California MLPA Master Plan Science Advisory Team

Methods Used to Evaluate MPA Proposals in the North Coast Study Region (DRAFT) Chapter 12 – Commercial and Recreational Fishery Impacts

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Status of this chapter: **Draft for review and action by the SAT. Note that changes made from January 13 to this version are very minor (changes in underline and strikeout).**

While fishery impacts are not the focus of the MLPA, they may be considered in designing alternative MPA proposals. The evaluation of maximum potential recreational and commercial fishery impacts utilizes region-specific data collected by MLPA contractor Ecotrust on areas of importance. To evaluate the potential recreational and commercial fishery impacts, MLPA Initiative staff and contractors do the following:

- Conduct local knowledge interviews with recreational and commercial fishermen, using an interactive, custom computer interface, to collect geo-referenced information about the extent and relative importance of study region commercial and recreational fisheries.
- Organize impact analyses by port, fishery, and/or user group.
- Evaluate and summarize the maximum potential impacts on commercial, commercial passenger fishing vessel (CPFV), and recreational fishing grounds both in terms of total area and value affected, with results summarized for both study region fishing grounds and total fishing grounds[1].
- Conduct an impact analysis for commercial and CPFV fisheries.
- Consider or identify “outliers” (i.e., fisheries and individual fishermen likely to experience disproportional impacts).
- Assess the effect of existing fishery management area closures and other constraints on fishing grounds.

Background

In order to conduct an analysis of the relative effects of MPA proposals on fisheries that are conducted in the MLPA North Coast Study Region (NCSR), we use data layers characterizing the spatial extent and relative stated importance of fishing grounds for key commercial, commercial passenger fishing vessel (CPFV), and recreational fisheries. This information was collected during interviews in the summer and fall months of 2009 (June through October), using a stratified, purposeful sample of 219 commercial fishermen and stratified, solicited samples of 22 CPFV operators and 574 recreational fishermen. Individual responses regarding the relative importance of ocean areas for each fishery were standardized using a 100-point scale and normalized to the reported fishing grounds.

Using the normalized data described above, we assess the potential effects of any MPA proposal using a variety of analyses (see Table 12-1).

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[1] *Impact analyses represent a “worst case scenario” in which fishermen cannot fish in a different location.*

We report results for the commercial and CPFV fisheries at both the study region and port group levels. We report results for the recreational fisheries by user group (i.e. private vessel, kayak, and dive) and by port group (see Table 12-2).

Table 12-1: Reported ~~R~~results

	Commercial	CPFV	Recreational
Potential impacts on fishing grounds (area and stated value)	X	X	X
Potential net economic impacts	X	X	
Potential gross economic impacts	X		
Disproportionate impacts on fisheries	X	X	
Disproportionate impacts on individuals	X		

Table 12-2: Summary of results by sector

	Commercial	CPFV	Recreational
# of fisheries	10 species	5 species	5 species
Level of analysis	Port-fishery combinations	Port-fishery combinations	Results reported by user group (private vessel, kayak, dive) and by port

Port groups for the commercial fisheries are defined as Crescent City, Trinidad, Eureka, Shelter Cove, Fort Bragg, and Albion[2]. Port groups for the CPFV fisheries are defined as Crescent City, Trinidad, Eureka, Shelter Cove, and Fort Bragg. Port groups for the recreational fisheries are defined as Crescent City, Trinidad, Eureka, Shelter Cove, and Fort Bragg/Albion.

It should be noted that, with respect to the recreational fishery analysis, the use of a stratified, solicited sample limits the use of traditional statistical measures (e.g., confidence intervals), meaning they may not deliver their advertised precision. Nevertheless, this approach does allow us to make broad generalizations about preferences of the overall recreational fishing population and the three user groups within the study area (i.e., private vessel, kayak, and dive), adding increased thematic resolution to the MLPA decision-making process.

[2] *In contrast to other commercial fisheries, seaweed harvesters do not have landings data associated with a port. Therefore, based on spatial harvest patterns we define three harvest complexes within the study region: the Crescent City and Trinidad complex, the Fort Bragg and Albion complex, and the Elk complex.*

Impact on Commercial Fishing Grounds: Methods

Marine protected area (MPA) proposals typically vary according to their spatial extent and the commercial fisheries they affect. More specifically, MPAs often vary by the number and types of fisheries permitted within their boundaries. Furthermore, study area fisheries themselves vary in spatial extent and frequently overlap. Many of them are conducted in fishing grounds that extend beyond the state waters of the NCSR, and because of this we report potential impacts both in terms of total fishing grounds and those that fall within the study area (i.e., zero to three nautical miles from shore). Since any one MPA may have different effects on different fisheries, and different fisheries may be affected differently by all MPAs, it is necessary to consider single MPAs and single fishery uses independently. Note that because current fishery closures affect all proposals equally, they have no differential effect.

