California MLPA Master Plan Science Advisory Team
Draft Responses to Questions Received at the
October 16-17, 2007 NCCRSG Meeting
Revised February 15, 2008

The questions listed below were received at the NCCRSG meeting on October 16-17, 2007. MLPA I-Team staff and the MLPA Master Plan Science Advisory Team (SAT) co-chairs have reviewed the questions and determined that some are policy/management based, others are science-based, and still others have both policy and science components.

This document contains responses to all of these questions. I-Team staff has provided responses to the policy/management questions, while the SAT has provided responses to the science questions. Some questions contain both policy and science responses.

1. Would allowance of shore-based angling along a broad (100 yard) ribbon of the coast be acceptable and what impact would this have on the protection level of an MPA?

Staff response: Each of these areas will, by definition, be classified as a state marine conservation area (SMCA) or state marine park (SMP) and will be evaluated against the California Department of Fish and Game's (DFG's) feasibility criteria as well as be given a level of protection by the SAT.

DFG's recommendation is to propose an SMCA or SMP that allows fishing from shore. A boundary distance offshore is not recommended since 100 yard fishing zones are not easily enforced and this could negate the intent to allow only shore-based fishing. DFG recommends against a separate narrow SMCA that allows fishing sited adjacent to and inshore of an SMR or other designation. This creates an abrupt change in regulations, multiple designations in a small area, is difficult to enforce, and creates difficulties for public understanding. DFG recommends that the SAT provide input on the ecological impacts of shore-based fishing on the overall level of protection of the area.

This response was adopted by the SAT at its January 23, 2008 meeting.

SAT response: This question is addressed in the evaluation methods document, *Draft MLPA Evaluation Methods for MPA Proposals* in the section describing levels of protection.

2. **Where is the sewer outfall from San Francisco in relation to the Gulf of the Farallones National Marine Sanctuary?**

Staff response: The outfall for San Francisco's treated sanitary wastewater is outside of the Gulf of the Farallones and Monterey Bay National Marine sanctuaries. The outfall is approximately 5 nautical miles west of the San Francisco/San Mateo County boundary, near the 20 meter depth contour. The eastern boundary of the Monterey Bay National Marine Sanctuary is approximately 4 nautical miles west of the outfall. The eastern boundary of the Gulf of the Farallones National Marine Sanctuary is approximately 8 nautical miles west of the outfall. During calm weather the wastewater treatment facility and

outfall function correctly, however, during major storm events discharge from the outfall may reach nearshore waters and beaches.

Reference

Oceanside Biology Laboratory. August 2007. Southwest Ocean Outfall Regional Monitoring Program 2006 Data Report. Prepared for San Francisco Public Utilities Commission Natural Resources and Land Management Division. Accessed online 1 November 2007 http://www.mbnms-simon.org/docs/project/100212_2005_report.pdf

3. How should the NCCRSG consider or deal with international telecommunication cables that are being installed and may cross MPAs or future wave farms that may not allow access?

Staff response: A policy memo from the California Department of Fish and Game will be provided to the NCCRSG addressing the issue of other management measures, such as wave farms, which may impact the NCCRSG's deliberations.

4. Have any wave farms been proposed for this study region?

Staff response: Four wave energy proposals for California are currently under review by the Federal Energy Regulatory Commission (FERC). Additionally, one tidal energy proposal is under review. None of these proposals are within the MLPA North Central Coast Study Region, though at least two border the region closely. The proposals are:

1. Pacific Gas & Electric: "WaveConnect" pilot project off Humboldt Bay and Fort Bragg. The FERC application is for a 136 square mile study area off Humboldt Bay and 68 square mile area in Mendocino. The actual test sites could be about 1-4 square miles in area and would test multiple types of devices for a period of 3 years. They are not considering any on- or near-shore devices. The pilot project could be near 3 miles offshore.
2. Chevron: Two 40-megawatt wave farms off Fort Bragg are proposed.
3. Finavera: Planning to apply for a preliminary permit for the area north of Trinidad (Big Lagoon area). Finavera's plan is to install and test 4 buoy systems to generate 250 megawatts, on average. The four buoys would take up an area of ocean bottom approximately 950' by 200'.
4. Fairhaven Wave Energy: Proposal to place 40 to 80 wave energy converters (20 megawatts) in a site approximately ½ mile wide by 4 miles long northwest of Eureka.
5. Golden Gate Energy: Proposal is to develop a tidal current energy system. The system would be installed below the Golden Gate Bridge and use existing infrastructure for placement.

