

California Marine Life Protection Act Initiative
Master Plan Science Advisory Team
DRAFT Executive Summary – Central Coast MPA Proposal Evaluations
Revised May 1, 2006

STAFF NOTE: This summary has only been partially revised; additional work is required related to goals 2 and 6 before complete.

The MLPA Master Plan Science Advisory Team (SAT) analyzed the relative merits of the six proposed central coast marine protected area (MPA) packages (0, 1, 2, 3, S, AC) in meeting the SAT guidelines and science-related goals (1, 2, 3, 4 and 6) of the Marine Life Protection Act (MLPA). Those analyses were discussed, refined and approved by members of the SAT members present at the January 20, 2006 and March 2, 2006 SAT meetings in San Jose. Subsequent to those meetings, modifications were made by the BRTF to packages 2 and 3. A SAT sub-team analyzed the resulting packages 2R and 3R relative to goals 1 and 4.

Table 1: Scientific Elements Used to Evaluate MLPA Science-Related Goals

MLPA goal	SAT evaluation of scientific elements
1. To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.	Habitats and protection levels
2. To help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted.	Size, spacing and protection levels
3. To improve recreational, educational, and study opportunities provided by marine ecosystems that are subjected to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity.	Habitat replication
4. To protect marine natural heritage, including protection of representative and unique marine life habitats in California.	Habitats and protection levels
5. To ensure that California's MPAs have clearly defined objectives, effective management measures and adequate enforcement and are based on sound scientific guidelines.	No SAT evaluation specific to Goal 5
6. To ensure that the states' MPAs are designed and managed, to the extent possible, as a network.	Size and spacing guidelines

Based on these new analyses, the SAT sub-team drew a number of conclusions:

SAT Guidelines and Area Protected by MPAs

Helping to sustain populations through the use of MPAs depends on population size, the spatial distribution of MPAs, the magnitude of fishing pressure outside the MPAs, extent of adult movement and the dispersal distance of larvae. To help sustain a variety of populations and, by extension communities and ecosystems, the SAT chose MPA size and spacing

guidelines that were judged to be adequate. As such, the MLPA Master Plan Framework (MPF) guidelines of MPA size and spacing provide a method for evaluating the proposed MPA packages. With regard to helping to sustain populations, the SAT recommended that MPAs should extend from the shoreline to deep water (i.e., offshore boundary of state waters) and should be a minimum of 3-6 miles along the coast, and preferably 6-12 miles in length. These size guidelines were recommended to include the typical range of movements of many species living in state waters. The maximum spacing guideline of 30-60 miles was based on the dispersal distances of larvae of many species.

The size and spacing guidelines are not independent of one another. The SAT recommended that if proponents choose to propose smaller MPAs, then those MPAs should be spaced closer together (at the lower end of the proposed spacing guideline). Conversely, consistently larger MPAs could be situated at the larger end of the spacing guideline.

Because there are many possible combinations of size and spacing, the SAT provides the following guidance to the MLPA Blue Ribbon Task Force (BRTF) with respect to the amount of area needed to be protected to meet the MLPA goals:

- The minimum size guideline (3 miles long) combined with the minimum spacing guideline (30 miles apart) suggests that at a minimum, MPAs should cover at least 9% of each habitat in the study area (i.e., 3 mi/33 mi).
- The maximum of the preferred size guideline (12 miles) combined with the lower value of the maximum spacing guideline (30 miles) suggests that MPAs covering up to 29% of each habitat in the study area bound the preferred range of SAT guidelines (i.e., 12 mi/42 mi).

Using these benchmarks, we examined which habitats were included at the 10%, 20% (i.e., midpoint), and 30% levels for each package.

General Comments on All Packages (without consideration of existing kelp harvest leases)

How packages are similar:

1. All packages have increased conservation benefits and have created substantially better ecological MPA networks relative to existing MPAs (Package 0).
2. All packages meet the minimum MPF guidelines for MPA spacing for the majority of habitats even when only high-protection MPAs are considered.
3. Most MPAs in all packages meet the MPF guidelines for shoreline length even when only high-protection MPAs are considered.
4. With respect to habitat replication, all packages include at least two MPAs that meet the MPF area or shoreline length guidelines for each of the following habitat types: sandy beach, rocky intertidal, surfgrass/eelgrass, shallow sand, deep sand, shallow rock, kelp, and upwelling centers.

How packages differ:

5. The packages differ substantially in the amount of area protected, the level of protection in each of the 10 habitat types¹ that were evaluated, and the number of MPAs in the MPF preferred size range.
6. With respect to the amount of area receiving any protection and to the amount of area receiving high protection (SMR & SMCA-high), the packages are ordered in the following manner: Package 1 (least protection), Package 3R, Package 2R, and Package AC (most protection). However, packages 3R and 2R are essentially equivalent in amount of area receiving high protection.
7. Packages 2, 3, AC and S have a strong majority of high protection MPAs that meet MPF guidelines for area or shoreline length. A majority of high protection MPAs in Package 1 are smaller than MPF guidelines for area.
8. The diversity of habitats is protected at high levels in a substantially larger number of MPAs that meet MPF area guidelines in Packages 2, 3, AC and S than in Package 1.
9. Packages 2 and S meet the MPF spacing guidelines for all habitats protected at high levels, whereas packages 1 and 3 have a gap between MPAs in one habitat that exceeds MPF guidelines*, and Package AC has two gaps that exceed MPF guidelines. (*the gaps in packages 1 & 3 reflect miscommunications between the SAT and package proponents, and can be rectified)

Specific Comments on All Packages (without consideration of existing kelp harvest leases)

Moderate to High Level of Protection across All Packages

10. All packages protect at least 10% of each of the 10 habitat types at the moderate-to-high protection levels across the study region, with the exception of shallow canyon habitat in Packages 1 and 3R (each protecting 5%)..
11. All packages provide moderate-to-high level protection to at least 20% of five habitats: deep rock, deep sand, deep canyon, rocky intertidal, and estuarine habitats.
12. No package protects 30% or more of all habitats at the moderate-to-high levels. However, packages AC, 2R, 3R, and 1 protect 8, 5, 5, and 2 habitat types at these protection levels, respectively.

High Level of Protection across All Packages (SMR or SMCA-High MPAs)

13. All packages provide high-level protection for at least 20% of rocky intertidal habitat.
14. All packages provide high-level protection for at least 30% of estuarine habitat.
15. In packages 2, 3, AC and S, at least half of the high protection MPAs meet or exceed the minimum MPF guidelines.
16. Packages 3R, AC, 2R, and 1 protect 20% or more of 7, 6, 6, and 4 of the ten habitat types at high level protection, respectively.

¹ Note the types here

Highest Level of Protection across All Packages (SMR)

17. Only packages 2R and AC provide the highest level of protection to at least 10% of all habitat types, excluding shallow canyon habitat.
18. All packages provide the highest level of protection to at least 10% of five habitats: shallow rock, sandy beach, kelp, rocky intertidal, and estuaries.
19. All packages provide the highest level of protection to at least 20% of rocky intertidal and estuarine habitats.
20. In general, all the packages provide the least amount of highest level of protection to deep rock, deep sand, deep canyon, shallow canyon, and shallow sand habitats.

Other Comments to Specific Packages

Package 1

- Provides moderate-to-high level protection for at least 20% of five habitats.
- Provides high-level protection for at least 20% of four habitats: rocky intertidal, estuaries, deep canyon, and deep sand.
- Provides high-level protection for at least 30% of only one habitat: estuaries.
- When high protection MPAs are considered, Package 1 has a smaller fraction of MPAs that meet MPF guidelines than the other packages.
- SMRs include less than 1% of available deep rock habitat, and less than 5% of available deep sand, shallow sand, deep canyon, and shallow canyon habitats.

Package 2R

- Provides moderate-to-high level protection for at least 20% of eight habitats.
- Provides high-level protection for at least 20% of six habitats: rocky intertidal, estuaries, deep rock, shallow rock, kelp, and sandy beach.
- Provides high-level protection for close to 30% (or greater) of four habitats: shallow rock, rocky intertidal, estuaries, and kelp.
- Provides less than 5% of available shallow canyon habitat.

Package 3R

- Provides moderate-to-high level protection for at least 20% of eight habitats.
- Provides high-level protection for at least 20% of seven habitats: shallow rock, deep rock, deep canyon, rocky intertidal, kelp, sandy beach, and estuaries.
- Provides high-level protection for at least 30% of four habitats: shallow rock, kelp, rocky intertidal, and estuaries.
- SMRs are proposed for less than 1% of available deep rock habitat, and less than 5% of available shallow canyon habitat.

