathered were not linked to particular habitats or locations in the NCSR, limiting the ability of the SAT to provide feedback on how the specific configuration of proposed MPAs may contribute to protection of traditional tribal uses.

In a letter distributed on May 28, 2010, the MLPA Initiative and California Department of Fish and Game (DFG) staff invited tribes and tribal communities to meet to discuss the Round 2 draft MPA proposals and proposed allowed uses. Some individual members of tribes and tribal communities also provided input on proposed uses in the Round 2 draft MPA proposals. The information assembled to date will be aggregated to protect the confidentiality of individuals, tribes and tribal communities and it will be presented to the NCRSG at its July 29-30, 2010 meeting. Any further input from tribes and tribal communities on proposed uses in MPAs will be integrated into the aggregated information to protect confidentiality and presented at subsequent NCRSG, SAT and BRTF meetings. This information may help the NCRSG identify potential uses for proposed MPAs and also may help the SAT better assess how proposed MPAs could affect traditional tribal uses in Round 3.

The NCRSG can propose several different types of MPAs under the Marine Life Protection Act, including state marine reserves (SMRs), state marine conservation areas (SMCAs) and state marine parks (SMPs). SMPs are intended to allow some types of non-commercial activities, while SMCAs are intended to allow some types of commercial and/or non-commercial activities. The NCRSG could propose uses in SMPs and SMCAs to accommodate traditional tribal uses and reduce conflict among user groups.

**7. Do the SAT evaluations sufficiently address the guideline from the MLPA master plan “To lessen negative impact while maintaining value, take into account local resource use and stakeholder activity?”**

**Response:** The SAT conducts an evaluation of potential impacts on commercial and recreational fisheries. Methods for this evaluation are described fully in Chapter 11 and Appendix B of the *Draft Methods Used to Evaluation Proposed MPAs in the North Coast Study Region*. The evaluation is based on data gathered by Ecotrust on areas of importance to commercial and recreational fishers; on the operating costs of commercial fishing and charter boat businesses (also collected by Ecotrust); and on DFG landings data. The purpose of the evaluation is to help the NCRSG and BRTF better understand potential impacts of proposed MPAs on commercial and recreational fishers. The evaluation provides the maximum potential impact assuming that all use within the proposed MPA is lost if the activity is prohibited and the effort is not redistributed throughout the study region. The NCRSG can use the information from the SAT evaluation to revise MPA proposals to lessen the potential negative impact of MPAs on commercial and recreational fishers. One of the charges of the NCRSG is to “take into account local resource use and stakeholder activity” in the design of MPA proposals, as described in the MLPA master plan. The NCRSG members determine how best to lessen the potential negative impacts of MPA proposals using their knowledge and the available data for the study region, as well as results from the SAT evaluation. There is no guideline for the acceptable level of impact; this is a decision that must be made by the NCRSG as it develops MPA proposals and the BRTF as it reviews the range of MPA proposals submitted for consideration.

**8. Would the SAT review scientific articles to make a finding that they cannot find any adverse effect on marine environments by Native Americans?**

**Response:** The SAT reviews scientific literature on relevant topics that emerge during the MPA planning process. The SAT has reviewed data and literature to assess potential effects of commercial and non-commercial uses in proposed MPAs through its protocol for assigning levels of protection, taking into account the species and methods of take and regulations that apply to all users. The SAT has not assessed potential effects of any subgroup of non-commercial users.

The SAT notes that a review of the scientific literature on the subject of effects of traditional methods of take would be focused on reported observations of changes in marine environments due to traditional activities, rather than identifying these changes as, for

example, “beneficial” or “adverse.” Changes could include increases or decreases in targeted or non-targeted populations, among other variables.

The scientific literature on traditional uses of marine resources by Native Americans in the NCSR is limited. Some information on species gathered is available in Appendix E of the north coast regional profile. However, this information is generally limited to the species gathered, with little information on methods and frequency of take and number of individuals engaged in the activity now and in the past, variables which could contribute to an evaluation of ecological changes in marine environments due to those activities.

Scientific literature about ecological changes in marine environments due to traditional uses of marine resources by Native Americans in regions outside of northern California also may help to address the question. Although the SAT did not complete a full scientific review, the SAT finds evidence in the scientific literature for altered abundances of marine species that are gathered by Native Americans using traditional methods (e.g., Salomon et al. 2007, Rick and Erlandson 2008).