A key assumption of this analysis is that each of the MPA proposals completely eliminates fishing opportunities in areas closed to specific fisheries and that fishermen are unable to adjust or mitigate in any way. In other words, the analysis assumes that all commercial 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. The effect of such an assumption is most likely an overestimation of the impacts, or a “worst case scenario.”

Potential Impacts on Area and Stated Value

We conduct an overlay of each MPA with each fishery considered in this study. MPAs are grouped according to level of protection, using the same levels of protection as elsewhere in the SAT evaluations. In other words, for each MPA and protection level within each proposal, we assess the commercial fisheries that would be affected.

We compile results in a series of spreadsheets, summarizing the effects of the various MPA proposals on commercial fisheries, both in terms of the area affected and the relative value lost. We use the same analytical methods as those developed and used in previous iterations of the MLPA process (Scholz et al. 2006; 2008; 2010), creating a weighted surface that represents the stated importance of different areas for each fishery. More specifically, we multiply these stated importance values by the proportion of in-study region landings (by landing port and by fishery). The percentage of area and value affected is calculated based on grounds identified within only the NCSR, not within the whole state of California. These estimates then feed into the economic impact assessment (described in Appendix C).

The percentage change in area and value for each of the commercial fisheries (both for the study region and for each port group) is determined by the intersection of each MPA proposal and the fishing grounds specific to that fishery. Each MPA within a proposal is classified by whether it would affect the fishery or not. If a fishery is affected by a MPA, the area and value are summarized and then divided by the total area and value for the entire fishing grounds as derived from interviews with fishermen, and the total study area. The total percentage of area and value affected for the total fishing grounds and the grounds inside the study area are then summarized by proposal for all MPAs affecting each fishery.

The percentage change in area and value for each of the commercial fisheries (both for the study region and for each port group) are determined by the intersection of each MPA proposal and the fishing grounds specific to that fishery. Each MPA within a proposal is classified by whether it would affect the fishery or not. If a fishery is affected by an MPA, the area and value are summarized and then divided by the total area and value for the entire fishing grounds as derived from interviews with fishermen, and the total study area. The total percentage of area and value affected for the total fishing

grounds and the grounds inside the study area are then summarized for all MPAs affecting each fishery per proposal.

For the commercial fisheries, we also evaluate the additional impacts that potentially occur when considering the existing fishery management area closures and/or fishery exclusion zones. The fishing grounds, as defined by the fishermen through the interview process, represent the total area and value regardless of these existing or potential fishery management closures and/or fishery exclusion zones. In order to evaluate the effect of such closures, the fishing grounds that fall inside those areas are removed, and the value associated with the removed area redistributed to the remaining fishing grounds outside the closed areas. In other words, values are redistributed across only what could be considered the available fishing grounds in proportion to their relative value as derived from the interviews. Using the same method described above, we determine the percentage change in value by the intersection of each MPA proposal with the total fishing grounds now constrained to areas not inside the closed areas~~,~~ (i.e. the "available fishing grounds").

Potential Primary Impacts on Ex-Vessel Value

In order to estimate the impacts to the commercial fishery sector associated with each of the MPA proposals, we estimate a "worst-case scenario" or maximum potential economic impact of each MPA proposal[3]. To accomplish this, we use methods similar to those in Scholz et al. (2008), which are based on methods utilized in the MLPA Central Coast Study Region process by Wilen and Abbott (2006). The modified analysis in Scholz et al. (2008), however, differs in a very important respect, that is, by having original survey data on fishermen's operating costs collected through the interview process.

As part of the fishermen interview process in the NCSR, field staff asked~~s~~ several questions related to operating costs, including:

- What percentage of your gross revenue goes towards crew share or labor?
- What percentage of your gross revenue goes towards fuel?
- What percentage of your gross revenue goes towards other costs?

With the opportunity to interview NCSR fishermen directly, information specific to the study region is gained. There is also the opportunity for data resolution regarding types of costs fishermen face. Using data from the interviews, two cost categories are created: fixed and variable. Fixed costs include costs that are independent of the number of trips a fishing vessel makes or the duration of these trips. For example, vessel repairs and maintenance, insurance, and mooring and dockage fees are typically considered fixed costs. On the other hand, variable costs include costs that are dependent on the number of trips a vessel makes or the duration of these trips. Variable costs typically include fuel, maintenance, crew share, and gear repair/replacement. For the purpose of this study, crew wages and fuel costs are assumed to be variable costs. All other costs are assumed to be fixed costs.