Summary of Potential Impacts to Commercial and Recreational Fisheries in the Central Coast Study Region

Each package also was analyzed for impacts on 19 commercial fisheries and 2 important recreational fisheries (i.e., salmon and rockfish). There are several patterns that emerge from

the analysis of the 5 proposed MPA packages (excluding Package 0):

- A. All packages affect the 19 commercial fisheries differently, with the smallest effects in terms of both value (equivalent to “stated importance”) and area affected evidenced in Package 1 in the majority of fisheries studied.
- B. In the commercial fisheries, for 16 out of the 19 species investigated, Package 1 has the least effects within the study region and Package AC the most, packages S and 3 lie between packages 1 and 2 in 12 of the 19 fisheries.
- C. There are some deviations from this pattern in terms of the relative value of the affected areas, i.e., larger areas affected do not always correspond to higher stated importance affected.
- D. In the commercial fishery, for 18 out of the 19 species investigated, Package 1 has the least effects on the relative value and Package AC the most, packages S and 3 lie between packages 1 and 2 in 11 of the 19 fisheries.
- E. Package S has the least impact within the study region for 2 of the fisheries, anchovy and white seabass, with comparable impacts to Package 1 for 8 of the fisheries, (anchovy, halibut, mackerel, salmon, sardine, white seabass, and squid);
- F. Package S has less than 10% impact on the value within the study area for 8 of the 19 commercial fisheries, compared to 12 for Package 1, 7 for Package 3, 2 for Package 2 (5 additional fisheries for Package 2 are between 10% - 11%), and 1 for Package AC.
- G. Packages have similar effects on the 2 recreational fisheries considered, with the package that affects the smallest area of grounds being the one that affects the least number of trips.
- H. Package 1 followed by Package S affects the least amount of recreational fishing area and trips for both salmon and rockfish, with Package 2 having the largest effect on the recreational fishing area and number of trips for salmon, while packages AC and 3 have the largest effect on the recreational fishing area and number of trips for rockfish.

Summary of Non-Consumptive Economic Impacts

Each package was qualitatively analyzed for non-consumptive impacts. The following general observations can be drawn:

- I. Compared to the status quo (Package 0), all of the proposed packages provide increased protection and enhancement of non-consumptive use values in the central coast.
- J. Throughout the region, packages 2, 3, S and AC generally provide substantial protection and enhancement for non-consumptive uses. The proposals, however, are likely to differ considerably in the magnitude of improvement and protection in specific areas (e.g. the Monterey Bay area).
- K. For non-consumptive uses, four areas could be considered to be centers of intensive non-consumptive use: a) Elkhorn Slough (primarily for kayaking and wildlife viewing) and b) south Monterey Bay, the Pinnacles near Carmel Point, and Point Lobos (for diving and kayaking).
- L. All of the packages provide high levels of protection to Elkhorn Slough and the Point

Lobos area, but the packages differ substantially in the degree to which non-consumptive uses are likely to be protected or enhanced in the vicinity of south Monterey Bay and the Pinnacles.

- M. For the south Monterey Bay dive areas associated with Lovers Point and the Monterey Breakwater, packages 2 and AC provide the greatest protection. Packages 1 and S provide only low levels of protection in these areas.
- N. For the Pinnacles dive area, packages 2, 3, S and AC provide moderate to substantial protection, with packages 2 and AC providing the greatest protection. Package 1 provides the least protection.



Marine Life Protection Act Initiative



Draft Size & Spacing Evaluation for the BRTF-Recommended Central Coast MPA Packages

May 1, 2006 MLPA SAT Meeting
Presented by Dr. Steve Gaines



Lengths: High Protection Clusters

Pkg	# of MPA Clusters	Below Minimum	At Minimum	Preferable Size
1	15	27%	46%	27%
2R	16	19%	50%	31%
3R	14	7%	55%	38%



Lengths: High Protection Clusters

Pkg	# of MPA Clusters	Below Minimum	At Minimum	Preferable Size
1	15	4	7	4
2R	16	3	8	5
3R	14	1	8	5



Areas: High Protection Clusters

Pkg	# of MPA Clusters	Below Minimum	At Minimum	Preferable Size
1	13	54%	31%	15%
2R	14	36%	14%	50%
3R	14	28%	22%	50%



Areas: High Protection Clusters

Pkg	# of MPA Clusters	Below Minimum	At Minimum	Above Minimum
1	13	7	4	2
2R	14	5	2	7
3R	14	4	4	7



Areas: HP Clusters - **Kelp Leases**

Pkg	# of MPA Clusters	Below Minimum	At Minimum	Above Minimum
1	13(12)	7(6)	4	2
2R	14(12)	5(4)	2	7(6)
3R	14(12)	4(3)	4	7(6)



Guideline Clusters per Habitat

* DRAFT *

Pkg	Sand Beach	Rocky Intertidal	Surfgras s/Eelgrass	Sand, 0-30	Sand, 30-100	Sand, >100	Rock, 0-30	Rock, 30-100	Kelp	Upwelling	Shallow Canyon	Deep Canyon	Average
1	4	4	2	2	4	3	3	2	3	2	1	2	2.6
2R	7	7	4	7	8	4	4	3	3	5	3	4	4.9
3R	7	7	4	6	8	4	4	3	3	5	2	3	4.7

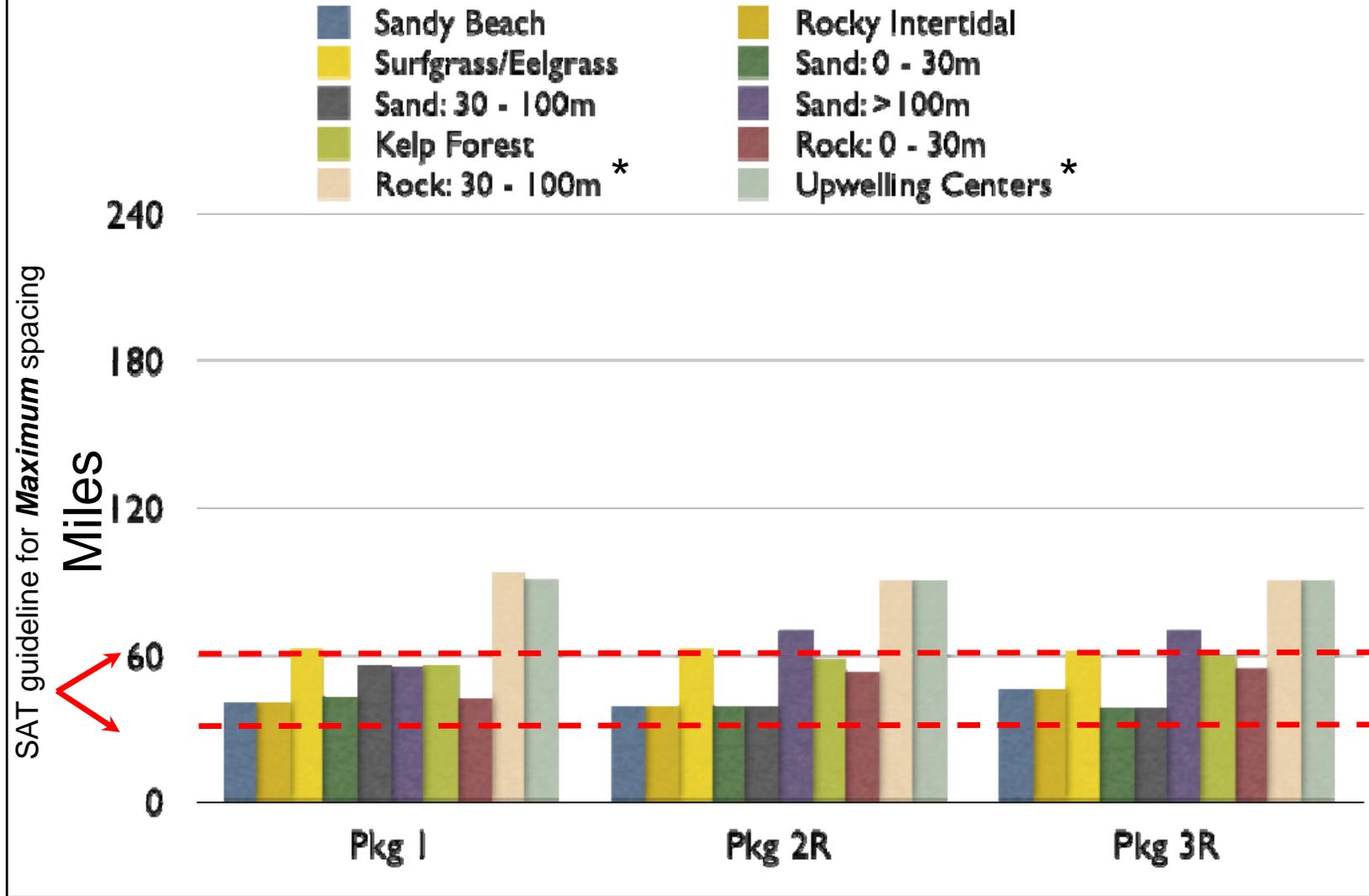


Guideline Clusters - **Kelp Leases**

* DRAFT *

Pkg	Sand Beach	Rocky Intertidal	Surfgras s/Eelgrass	Sand, 0-30	Sand, 30-100	Sand, >100	Rock, 0-30	Rock, 30-100	Kelp	Upwelling	Shallow Canyon	Deep Canyon	Average
1	4	4	2	2	4	3	3	2	3	2	1	2	2.6
2R	6	6	3	6	7	4	3	3	3	4	3	4	4.3
3R	6	6	3	5	7	4	3	3	3	4	2	3	4.1

Maximum Gaps





Spacing Summary

* DRAFT *

Maximum Distance in Miles

Pkg	Average Maximum Gap	Largest Gap	Gaps >> Guideline*
1	60	94	0
2R	58	90	0
3R	60	90	0

*or greater than minimum possible gap if guideline not achievable.



Spacing Summary - **Kelp Leases**

Maximum Distance in Miles

Pkg	Average Maximum Gap	Largest Gap	Gaps >> Guideline*
1	60(61)	94(101)	0
2R	58(60)	90	0
3R	60(65)	92	2 (kelp, sh. rock)

*or greater than minimum possible gap if guideline not achievable.