5. Can the SAT analyze displacement effects?

Staff response: This question was responded to at the NCCRSG meeting both by staff and SAT member Astrid Scholz; it is additionally addressed in the California Environmental Quality Act (CEQA) review of the central coast MPAs. It is extremely difficult to predict

human behavior and response to fishery closed areas. At present, the spatial data necessary to effectively conduct this analysis is not available; such an analysis requires high precision small scale data on catch and fishing behavior. Monitoring efforts of the recently implemented central coast MPAs may in the future provide some insight into fishing behavioral shifts and displacement effects.

Reference

Jones & Stokes. 2006. *Environmental Impact Report: California marine Life Protection Act Initiative Central Coast marine Protected Areas Project.* Draft. November. State Clearinghouse #2006072060. (J&S 06682.06) Oakland, CA. Prepared for California Department of Fish and Game, Marine Region, Monterey, CA.

6. Is a marine protected area (MPA) that protects Farallon rockfish likely to increase the abundance of juvenile rockfish in the Farallon subregion?

This response was adopted by the SAT at its January 23, 2008 meeting.

SAT response: The interaction between adult and larval rockfish numbers within the Farallon subregion is a complex issue that depends on a number of physical and biological conditions. Though protecting adult rockfish in the Farallones should increase larval production through increased survival, growth, and age of adults, it is unclear if those larvae will be exported from the subregion or survive to adulthood if they are retained there. Complex current patterns around the Farallones could retain larvae near the islands or advect them inshore, where they could replenish populations along the coast, particularly those in the lee of Point Reyes due to the established current gyre in that area.

However, a growing number of studies indicate a surprising rate of local retention of larvae associated with islands (Hellberg et al. 2002, Kingsford et al. 2002, Sponaugle et al. 2002, Swearer et al. 2002, Thorrold et al. 2002, Warner & Cowen 2002). If larvae are retained at the Farallones, their contribution to adult rockfish populations depends on the size of the initial adult populations. Since adult rockfish prey on young rockfish (Hallacher & Roberts 1985), low initial adult populations (presumably due to fishing and marine mammal predation) would lead to higher juvenile survival. High numbers of adults (presumably due to protection from fishing) would decrease the survival rate of juvenile rockfish due to predation. However, predation might eventually increase larval production by providing increased growth and fecundity in adults. Due to natural variation in larval production and the uncertain role played by local currents, quantifying increases in larval production due to protection of adults in the Farallon subregion will be difficult.

References

Hallacher, L.E. and D.A. Roberts. 1985. Differential utilization of space and food by the inshore rockfishes (Scorpaenidae: *Sebastes*) of Carmel Bay, California, USA. Env. Biol. of Fishes 12: 91-110.

Hellberg, M.E., R.S. Burton, J.E. Neigel, and S.R. Palumbi. 2002. Genetic assessment of connectivity among marine populations. Bull. Mar. Sci. 70: 273-290.

Kingsford, M.J., J.M. Leis, A. Shanks, K.C. Lindeman, S.G. Morgan, and J. Pineda. 2002. Sensory environments, larval abilities and local self-recruitment. Bull. Mar. Sci. 70: 309-340.

Sponaugle, S., R.K. Cowen, A. Shanks, S.G. Morgan, J.M. Leis, J. Pineda, G.W. Boehlert, M.J. Kingsford, K.C. Lindeman, C. Grimes, and J.L. Munro. 2002. Predicting self-recruitment in marine populations: biophysical correlates and mechanisms. Bull. Mar. Sci. 70: 341-375.