The net economic impact (NEI) of each MPA proposal is calculated for each port group, and for the NCSR as a whole. The NEI results are presented as revenue reductions in both dollar terms ($ 2007~~8~~) and percentage terms. The starting point for calculating NEI is baseline gross economic revenue

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[3] *For a detailed description of the methods used, please see Scholz et al. (2008), which can be found at http://www.ecotrust.org/mlpa/Ecotrust_FinalReport_NCCSR_080701.pdf.*

(Baseline GER), which is gross revenue for the fishery in question absent any MPA proposal. Baseline GER is based on an eight~~nine~~-year average (2000–07~~8~~) converted to 2007~~8~~ dollars. The baseline net economic revenue (Baseline NER) is found by subtracting the fishery-specific fixed and variable costs from the Baseline GER. A similar net economic revenue calculation is performed for each MPA proposal and is then compared with Baseline NER to yield NEI.

Potential Disproportionate Impacts on Fisheries

We also use the results of our analysis to evaluate whether there are commercial port-fishery combinations that may be disproportionately affected by each of the MPA proposals. To assess these impacts, we use a box plot analysis to identify outliers within each fishery (calculated using estimated impacts on the stated value of total fishing grounds). In a box plot analysis, outliers are defined as extreme values that deviate significantly from the rest of the sample. Box plot analysis results can also inform convergence among MPA proposals within a fishery and/or relative potential impacts between fisheries.

Potential Disproportionate Impacts on Individuals

For the individual impact analysis, we evaluate if there are individual fishermen who would be disproportionally affected by each MPA proposal (i.e., 100% or a large portion of their grounds are inside a proposed MPA that would restrict fishing). To assess these impacts, we first overlay each fisherman's fishing grounds weighted by ex-vessel revenue (for each fishery in which the individual participates) with those areas being considered for closure under each proposal. We then summarize the potential impact on each fisherman's ex-vessel revenue across all fisheries in which the individual participates. The "worst-cast scenario" still applies in that fishermen are assumed not to adjust to different fishing grounds.

We then use a box plot analysis to identify individual outliers. In a box plot analysis, outliers are defined as extreme values that deviate significantly from the rest of the sample. This analysis not only identifies individual outliers, but is able also to describe the relative impacts of proposals on individual fishermen.

Impact on CPFV and Recreational Fishing Grounds: Methods and Approach

Potential Impacts on Area and Stated Value

The methods and approach used to assess the impact of the various MPA proposals on CPFV and recreational fisheries are identical to those used to assess the impact on commercial fisheries (please refer to Appendix C for a description of those methods) with one exception. While the stated importance values of the commercial fishing grounds are weighted by each fisherman's relative contribution to the total ex-vessel value of in-study region landings (both by landing port and by fishery), no weighting occurs in the calculation of CPFV and recreational fishing grounds[4]. Rather, the analysis is done using only stated importance values from the interviews.

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[4] *No weighting occurs for the obvious reason that ex-vessel values do not exist for CPFV or recreational fishery landings.*

The recreational data should be used with the following caveats:

- The data are not representative of the entire population of recreational fishermen due to the less than desirable (less than statistically significant) sample size (CPFV not included).
- The data should only be considered at the port/landing level, not at the entire study region level.
- The data represent interviewees' areas of value, not areas of effort.
- The data represent areas that are important to interviewees over their entire recreational fishing experience, not necessarily the areas that are important to them currently.

That said, based on conversations with leaders of the recreational fishing community, we believe that the data and the manner in which they were acquired allow us to produce results that speak broadly to the preferences of the overall recreational fishing population and also each user group and port/landing.

As in the commercial fisheries impact analysis, the percentage change in area and value for each of the recreational fisheries (only for the port/landing) is determined by the intersection of each MPA proposal and the fishing grounds specific to that fishery.

Potential Primary Impacts on Value

Similar to the analysis of the commercial fisheries, we calculate the potential net economic impact for the CPFV fisheries as the average reduction in net economic revenue across all species considered. Please see ~~Section 2.2~~ the section on commercial fisheries for a description of the methods we use.

Potential Disproportionate Impacts on Fisheries

For the CPFV fisheries, we also evaluate whether there are port-fishery combinations that may be disproportionately affected by each MPA proposal. Please see ~~Section 2.3~~the section on commercial fisheries for a description of the methods we use.

References

Scholz, A. J., C. Steinback, S. Kruse, J. Bonkoski, S. Hetrick, N. Lyman, S. Lloyd, and L. Weiss. 2010. Commercial and recreational fishing grounds and their relative importance off the South Coast of California. Report submitted to California Marine Life Protection Act Initiative (forthcoming).

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Wilen, J. and J. Abbott. 2006. Estimates of the Maximum Potential Economic Impacts of Marine Protected Area Networks in the Central California Coast. Final report submitted to the California Marine Life Protection Act Initiative in partial fulfillment of Contract #2006-0014M (July 17).