California Marine Life Protection Act Initiative

c/o California Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

To: California Department of Fish and Game
From: MLPA Initiative Staff
Subject: Central Coast MPA Packages – DRAFT revised evaluation of post BRTF packages (1, 2R, and 3R) relative to MLPA goal 3
Date: March 29, 2006 DRAFT

NOTE: DRAFT SUMMARY OF BRTF PACKAGES 1, 2R, and 3R. NOTE THE ANALYSIS OF REPLICATION FOR THESE REVISED PACKAGES HAS NOT BEEN COMPLETED BY THE SAT AND IS NOT YET INCLUDED IN THIS ANALYSIS.

Summary

All proposed marine protected area (MPA) packages for the central coast provide better recreational, educational and study opportunities than the existing condition (Package 0). Packages 1, 2R, and 3R are comparable in the accessibility of MPAs, with 16-20 MPAs in each package within 15 miles of major central coast ports and population centers. Packages 2R and 3R have more high protection MPAs near ports and population centers than does Package 1.

Packages 2R and 3R include more state marine reserves (SMRs) and high protection state marine conservation areas (SMCAs) that are valued by non-consumptive recreational uses (such as non-consumptive diving, photography, wildlife viewing, kayaking, etc.) in popular areas such as the Monterey waterfront and Carmel Bay that are very accessible. Package 1 provides more consumptive recreational opportunities (recreational fishing, including shore-fishing, skiff/kayak fishing, spear-fishing, and commercial party boat fishing) in lower protection SMCAs in those same highly popular sites.

An evaluation of habitat replication needed for scientific studies has not yet been completed by the Science Advisory Team for Packages 1, 2R, and 3R; however, based on the configuration of prior versions of Packages 1, 2 and 3, results are expected to be similar. In the earlier evaluation of prior versions, all revised packages provide comparable replication of shallow habitats and all have minimal replication of most deepwater habitats. Overall, the prior versions of the packages met minimum replication criteria (at least 3 replicates) in all MPAs about equally well. All packages protect shallow water habitats with a similar number of MPAs, but are much less protective of deep water hard and soft bottom habitats and canyons.

In terms of replication of habitats in SMRs, soft bottom (100-200m), hard bottom (100-200m and >200m), shallow canyon and deep canyon habitats are poorly represented in SMRs in all packages. Eelgrass appears to be poorly replicated in SMRs in all packages, though this is a data resolution issue, as all packages actually include at least two examples of this rare

habitat, though below the minimum area criteria. Canyon habitat is rare in the rest of the biogeographic region, so minimal replication in the central coast makes meeting the replication requirement for the biogeographical region more difficult.

All packages propose MPAs near marine research institutions on the central coast. Packages 2R and 3R provide slightly better educational and study opportunities as those packages include more high protection MPAs near research institutions, propose expanding more of the existing reserves that have a long history of scientific study, and generally include more established monitoring sites than does Package 1. Table 1 provides a summary of the evaluation across packages.

Evaluation

Goal 3 of the Marine Life Protection Act (MLPA) is:

“To improve recreational, educational, and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity.”

MLPA Initiative staff and the Master Plan Science Advisory Team (SAT) evaluation subteam used some simple metrics to evaluate how well the proposed central coast MPA packages address goal 3 of the MLPA. This evaluation compared packages relative to one another and included the following packages:

- Package 0 (existing MPAs)
- Package 1 (2/9/06 version)
- Package 2R (3/15/06 version, as revised by the BRTF)
- Package 3R (3/15/06 version, as revised by the BRTF)

The MLPA Initiative staff evaluation of recreational opportunities focused on accessibility of different types of MPAs to the public, specifically:

- *Distance of proposed MPAs from population centers.* The number of MPAs within 0-15 and 15-50 miles of a population center (Santa Cruz, Monterey, San Luis Obispo or Santa Maria) was determined for each package.
- *Distance of proposed MPAs from major ports.* The number of MPAs within 0-5, 5-15, and 15-50 miles of a port or harbor (Santa Cruz, Moss Landing, Monterey, Morro Bay or Port San Luis) was determined for each package. The 0-5mi distance reflects potential use of MPAs by users with small craft.
- *Stakeholder input.* Input from the regional stakeholders at the Central Coast Regional Stakeholders Group meetings, as well as the proponents’ rationales provided with packages, provided qualitative information on how packages and specific MPAs meet different user group needs.

The MLPA Initiative staff and SAT evaluation of educational and study opportunities focused on:

- *A SAT evaluation of replication of habitats within the study region.* The number of proposed MPAs (high protection MPAs and all MPAs) that contain each habitat was determined relative to the MLPA Master Plan Framework guidelines for replication for prior (2/9/06) versions of packages 1, 2, and 3 and is included as Appendix A. The results are expected to be comparable for Packages 1, 2R, and 3R.
- *Staff evaluation of replication of habitats in SMRs.* In addition, the MLPA requires replication of all habitats in state marine reserves (SMRs) across the biogeographical region [Fish and Game Code, Section 2857 (c)(3)]; the contribution of the central coast MPAs toward that biogeographical requirement was also evaluated.
- *Distance of proposed MPAs from major marine research institutions.* The number of MPAs within 0-15 and 15-50 miles of the University of California, Santa Cruz Long Marine Lab; Monterey Bay Aquarium Research Institute; Hopkins Marine Station; or California Polytechnic Univeristy, San Luis Obispo was determined for each package.
- *Number of established marine research monitoring sites.* The number of sites monitored by Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), Cooperative Research and Assessment of Near-shore Ecosystems (CRANE), and Multi-Agency Rocky Intertidal Network (MARINE) within MPAs was calculated for each package.

Recreational Opportunities

Goal 3 describes recreational opportunities in “*ecosystems that are subject to minimal human disturbance*” which we chose to interpret as SMRs and high protection SMCAs; these designations of MPAs are often preferable to many non-consumptive users (such as non-consumptive divers, photographers, wildlife viewers, kayakers, etc.). However, it should be noted that for consumptive uses (recreational fishing, including shore-fishing, skiff/kayak fishing, spear-fishing, and commercial party boats), users likely prefer accessible MPAs that allow recreational fishing (state marine parks [SMPs] and many SMCAs) and are considered to offer moderate to low protection. There was also recognition by the Central Coast Regional Stakeholder Group (CCRSg) members that MPAs which restrict fishing may enhance recreational opportunities inside those MPAs for those who like to see large fish, as well as potentially benefiting recreational opportunities in adjacent open areas by providing better fishing through spillover of targeted species.

For recreational opportunities, all packages include a comparable number of MPAs that can be considered easily accessible (<15 miles) from population centers. There are more high protection MPAs proposed near (<15 mi) population centers than moderate or low protection MPAs. Packages ranged from 16-20 MPAs within 15 miles of population centers, with 5-6 low protection MPAs that allow some fishing, and 10-14 high protection MPAs with limited or no take (Figure 1). A measure of distance of MPAs from major ports and harbors showed that all packages had 7-12 MPAs (including 4-8 high protection MPAs) within 5 miles of major ports and harbors (Figure 2).

For recreational opportunities, the issues are not so much overall numbers of accessible MPAs, rather than the types of activities allowed in specific popular sites, such as the Monterey waterfront and Carmel Bay that are highly valued by many different consumptive and non-consumptive user groups. Based upon input from stakeholders at the CCRSG meetings and rationale narratives provided by package proponents, non-consumptive users generally prefer the MPA designs incorporated into Package 2R and 3R, which offer more high protection MPAs at popular and more accessible sites; consumptive users generally prefer Package 1, which offers more fishing opportunities at popular and more accessible sites.

Educational and study opportunities

The earlier SAT subteam evaluation of replication of habitats in MPAs from prior packages 1, 2, 3, S and AC is included as Appendix A; while this analysis has not yet been revised to include Packages 1, 2R and 3R, results are expected to be similar. Based on an evaluation of habitat replication needed for scientific studies, all packages are expected to provide comparable replication of shallow habitats and all have minimal replication of most deepwater habitats. Overall, the packages are expected to meet minimum replication criteria (at least three replicates) in all MPAs about equally well. All packages are expected to protect shallow water habitats with a similar number of MPAs, but are much less protective of deep water hard and soft bottom habitats and canyons.

The MLPA requires replication of all habitats in SMRs in each biogeographical region (the central coast is included in the Point Conception to Oregon border biogeographical region). The central coast packages provide replicates of most habitats towards this requirement. Submarine canyon habitat is rare in state waters; the central coast has the vast majority (around 90%) of this habitat in the biogeographical region, and therefore could more easily contribute towards replication of this habitat than other study regions to the north. All packages are expected to provide only one to three replicates of canyon habitat by depth zone.

Educational and study opportunities are improved by the presence of MPAs near research institutions and MPAs that include established monitoring sites. All packages include some MPAs (ranging from 17-21 MPAs, with 11-15 of them high protection level) within 15 miles of major marine research institutions (Figure 3). All packages retain or expand some existing MPAs with a long history of scientific studies (eg. Hopkins SMR and Big Creek SMR). All packages proposed to expand the existing Hopkins SMR to include more area. Packages 2R and 3R also propose expanding the existing Big Creek SMR to include more deepwater habitat and to be larger in size to improve effectiveness.