Swearer, S.E., J.S. Shima, M.E. Hellberg, S.R. Thorrold, G.P. Jones, D.R. Robertson, S.G. Morgan, K.A. Selkoe, G.M. Ruiz, and R.R. Warner. 2002. Evidence of self-recruitment in demersal marine populations. Bull. Mar. Sci. 70: 251-271.

Thorrold, S.R., G.P. Jones, M.E. Hellberg, R.S. Burton, S.E. Swearer, J.E. Neigel, S.G. Morgan, and R.R. Warner. 2002. Quantifying larval retention and connectivity in marine populations with artificial and natural markers. Bull. Mar. Sci. 70: 291-308.

Warner, R.R. and R.K. Cowen. 2002. Local retention of production in marine populations: evidence, mechanisms, and consequences. Bull. Mar. Sci. 70: 245-249.

Personal communication: Dr. Mark Carr and Dr. Pete Raimondi.

7. The NCCRSG would like the SAT to (re)consider and comment on the following as possible additions to the list of species likely to benefit from MPAs. (An NCCRSG workgroup was tasked to come up with a list and rationale for review of particular species – see additional discussion points in Appendix I)

a. Flat abalone, *Haliotis walallensis*, and Northern abalone, *Haliotis kamtschatkana (see Rogers*-Bennett, 2007, Sloan, 2004, and Gladstone, 2002)

b. White sharks - SAT response to NCCRSG questions (revised Oct 12), "Since little is known about the breeding locations of white sharks, protecting forage species in areas where white sharks aggregate (e.g. the Farallones, Tomales Point) would likely benefit them."

c. Salmonids - SAT response to NCCRSG questions (revised Oct 12), "Placing a protected area in the coastal waters offshore of the river mouth will protect salmon during a crucial life stage."

This response still requires review and further clarification by the full SAT before being adopted.

Draft SAT Response to Questions 7a: Flat abalone, *Haliotis walallensis,* are found subtidally from 20 to at least 70 feet. The species lives on and under rocks with other species of abalones, and feeds by grazing on small attached algae. Ranging from British Columbia to La Jolla, California, it is rare south of Carmel, California. The species is generally not plentiful, but occasionally abundant in small areas (Cox 1962).

Flat abalone are not harvested in California, although there is a new commercial flat abalone fishery in Oregon. Currently, they no longer occur in southern California, and in central California this species has declined from 32% to 8% of the total number of abalones (Haliotis spp) inside a marine reserve (Rogers-Bennett 2007). Long-term persistence of flat abalone may be a concern due to their reduced range, threats from ocean warming, sea

otter predation, and the flat abalone fishery in Oregon, suggesting that improved monitoring and protection will be critical (Rogers-Bennett 2007).

Northern (aka "pinto") abalone, *H. kamtschatkana*, range from Sitka, Alaska to Monterey, California, and are found in the intertidal and subtidal zones down to at least 70 feet. Abalone are slow growing and long-lived, with life spans of up to 50 years. Adults may move only a few hundred meters during their lifetimes. During spawning events, abalone aggregate in shallow subtidal areas to maximize fertilization success, which depends on their aggregation density (Babcock & Keesing1999). It is now recognized that northern abalone is particularly vulnerable to overexploitation due to this life history strategy (Tomascik and Holmes 2003).

California closed all commercial abalone fisheries in 1997, and at this time, northern abalone were not sufficiently abundant in California to have supported a fishery (NASSR Workshop 2007). In fact, northern abalone were never a major component of the California's commercial or recreational catch. Elsewhere, commercial and recreational over-harvesting since the mid-1970s has resulted in a large enough population decline that they were declared a threatened species on the Endangered Species Act (NMFS 2007). Despite the lack of local fishing pressure, there was an almost 10-fold decline in abundance in northern California: 156,000 in 1971 to 18,000 in 1999-2001 (NMFS 2007).