### **References**

Rick, T.C. and J.M. Erlandson, Eds. 2008. *Human Impacts on Ancient Marine Ecosystems: A Global Perspective*. UC Press, Berkeley, CA.

Salomon, A.K., N.M. Tanape, and H.P. Huntington. 2007. Serial depletion of marine invertebrates leads to a decline of a strongly interacting grazer. *Ecological Applications* 17:1752-1770.

### **9. Would the SAT assign a high level of protection to traditional tribal uses?**

**Response:** LOPs are based upon the likely impacts of proposed activities to ecosystems within MPAs. Conceptually, the SAT seeks to answer the following question in assigning LOPs: “How much will an ecosystem differ from an unharvested ecosystem (i.e. no take area) if one or more proposed activities are allowed?” To arrive at an answer, the SAT evaluates the ecosystem impacts of each activity that is proposed to be permitted in an MPA. Where multiple permitted activities are proposed, the one with the greatest impact will be used to determine the LOP for that MPA. The methods used to assign LOPs are described in Chapter 3 of the SAT’s *Draft Methods Used to Evaluate Marine Protected Area Proposals in the MLPA North Coast Study Region*.

In applying the conceptual model for assigning LOPs, the SAT makes three important assumptions:

- Any extractive activity can occur locally to the maximum extent allowable under current state and federal regulations.
- For the purpose of comparison, an unharvested system is a marine reserve that is successful in eliminating fishing and other extractive uses within the MPA.

- The proposed activity is occurring in isolation from other activities (i.e. without cumulative effects of multiple allowed activities). This assumption is based upon limitations in the SAT's ability to assess the cumulative impacts of multiple activities, not a belief that cumulative impacts do not occur.

Because the California Fish and Game Commission has indicated that proposed non-commercial uses in MPAs are available to all non-commercial users, the SAT did not assess LOPs for take of one particular group of non-commercial users (e.g., traditional tribal use).

Further, the SAT is not able to assign LOPs without information about the species and methods of take for proposed uses in MPAs. MPAs that allow take are assigned LOPs ranging from "high" for low-impact activities, to "low" for activities that alter habitat and thus are likely to have a large impact on the ecosystem. Both direct impacts (those resulting directly from the gear used or removal of target or non-target species) and indirect impacts (ecosystem-level effects of species removal) are considered in the levels of protection analysis.

**10. Why should proposed dredge spoil sites influence the location of MPAs when the location of the spoil sites has not yet been finalized?**

**Response:** In Question 9 found in the document *Draft Responses to Science Questions Posed during MLPA Public Meetings and via Email from May 3–20, 2010*, the SAT generally advised the NCRSG to avoid, when possible, placing an MPA adjacent to dredge disposal sites. Specifically with regard to the potential dredge spoil disposal sites near Noyo Harbor, the SAT recommended using caution when placing MPAs near those areas but did not make a firm recommendation to the NCRSG on whether to avoid the proposed site or not. The information provided for the proposed dredge disposal site near Noyo Harbor was intended to inform the NCRSG and the public on how dredge disposal sites should be considered during MPA planning. The NCRSG should be made aware of existing and proposed sites, but other established SAT guidance, including bioregions, habitat representation and habitat replication, and MPA size and MPA spacing, should be used as the primary mechanisms to drive the design of alternative MPA proposals.

**11. Did the SAT consider water quality in the Klamath River and the associated impacts to False Klamath Cove?**

**Response:** During winter rain events, the Klamath River plume may extend past False Klamath Cove (located just over four miles north of the river outlet) and as far north as Point St. George. It is unclear if there are any toxicity concerns in this plume as no studies have been performed to assess this. However, by evaluating a combination of data on mussel bioaccumulation at the mouth of the Klamath River, and water quality sample results at False Klamath Cove, the SAT can provide a general response.