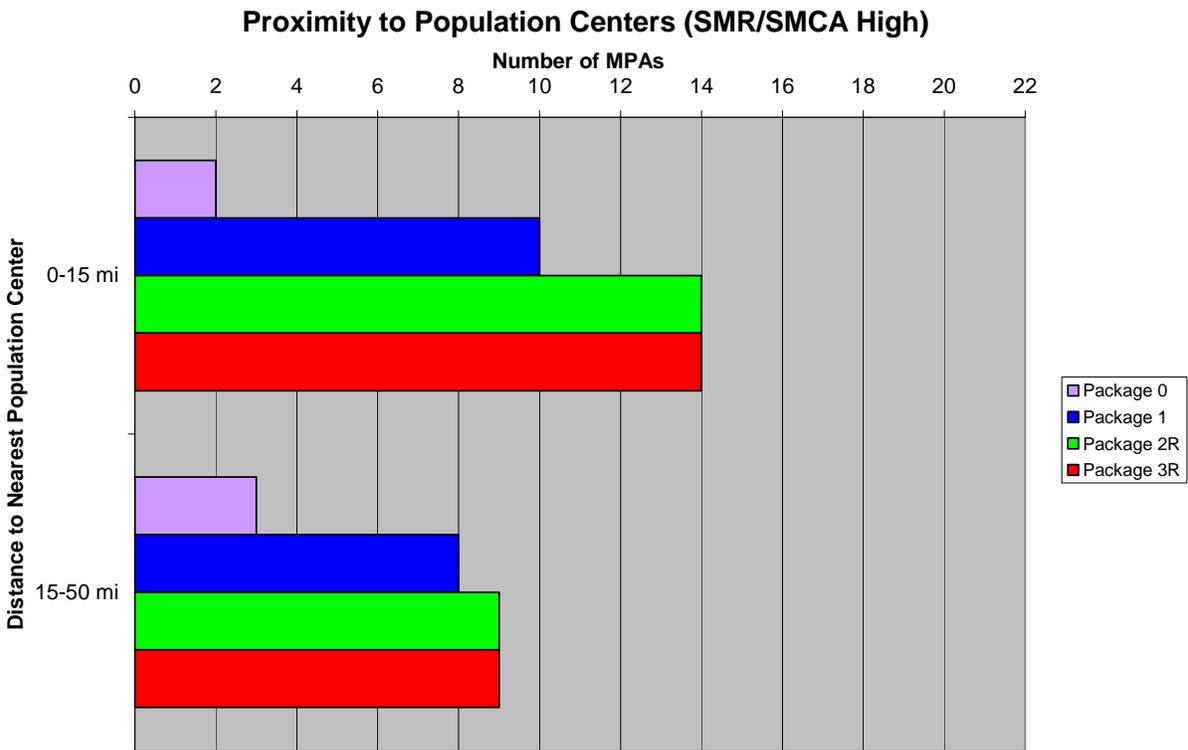
Packages 2R and 3R generally include more established monitoring sites from the PISCO, CRANE, and MARINE programs inside of MPAs (especially SMRs and high protection SMCAs) than does Package 1 (Figure 4).

Table 1: Summary of goal 3 evaluation of Central Coast MPA packages 1, 2R and 3R

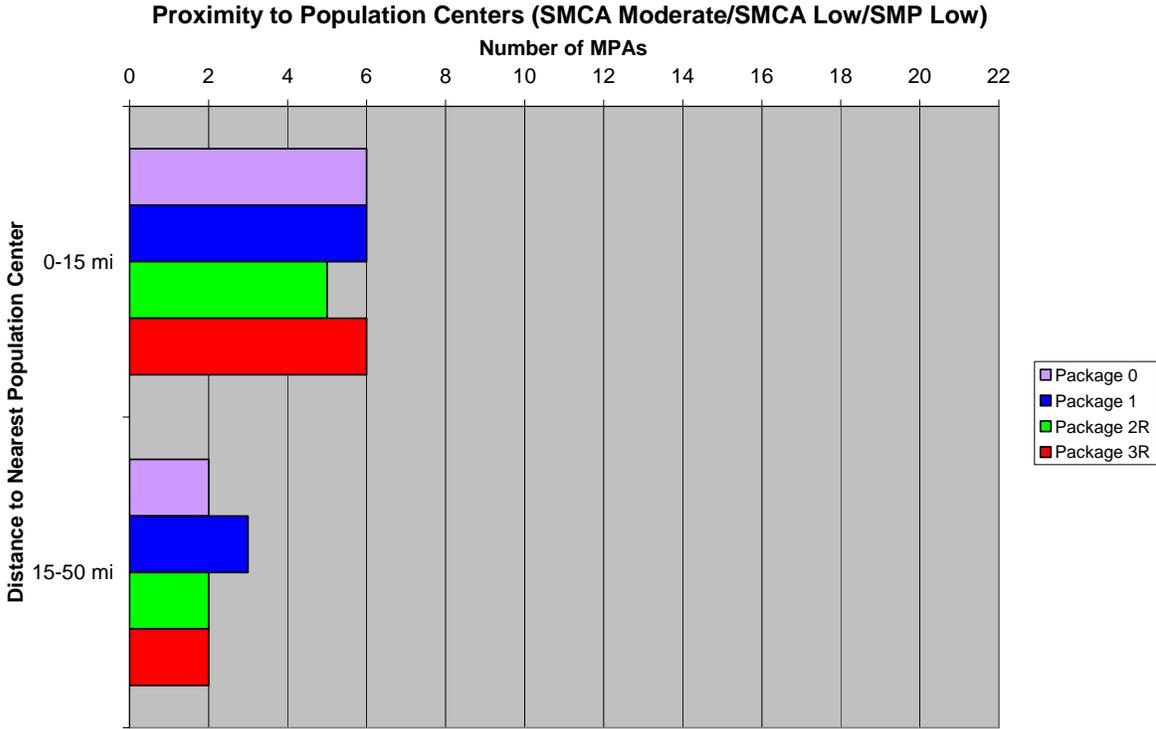
	Package 1	Package 2R	Package 3R
Recreational Opportunities:			
Proximity to ports and population centers	All packages have comparable number of MPAs near population centers and ports.		
Stakeholder perceptions	Package 1 provides better consumptive recreational opportunities.	Packages 2R and 3R provide better non-consumptive recreational opportunities.	
Educational and Study Opportunities:			
Replication of habitats (SAT evaluation)	Overall the packages met replication criteria equally well. All packages protect shallow habitats with a similar number of MPAs. All packages lack replication of deep water soft and hard bottom and canyon habitats.		
Proximity to marine research institutions	All the packages have high protection MPAs near research institutions. All packages would retain and expand Hopkins SMR and retain Big Creek SMR, two MPAs that have a long history of scientific study. Packages 2R and 3R would also expand Big Creek SMR.		
Established monitoring sites	MPAs in Package 1 contains fewer established monitoring sites	MPAs in packages 2R and 3R contain more established monitoring sites from the PISCO, CRANE, and MARINE programs	

Figure 1: Proximity of proposed MPAs to major population centers (Santa Cruz, Monterey, San Luis Obispo or Santa Maria).

1a) High protection MPAs (SMR and SMCA-High)



1b) Lower protection MPAs (SMP-low, SMCA-moderate, SMCA-low)