Both flat abalone and northern abalone could be included on the likely to benefit list, as these species occur in the study region and have life history characteristics that make them more conducive to protection by MPAs: sedentary behavior, low larval dispersal distance, long lifespan, and slow growth. Northern abalone in particular are more vulnerable to overexploitation due the life history strategy of aggregating in shallow subtidal areas during spawning events to maximize fertilization success. MPAs are likely to have only indirect effects on abundance, however Rogers-Bennet & Pearse (2001) show that MPAs with high populations of urchins can increase settlement of juvenile abalone (including flat abalone).

Neither species would make a good candidate for the *list of species most likely to benefit from MPAs*. They are not harvested in California, there is no evidence that the species suffers direct negative impacts from human activities, and significant proportions of the species distributions do not occur within habitats in the study region.

References

Babcock, R. & J. Keesing. 1999. Fertilization biology of the abalone *Haliotis laevigata*: laboratory and field studies. *Can. J. Fish. Aquat. Sci.* 56:1668–1678

Cox, K. W (1962). California Abalones, Family Haliotidae. *The Resources Agency of California Department of Fish and Game Fish Bulletin*:118.

DFO Canada Species at Risk: Northern Abalone
http://www.dfo-mpo.gc.ca/species-especes/species/species_northernAbalone_e.asp

NOAA NMFS: Species of Concern
www.nmfs.noaa.gov/pr/pdfs/species/pintoabalone_highlights.pdf

NOAA NMFS: Sustainability Species of Concern
http://www.nmfs.noaa.gov/speciesid/fish_page/fish5a.html

Northern Abalone Scientific Session and Recovery Workshop
Georgia Basin Puget Sound Research Conference, Vancouver, BC
Tuesday, March 27, 2007

Rogers-Bennett, Laura (2007). Is climate change contributing to range reductions and localized extinctions in northern (*Haliotis kamtschatkana*) and flat (*Haliotis walallensis*) abalones? *Bulletin of Marine Science*: 81(2) 283-296

Rogers-Bennett, L. & J. S. Pearse (2001). Indirect benefits of Marine Protected Areas for Juvenile Abalone. *Conservation Biology* 15(3): 642-647

Tomascik, T. and H. Holmes 2003. Distribution and abundance of *Haliotis kamtschatkana* in relation to habitat, competitors and predators in the Broken Group Islands, Pacific Rim National Park Reserve of Canada. *Journal of Shellfish Research* 22 (3): 831–838

UC Davis Seafood Network Information Center: Abalone
http://seafood.ucdavis.edu/pubs/abalone.htm

This response still requires review and further clarification by the full SAT before being adopted.

Draft SAT Response to Question 7b: White sharks are a highly mobile species that appears to establish, at least temporary foraging territories in the study region (Anderson et. al., 2006). White sharks forage close to shore off pinniped colonies at Point Reyes, Tomales Point, and the Farallon Islands (see Anderson et. al., 2006). Despite the benefits pinnipeds may receive from MPAs at some locations, it is unclear if the proportion of the pinniped populations that would benefit from MPAs represents a significant proportion of the forage base, over an individual's life span, for white shark populations in the study region. Other sharks that are on the list of species likely to benefit from MPAs exhibit life history traits that rely on specific habitats that warrant protections, such as nursery areas in eel grass beds. Additionally, white sharks are not targeted in fisheries. Despite some benefits white shark prey may receive from MPAs this species is not likely to receive significant benefits from MPAs.

Reference

Anderson, S.G., Becker, B.H., and S.A. Allen (2006) Observations and prey of white sharks (C*archaradon carcharias*) in and around the Point Reyes National Seashore: 1984 – 2004. California Fish and Game

This response was adopted by the full SAT at its January 23, 2008 meeting.

SAT Response to Question 7c: Salmon are not likely to benefit from MPAs of the size generally under consideration in this process. This is due to their high mobility and pelagic

nature in marine waters. Limited protections for local populations could be achieved by siting MPAs around the mouths of estuaries where some salmon stocks aggregate before making upstream movements. However, the pressure of ocean fisheries would largely outweigh protection afforded by an MPA. Despite the opportunity for limited protection through MPAs at the mouths of estuaries, these species would not likely achieve significant benefit from MPAs.