Various segments of the Klamath River have been placed on the U.S. EPA's 303(d) list for water quality impairments, which include elevated nutrient loads, low dissolved oxygen,

sedimentation/siltation, high water temperatures and microcystin (a biotoxin associated with blue-green algae blooms). Blue-green algae blooms are known to extend into the ocean at the mouth of the Klamath during the late summer and fall bloom period. However, mussel watch data<sup>1</sup> collected at Flint Rock (at the mouth of the Klamath River) indicated that the levels of most priority pollutant constituents at this site are relatively low compared to other sites examined in the state<sup>2</sup>. For example, persistent organic pollutants such as dichlorodiphenyltrichloroethane (DDT), polychlorinated biphenyl (PCB), polycyclic aromatic hydrocarbons (PAH), chlordane and dieldrin at the Klamath River are below the median levels statewide, indicating very good water quality for those constituents. Similarly, for most heavy metals, the Klamath River site is below the median levels statewide. However, mussels at this site have accumulated a relatively higher amount (greater than 85<sup>th</sup> percentile of the statewide levels) of three metals: copper, chromium and nickel. These three metals have both natural and anthropogenic sources. The Klamath watershed includes serpentine rock which is known to be a natural source of chromium, nickel and occasionally other heavy metals. At this time, it is unclear whether the metals in the Klamath River are a byproduct or natural erosion processes from upstream, geologic ore formations or are derived from anthropogenic sources, such as runoff from highways or bridges.

In 2008, a study was conducted by the State Water Resources Control Board (unpublished data) to gather data on reference sites in the state to better understand natural water quality conditions in ocean areas that received runoff from relatively undisturbed watersheds. The reference site used for the north coast was located at the mouth of Wilson Creek in the Redwood Area of Special Biological Significance (ASBS), which is located at the northern boundary of the False Klamath Cove. Sampling was performed during the winter time, the period with the highest amount of runoff during the course of the year. The results indicated very good water quality, with low levels of all the constituents tested (Table 1). Nitrate, which can be indicative of natural sources (e.g., upwelling, or natural runoff) or an anthropogenic pollution source (from agricultural runoff, for example) was very low, but was slightly elevated when compared to other reference (clean water) sites in the state. Additionally, the low toxicity result of 98 percent urchin fertilization indicated an unlikely occurrence of any other chemical pollutant in the area that could not be measured directly. Overall, the water quality at this site was very good. It should be noted that in the southern part of False Klamath Cove there are some minor storm runoff discharge points that drain from a youth hostel and the highway, but these discharges have not been measured.

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<sup>1</sup> The National Oceanic and Atmospheric Administration's (NOAA) National Status and Trends Mussel Watch Program (Muscle Watch) is based on bi-yearly collection and analysis and uses these bivalves to measure the contaminants in the water by measuring the level of contaminants in the bivalve's tissues. Contaminants found in the tissue are a good indicator of local contamination in the environment.

<sup>2</sup> NOAA National Status and Trends Mussel Watch, unpublished data from 2007-2009 samples.

**Table 1. Areas of Special Biological Significance reference site sampling seawater results at the mouth of Wilson Creek near False Klamath Cove, March 14, 2008**

Constituent	Units	Concentration
TSS	mg/L	12.3
Ammonia	mg/L	0.03
Nitrate	mg/L	0.06
Nitrite	mg/L	0.01
Phosphorus	mg/L	<0.016
Chromium	µg/L	1.12
Copper	µg/L	1.07
Lead	µg/L	0.15
Nickel	µg/L	1.56
Zinc	µg/L	<0.005
Total PAH	µg/L	0.003
Total DDT	µg/L	<0.001
Total PCB	µg/L	<0.01
Toxicity Assay	% fertilization	98

Source: State Water Resources Control Board unpublished data.

In summary, runoff from the Klamath River that reaches False Klamath Cove during rain events does have the potential to influence conditions in the cove. However, based on the available data, there does not appear to be any evidence of chemical constituents from the Klamath River reaching the False Klamath Cove. Metals are slightly higher in the Klamath River, but should be present at lower levels in the resulting plume because of dilution that occurs during up-coast transport from plume events. Also, it would not be expected that the nutrients from the Klamath River would be concentrated at harmful levels in False Klamath Cove due to dilution effects. The impacts to the cove by the river may include slightly higher sediment loads or increased turbidity to the area from the Klamath River plume, but again it is not expected that turbidity would be at harmful levels. The SAT's general conclusion, based on the limited data, is that the Klamath River's influence on the False Klamath Cove is likely negligible.