1c) All MPAs

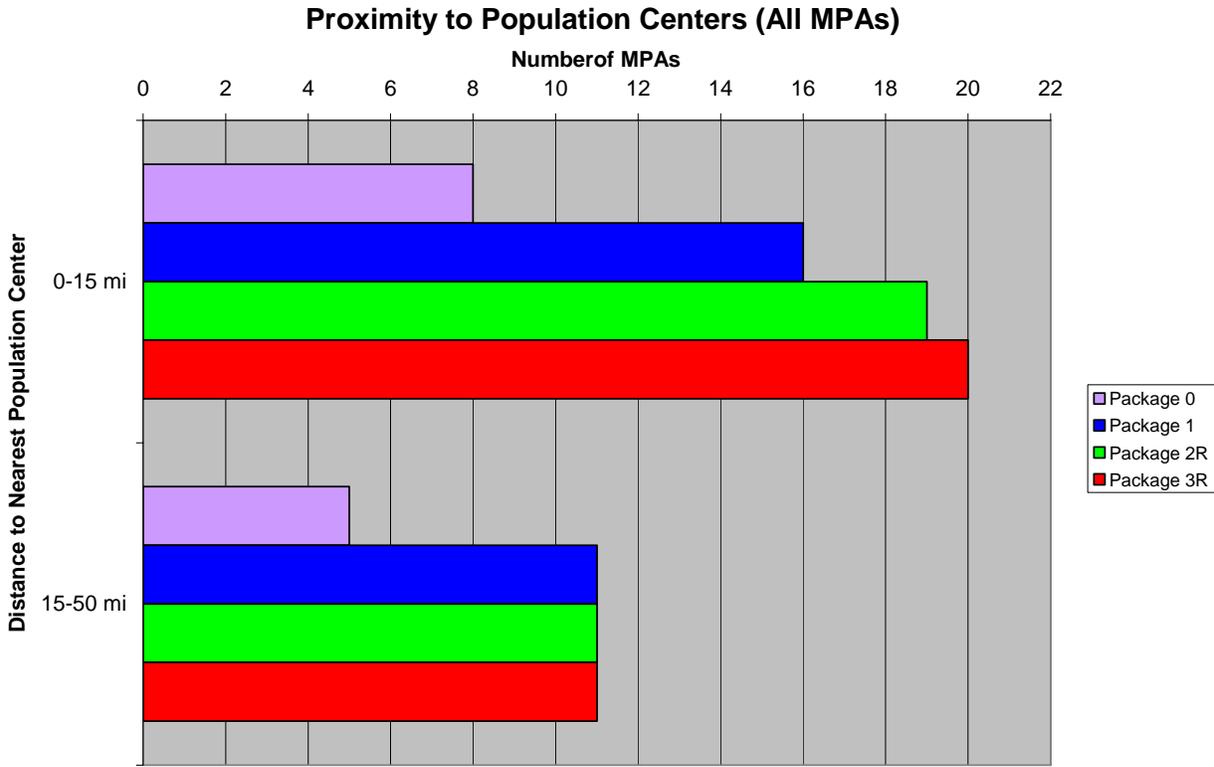
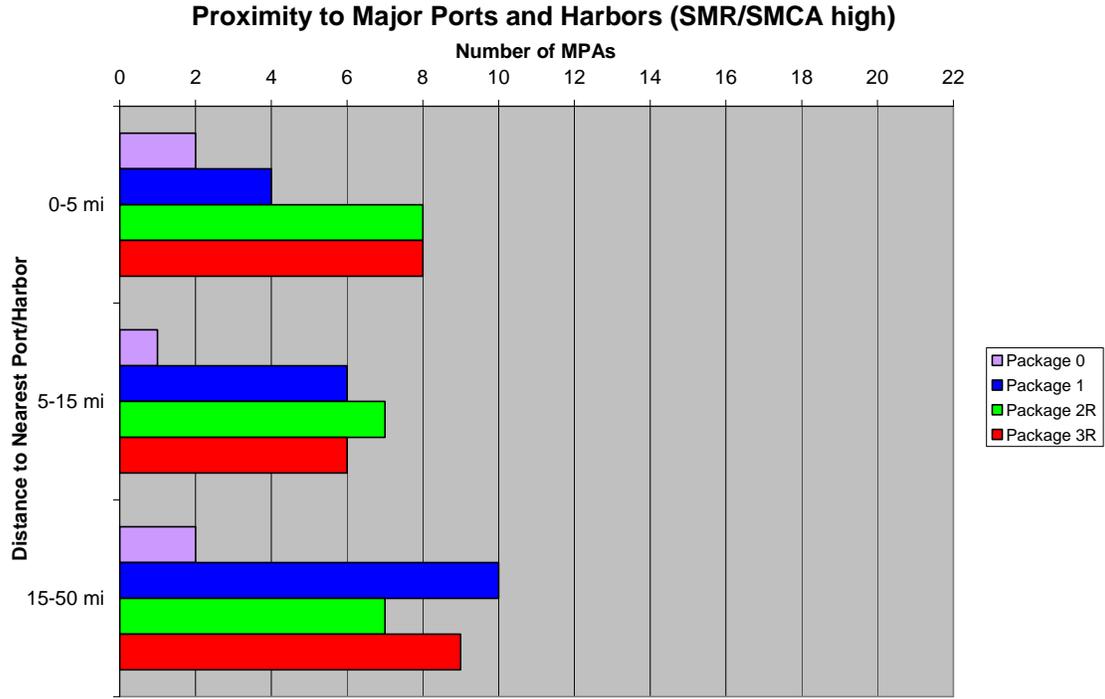
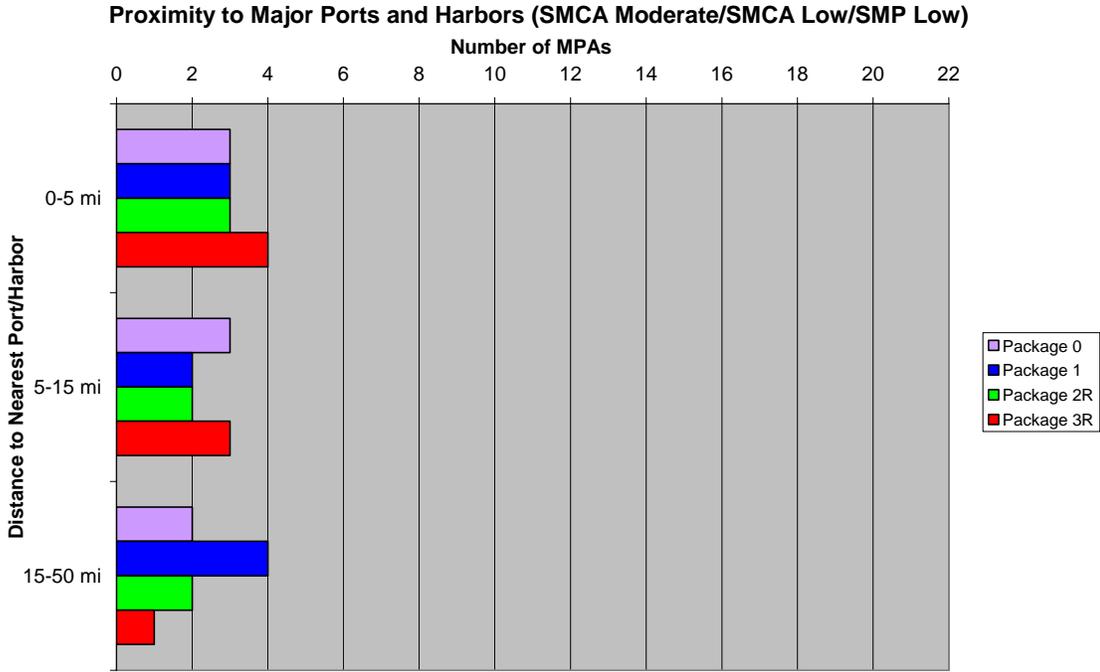


Figure 2: Proximity of proposed MPAs to major ports or harbors (Santa Cruz, Moss Landing, Monterey, Morro Bay, and Port San Luis)

2a) High protection MPAs (SMR and SMCA-High)



2b) Lower protection MPAs (SMP-low, SMCA-moderate, SMCA-low)



2c) All MPAs

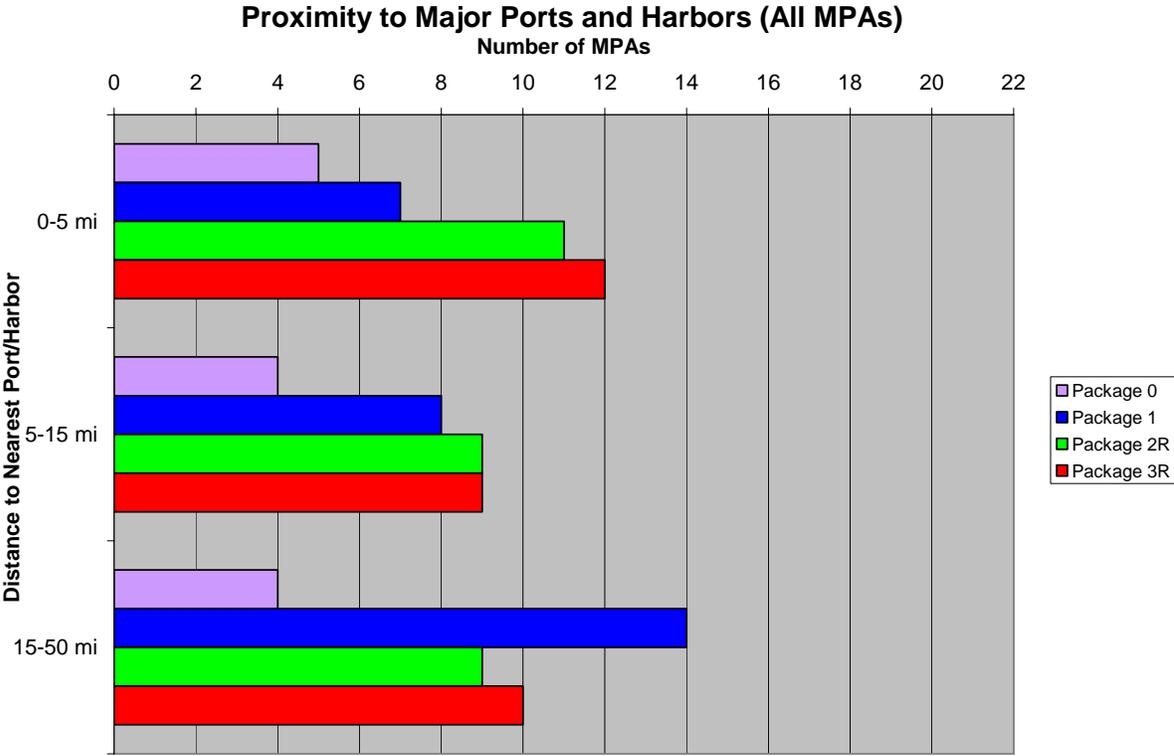
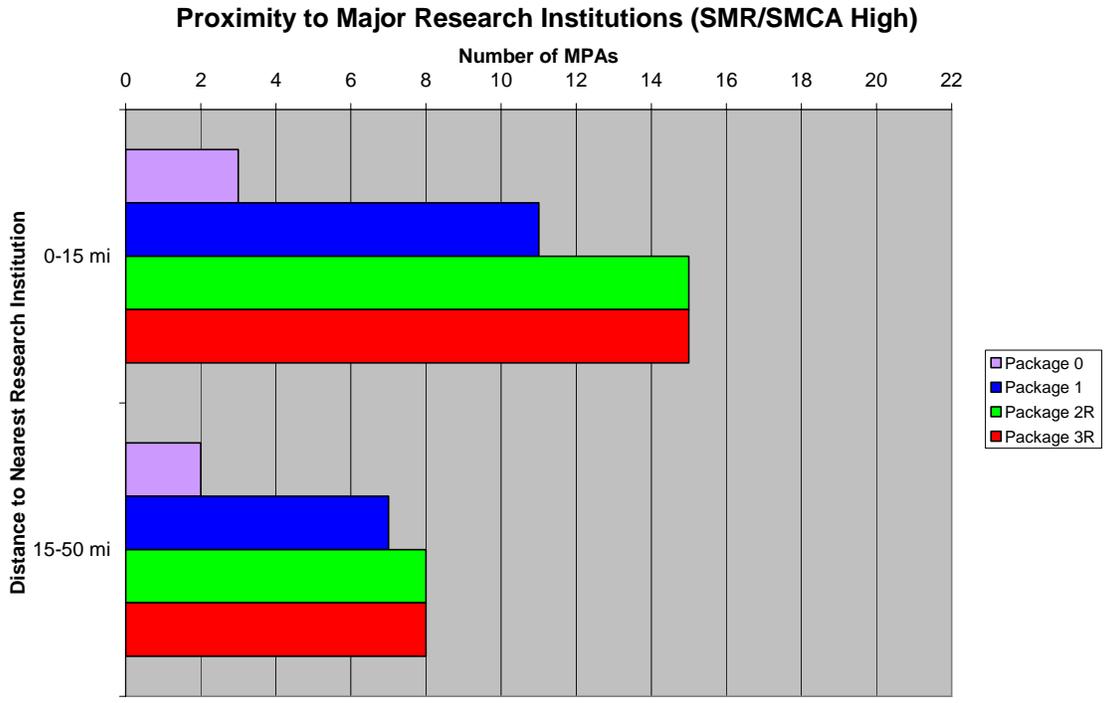