8. Would the designation of a state marine reserve or other MPA around the mouth of a major estuary make a significant contribution to protection of anadromous fish that spawn upstream?

a. Does the SAT have comments on what size and setback is likely to be protective? Would a fairly narrow boundary accomplish resource protection?

b. Is there a risk of boats "fishing the line" if the boundary is drawn tight to the mouth of a river?

This response was adopted by the SAT at its January 23, 2008 meeting.

SAT Response to question 8 and 8a: An MPA around the mouth and including an estuary could provide limited protection for local anadromous populations staging for movement upstream. The exact size of an MPA needed to protect salmon during this period would depend on the size of an estuary and other factors that can change widely from year to year including: run size, oceanic conditions, the amount of freshwater input and the presence of obstructions, such as sandbars, that may close the estuary for periods of time.

Spatial salmon fishing closures currently exist in regulation (section 27.75) around the mouths of various rivers in Northern California including the Klamath, Smith and Eel Rivers. These regulations close salmon fishing around river mouths in areas that range in size from 8 mi^2 (4 x 2 miles) to 36 mi^2 (12 x 3 miles) seasonally, and 18 mi^2 year-round.

Staff response to question 8b: It is the California Department of Fish and Game's (DFG's) experience in the Channel Islands and elsewhere that fishing effort is often exerted near the boundaries of area-based fishery closures. DFG enforcement staff are, however, very familiar with enforcing boundary line regulations for both MPAs and other management. If the intent of a protected area is to protect fish returning to a specific spawning location, the area should be large enough to protect the congregation of animals around that location.

9. What impact would the delineation of "vessel no traffic zones" of varying widths have on the level of protection assigned to an MPA?

a. What would be the specific benefit to seabirds and marine mammals?

This response was adopted by the full SAT at its January 23, 2008 meeting.

SAT response to question 9: According to the CDFG memorandum dated November 1, 2007, vessel no traffic zones would be designated as "special closures" and not marine protected areas (MPA) *per se*. However, in some respects vessel no traffic zones would

serve a similar function to medium or high protection MPAs because access would be restricted. The level of protection provided below the water surface would depend on the size of the special closure, whether or not the closed area had other access from shore or to divers, and whether or not the special closure was also within an MPA. Small special closures likely would provide only low to medium protection levels to most mobile animals but could provide higher protection levels to very sedentary (e.g., benthic invertebrates) animals.

Staff response to question 9: The California Department of Fish and Game has issued a memo to the NCCRSG on the use of "special closures." This memo provides information to supplement the SAT response above.

Staff response to question 9a: This question was previously addressed. Please see the response to question 6 from the NCCRSG July 10-11, 2007 meeting.

This response was adopted by the full SAT at its January 23, 2008 meeting.