Figure 3: Proximity of proposed MPAs to major marine research institutions (University of California, Santa Cruz Long Marine Laboratory; Monterey Bay Aquarium Research Institute; Hopkins Marine Station (Stanford University); CalPoly San Luis Obispo)

3a) High protection MPAs (SMR and SMCA-high)



3b) All MPAs

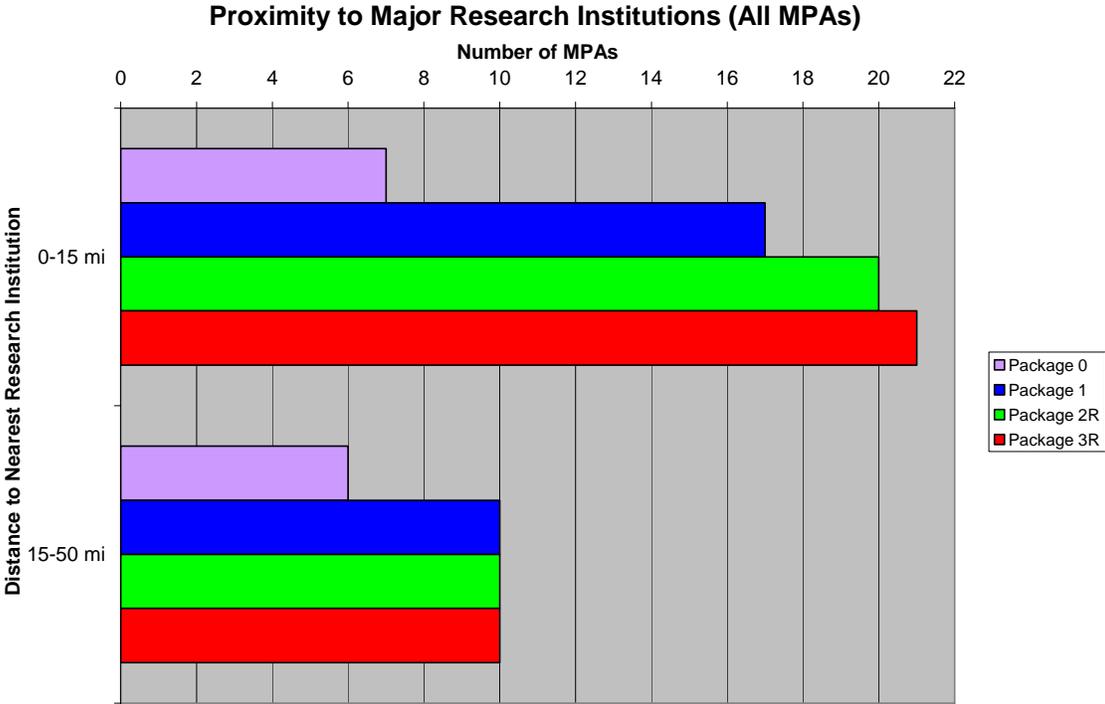
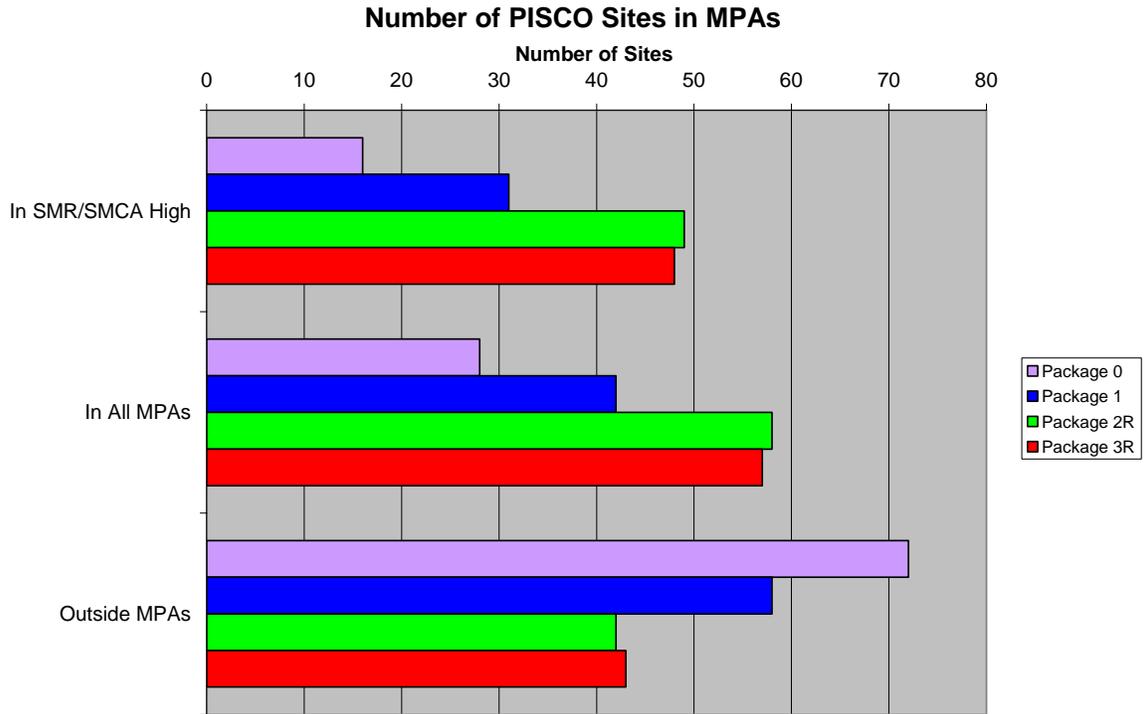
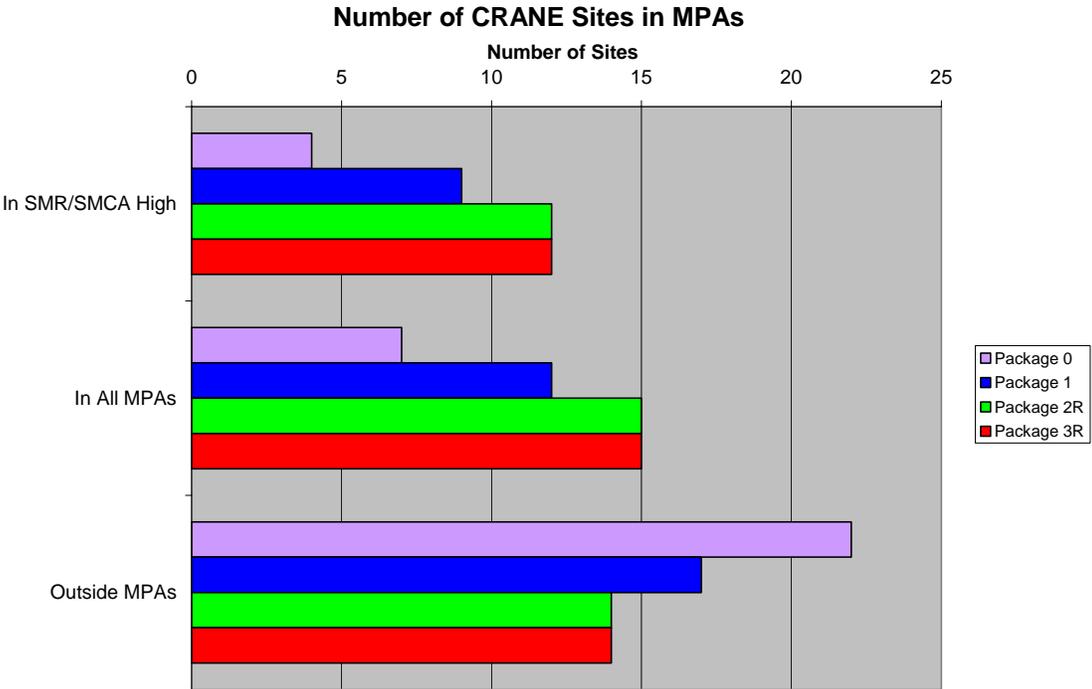


Figure 4: Number of established monitoring sites (PISCO, CRANE, and MARINE programs) inside and outside of proposed MPAs.