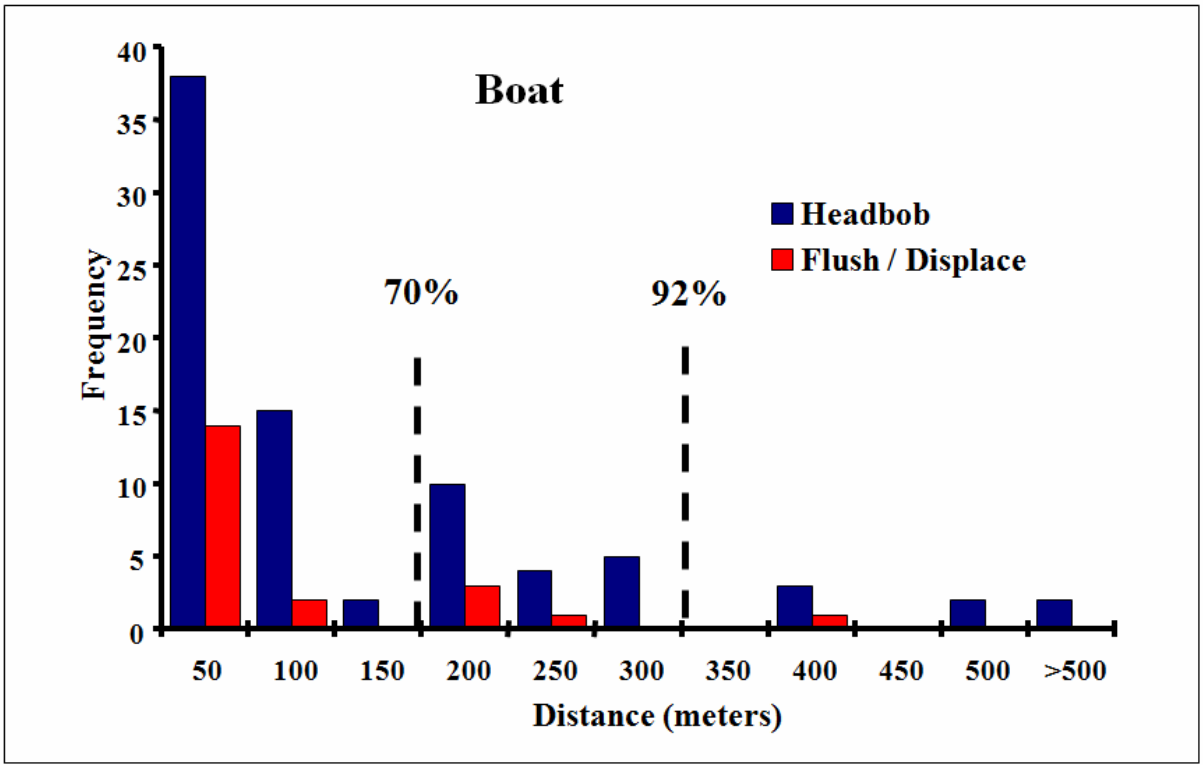
SAT response to question 9a: This question was also addressed in response to Question 6 from the NCCRSG July 10-11, 2007 meeting. Vessel no traffic zones would provide a high protection level for seabirds and marine mammals at breeding colonies, roosting and haul-out sites. Vessel traffic, including motorized and non-motorized, can cause significant levels of disturbance to seabirds and marine mammals (e.g., Allen et al. 1985; Riemer and Brown 1997; Carney and Sydeman 1999; Rojek et al. 2007; U.S. Fish and Wildlife Service, unpubl. data). Vessel noise, such as from loud engines and generators, has caused many disturbances to seabirds and pinnipeds at the Farallon Islands in the past (PRBO Conservation Science and USFWS, unpubl. data). Disturbances can lead to reductions in productivity or site abandonment. Disturbances at foraging areas can disrupt feeding activities and cause animals to leave the area, further prohibiting feeding and leading to costly additional energy expenditures. Frequent disturbances can cause significant impacts. For example, highly migratory birds (e.g., waterfowl, shorebirds) may not acquire adequate energy reserves to complete migrations (references).

Responses of seabirds/waterbirds and marine mammals to vessel approach vary depending on the species, habitat, and level of habituation. Because of this variability, most studies recommend choosing the most sensitive species and location for applying to a system of disturbance buffers (reviewed in Carney and Sydeman 1999). Examples of applied or recommended disturbance buffers are: 1) 500 feet for seabirds and pinnipeds at Three Arch Rocks, Oregon (Riemer and Brown 1997); 2) 300 feet for harbor seals at Bolinas Lagoon, California (Allen et al. 1985); 3) 300 feet around marine mammal rookeries (except for threatened Steller sea lions; National Oceanic and Atmospheric Administration [NOAA]); and 4) 1,000 feet at threatened Steller sea lion rookeries (NOAA Critical Habitat Plan, Steller sea lions; NOAA).