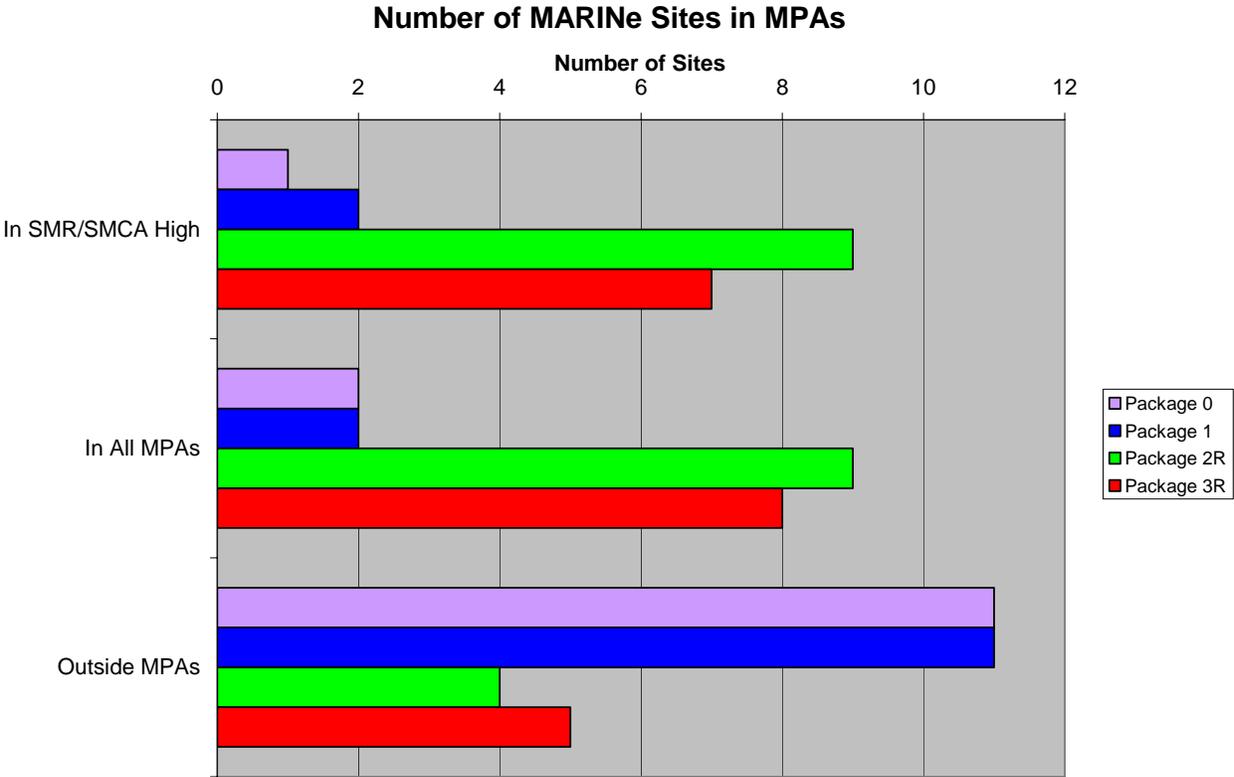
4a) Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) sites



4b) Cooperative Research and Assessment of Near-shore Ecosystems (CRANE) sites



4c) Multi-Agency Rocky Intertidal Network (MARINE) sites



California MLPA Master Plan Science Advisory Team
Draft summary of potential impacts of MPA packages 1, 2R and 3R on commercial and recreational fisheries in the MLPA Central Coast Study Region

Draft version, 27 April 2006

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Introduction

The following data sets were used in the analysis of relative effects of the MPA packages on commercial and recreational fisheries that are conducted in the waters in the MLPA Central Coast Study Region:

- For the commercial fishery, we used data layers characterizing the spatial extent and relative stated importance of fishing grounds of 19 commercial fisheries in the MLPA Central Coast Study Area (SA) previously transmitted by Ecotrust to the Marine Life Protection Act Initiative (MLPAI) under the terms of contract agreement No. 2005-0067.¹ This information was collected during interviews in the summer of 2005, using a stratified, representative sample of 100+ fishermen whose individual responses about the relative importance of ocean areas for each fishery were standardized using a 100-point scale and normalized to the reported fishing grounds for each fishery;
- For the recreational fishery, we used recreational private and rental boat fishing effort data from the California Recreational Fisheries Survey (CRFS) 2004 and made available to Ecotrust by the California Department of Fish and Game (CDFG). This information consists of observed number of angler trips per microblock, and is grouped for trips for particular species. Of those, we analyzed the trips for rockfish and salmon in order to characterize two of the most important recreational fisheries in the study area. Similar survey data for Commercial Passenger Fishing Vessels (CPFV) were not available in time for this analysis.

Overview of fisheries considered in the analysis

The commercial fisheries considered in this analysis are of varying importance in terms of ex vessel revenues. Table 1 lists the species or groups considered and their share of MLPA Central Coast Study Region (CCSR) commercial fishing revenues, using the 6-year average of nominal ex vessel revenues between 1999 and 2004. In most cases, the same fisheries account for substantially different proportions of statewide landings. For example, Dungeness crab accounts for only 1.66% of CCSR landings (by ex vessel revenue), but 17.33% of state totals. Interestingly, private and rental boat fishing for both rockfish and salmon account for double the percentage of all trips in the CCSR (22% and 50%, respectively) than trips for the same species statewide (10% and 23%). Corresponding data for the charter boat fleet were not available at the time of this analysis. In general, however, CPFV trips consist of several times the number of anglers as private and rental boat trips.

¹ Scholz et al., 2006, "Commercial fishing grounds and their relative importance off the Central Coast of California", Report to the California Marine Life Protection Act Initiative, Contract No. 2005-0067, April 2006, 39pp.

Table 1 – Summary of fisheries considered in the analysis

Commercial			Recreational		
<i>Species or group</i>	<i>% of CCSR fisheries revenues, 6-year average (1999-2004)</i>	<i>% of CA statewide fisheries revenues, 6-year average (1999-2004)</i>	<i>Species or group</i>	<i>% of CCSR observed private and rental boat recreational angler trips [No. of total trips: 84,000]</i>	<i>% of CA statewide [No. of total trips: 663,000]</i>
Anchovy	2.17%	0.65%	n/a	n/a	n/a
Cabazon	2.73%	0.59%	n/a	n/a	n/a
Dungeness crab	1.66%	17.33%	n/a	n/a	n/a
Halibut	1.95%	2.24%	n/a	n/a	n/a
Kelp Greenling	0.25%	0.08%	n/a	n/a	n/a
Lingcod	0.33%	0.17%	n/a	n/a	n/a
Mackerel	0.13%	1.10%	n/a	n/a	n/a
Deep Nearshore Rockfish	4.83%	1.24%	Rockfish	22%	10%
Rockfish Nearshore					
Rockfish Shelf					
Rockfish Slope					
Rock Crab	0.78%	1.03%	n/a	n/a	n/a
Salmon	12.57%	8.08%	Salmon	50%	23%
Sardine	7.19%	3.95%	n/a	n/a	n/a
Sablefish	5.53%	3.40%	n/a	n/a	n/a
White Seabass	0.47%	0.47%	n/a	n/a	n/a
Surfperch	0.20%	0.09%	n/a	n/a	n/a
Spot Prawn	7.38%	2.25%	n/a	n/a	n/a
Squid	24.49%	18.81%	n/a	n/a	n/a

Approach

The three MPA network proposals under review (packages 1, 2R and 3R) vary according to their spatial extent and the commercial and recreational fishing uses they potentially affect. Specifically, they vary by the number and types of fisheries permitted within the boundaries of particular MPAs within a network. Furthermore, SA fisheries themselves vary in spatial extent

and frequently overlap. Most of them are conducted in fishing grounds that extend beyond the state waters of the CCSR, and we report the effects both in terms of total fishing grounds (G) and those that fall within the study area. Since any one MPA may have different effects on different uses, and different uses may be affected differently by all MPAs, it is therefore necessary to consider single MPAs and single fishery uses independently. Similarly, since current fishery closures such as the Rockfish Closure Area affect all proposals equally, they have no differential effect.

We conducted an overlay of each MPA with each potential use. MPAs were grouped according to level of protection, using the same levels of protection as elsewhere in the MLPA Master Plan Science Advisory Team (SAT) evaluations and as described in the January 10, 2006 draft of the "Rationale for SAT categorization of MPAs by relative levels of protection" (ProtectionLevels_draft_10Jan06.doc), but uses were considered individually. In other words, for each MPA and protection level within each package, we assessed the fishery uses that would potentially be affected.

We quantified the first order maximum effects of proposed MPAs on both commercial and recreational fishing, analyzing the percent of total fishing grounds for any one fishery included in a given MPA. This is a first-order, "worst case" analysis that is silent on the eventual behavioral response. In other words, the analysis assumed that all fishing in an area affected by an MPA would be lost completely, when in reality it is more likely that effort would shift to areas outside the MPA. There are, however, currently no data available to support an analysis of such an adaptive response.

We compiled results in a series of spreadsheets transmitted to the MPLAI and SAT, summarizing the effects of the various MPA packages on commercial and recreational fisheries both in terms of the area affected and the relative value lost. For the purposes of this analysis, "value" was measured not in terms of dollars, but using two proxies: 1) an index of relative, stated importance derived from interviews with fishermen in the case of the commercial fisheries, and 2) number of observed private and rental boat trips to a microblock in the case of the recreational fisheries.

For this first order evaluation, we assumed that all fishing in an area intersected by MPAs and fishing grounds would be affected. Where an MPA straddled a reporting block in the recreational data, we apportioned the number of trips associated with that block proportional to the area overlap. In the case of the commercial fisheries, data are at a sufficient spatial resolution to allow for direct summation. It is important to note that the analysis specifically does not constitute an economic impact analysis, nor account for behavioral responses such as shifts in fishing effort to other areas.

The percent of area and value affected was calculated based on the grounds identified within the CCSR, not for the whole state

Assessing MPA packages

The percent change in area and value for each of the commercial fisheries were determined by the intersection of each MPA package and the fishing grounds specific to that use. Each MPA within a package was classified by whether it would affect the fishery or not. If a fishery was affected by an MPA, the area and value were summarized and then divided by the total area and value for the entire fishing grounds (G), as derived from interviews with fishermen, and the total study area (SA).

The total percent of the area and value affected for both the total fishing grounds and the grounds inside the study area was then summarized for all MPAs that affected each fishery per package. Packages vary considerably in their effects, both between and across fisheries, as Table 2 illustrates for commercial fisheries. Packages 2R and 3R are based on the March 15, 2006 MLPA Blue Ribbon Task Force decision. No revisions were made to the February 9, 2006 version of Package 1.² Packages AC and S have been removed from consideration.

Table 2 – Summary of effects on commercial fisheries

	Package 1	Package 2R	Package 3R
Area of total fishing grounds potentially affected			
Anchovy	4.39%	7.97%	5.79%
Cabazon	13.27%	16.96%	15.59%
Dungeness crab	3.38%	7.09%	6.89%
Deep Nearshore Rockfish	13.02%	16.54%	15.79%
Halibut	9.08%	10.09%	9.27%
Kelp Greenling	12.33%	17.73%	16.58%
Lingcod	12.61%	18.44%	16.95%
Mackerel	6.66%	12.30%	8.99%
Rockfish Nearshore	11.92%	15.39%	14.16%
Rockfish Shelf	5.18%	13.21%	12.72%
Rockfish Slope	0.64%	1.10%	0.96%
Rock Crab	4.79%	6.63%	6.21%
Salmon	0.44%	1.05%	0.79%
Sardine	4.38%	7.90%	5.76%
Sablefish	0.86%	2.26%	2.29%
White seabass	9.47%	7.84%	8.06%
Surfperch	8.07%	16.77%	18.26%
Spot Prawn	0.87%	2.50%	2.98%
Squid	6.82%	10.89%	9.59%

² The commercial fishery database was updated to account for a data processing error discovered in the squid fleet in March 2006, resulting in slight changes in the impacts of Package 1 that we report here

Table 2 – Summary of effects on commercial fisheries (continued)

	Package 1	Package 2R	Package 3R
Area of fishing grounds within the study area potentially affected			
Anchovy	10.14%	18.41%	13.39%
Cabazon	15.11%	19.31%	17.78%
Dungeness crab	6.96%	14.57%	14.13%
Deep Nearshore Rockfish	14.39%	18.26%	17.45%
Halibut	11.07%	12.30%	11.32%
Kelp Greenling	12.74%	18.34%	17.15%
Lingcod	13.32%	19.53%	17.93%
Mackerel	9.49%	17.58%	12.86%
Rockfish Nearshore	13.73%	17.70%	16.26%
Rockfish Shelf	5.67%	14.48%	13.93%
Rockfish Slope	14.33%	24.76%	21.66%
Rock Crab	11.28%	15.59%	14.63%
Salmon	6.07%	13.83%	10.44%
Sardine	10.14%	18.41%	13.39%
Sablefish	8.05%	21.22%	21.51%
White seabass	11.56%	9.58%	18.26%
Surfperch	8.07%	16.79%	9.86%
Spot Prawn	6.49%	18.36%	21.93%
Squid	9.00%	14.36%	12.63%
Value of total fishing grounds potentially affected			
Anchovy	3.65%	6.96%	5.14%
Cabazon	14.42%	27.33%	24.56%
Dungeness crab	1.92%	5.48%	5.59%
Deep Nearshore Rockfish	15.78%	21.80%	20.40%
Halibut	5.92%	9.23%	8.22%
Kelp Greenling	12.95%	23.61%	21.19%
Lingcod	12.87%	25.14%	22.85%
Mackerel	4.52%	8.72%	6.98%
Rockfish Nearshore	13.82%	24.77%	22.93%
Rockfish Shelf	6.99%	11.86%	11.47%
Rockfish Slope	0.64%	1.10%	0.96%
Rock Crab	5.79%	6.41%	6.36%
Salmon	0.77%	2.31%	1.49%
Sardine	3.45%	7.30%	5.09%
Sablefish	0.90%	3.09%	3.13%
White seabass	8.21%	7.39%	7.64%
Surfperch	2.73%	5.06%	5.51%
Spot Prawn	1.97%	4.19%	5.39%
Squid	5.77%	9.69%	7.26%

Table 2 – Summary of effects on commercial fisheries (continued)

	Package 1	Package 2R	Package 3R
Value of fishing grounds within the study area potentially affected			
Anchovy	5.72%	10.89%	8.06%
Cabazon	14.64%	27.71%	24.90%
Dungeness crab	4.50%	12.83%	13.09%
Deep Nearshore Rockfish	16.49%	22.80%	21.36%
Halibut	6.44%	10.02%	8.95%
Kelp Greenling	13.12%	23.92%	21.45%
Lingcod	13.11%	25.57%	23.24%
Mackerel	5.36%	10.28%	8.23%
Rockfish Nearshore	14.30%	25.64%	23.72%
Rockfish Shelf	7.46%	12.67%	12.24%
Rockfish Slope	14.33%	24.76%	21.66%
Rock Crab	11.99%	13.30%	13.17%
Salmon	3.42%	10.30%	6.65%
Sardine	5.24%	11.09%	7.71%
Sablefish	6.83%	23.30%	23.61%
White seabass	9.11%	8.16%	8.46%
Surfperch	2.73%	5.06%	5.51%
Spot Prawn	7.28%	15.48%	19.85%
Squid	6.17%	10.30%	7.75%

For example, Package 1 has lesser effects (both in area and value) on fisheries such as squid and spot prawn than on, say, White seabass. Illustrating another set of effects, Package 3R affects 9% of the total fishing grounds for halibut, but 11% when considering those that fall into the (nearer to shore) study area waters. In this case, the effects on fishing area and importance are almost identical, with 10% and 11% of stated importance affected, respectively.

In addition, from Table 1, the halibut fishery constitutes a little under 2% of study area commercial fisheries. In some cases, for example deep nearshore rockfish, alternatives can have markedly different effects on area and relative “value”. For example, Package AC affects 26% of the study area fishing grounds for deep nearshore rockfish, but well over one third, 37%, of stated importance.

Table 3 summarizes the effects on recreational fisheries. The estimated effect on trip numbers is an upper boundary, since a trip may be counted twice in the data when it covered more than one microblock. Furthermore, the analysis assumes that all trips to a block would be lost.

Table 3 – Summary of effects on private and rental boat recreational fisheries

	Package 1	Package 2R	Package 3R
Recreational salmon area potentially affected (statute miles²)	0.05	9.66	5.14
Maximum number of salmon trips potentially affected	4	75	66
Recreational rockfish area potentially affected (statute miles²)	17.58	43.42	37.94
Maximum number of rockfish trips affected	269	472	483

Summary of results from the analysis of fisheries effects

There are several patterns that emerge from the analysis of the four MPA packages:

- For the commercial fisheries, both packages 2R and 3R have more impacts, in terms of both size of the areas affected and their relative importance, than Package 1;
- In terms of impacts to total and study area fishing grounds and relative value (stated importance), there is no perceptible difference between 2R and the earlier Package 2;
- Compared to the previous version (Package 3), Package 3R has
 - smaller impacts on both total and study area fishing grounds of eight fisheries, no change in impacts on one fishery, and greater impacts on ten fisheries;
 - smaller impacts on the relative value of the total fishing grounds of ten fisheries, no change on one fishery, and greater impacts on eight fisheries; and
 - smaller impacts on the relative value of study area fishing grounds of eight fisheries, no change on two fisheries, and more impact on nine fisheries.
- In the recreational fishery, Package 2R, when compared to the previous version, has slightly smaller impacts on salmon and rockfish recreational fisheries, both in terms of the area and number of trips affected;
- Package 3R has a mixed suite of effects:
 - Compared to the previous version, it affects a greater area used for recreational salmon fishing, but fewer salmon trips; and
 - A smaller area used for recreational rockfish fishing, but a greater number of trips.