Data for boat disturbances to Common Murre breeding colonies in central California were presented in tabular form in the response to Question 6 from the NCCRSG July 10-11, 2007 meeting. Updated data (including 2007) are presented here graphically for easier viewing. From these data, about 50% of disturbances occurred at vessel distances of $\leq$ 50

m (164 ft.), 70% at ≤ 150 m (492 ft.), and nearly all (92%) disturbances occurred at distances ≤ 300 m (984 ft.). From these data, levels of protection provided by various no vessel traffic zones could be assigned: 1) low (≤ 175 ft.); 2) medium (150-500 ft); high (500-1,000 ft.); and 4) very high (>1,000 feet).

Figure 1. Frequency distributions of vessel distances causing disturbances to Common Murre colonies at nearshore central California colonies (G. McChesney, U.S. Fish and Wildlife Service, unpubl. data). Distances are shown in 50 meter (164 feet) increments. Disturbance types are displayed as "headbob" (alert or agitated) and "flush/displace" (birds leave site). Dashed lines indicate distances containing 70% and 92% of all disturbances.



Appendix I. Additional rationale and discussion provided by the NCCRSG for considering the species listed in Question 7.

a. Flat abalone, *Haliotis walallensis*, and Northern abalone, *Haliotis kamtschatkana (see Rogers*-Bennett, 2007, Sloan, 2004, and Gladstone, 2002)

Rationale for this is based on the above scientific literature. Both species are under threat because of ocean warming contracting the southern portion of their ranges, the expansion of the sea otters range, and for the flat abalone, a commercial fishery in Oregon. They would also be a good candidate for "flagship" species that would highlight the need for kelp bed community conservation (Sloan, 2004). Gladstone (2002) included them with other mollusks as important indicator assemblages. In the mid- 90s, flat abalone were routinely observed at Saunder's Reef (*Lance Morgan, pers. comm., Oct. 2007)*.

b. White sharks - SAT response to NCCRSG questions (revised Oct 12), "Since little is known about the breeding locations of white sharks, protecting forage species in areas where white sharks aggregate (e.g. the Farallones, Tomales Point) would likely benefit them."

The following provides additional rationale and discussion for and against the inclusion of white sharks to the list of species likely to benefit from MPAs. These discussion points were summarized from email discussions among the NCCRSG about this topic.

Discussion and rationale against inclusion of white sharks to the list of species likely to benefit:

1. White sharks are already protected from fishing therefore would not benefit any further.
2. The forage base of white sharks is marine mammals, which are also fully protected.
3. Since little is known about the breeding locations of white sharks any considerations of MPA placement for benefiting white sharks would entail a ‘shotgun’ approach which is unacceptable for all other MPA requirements.
4. The feeding grounds for white sharks are very broad. “They eat whenever and where ever they want” therefore would not benefit from MPAs aimed at protecting forage.
5. There is no need to minimize human disturbance to foraging behavior. Seals have been known to board vessels to escape feeding white sharks. Therefore, white shark feeding behavior is not disturbed by vessel presence.

Discussion and rationale for inclusion of white sharks to the list of species likely to benefit:

1. Although white sharks are protected they would still gain benefit from additional protective designations such as MPAs since interactions with humans may still result in some level of take.

2. White sharks are internationally recognized as threatened and appear on the IUCN's red list and in CITES appendices.
3. There are only four places where white sharks congregate in central and north central California. Three of those locations lie in the MLPA North Central Coast Study Region.
4. It has been suggested that research is beginning to show there are limited numbers of white sharks and that some individuals may move between all four sites described above.
5. As apex predators white sharks have small population sizes and are highly susceptible to human disturbance and impacts.
6. White sharks mature late and have low fecundity.
7. The Farallon Islands are an important white shark study area due to location and low human impact.
8. Allowing take of other organisms increases risks to white sharks.
9. White sharks frequent the same foraging grounds annually, therefore protecting forage grounds increases protection to white sharks.
10. As an apex predator they promote ecosystem health and can be an indicator species.

c. Salmonids - SAT response to NCCRSG questions (revised Oct 12), "Placing a protected area in the coastal waters offshore of the river mouth will protect salmon during a crucial life stage."

   No additional rationale was provided.