12. Potential Commerical and Recreational Fishery Impacts

Status of this chapter: Draft

While potential 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 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 a socioeconomic impact analysis for commercial fisheries;
- consider or identify “outliers” (i.e. fishermen likely to experience disproportional impacts); and
- 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 potential effects of MPA proposals on commercial fisheries that are conducted in the MLPA South Coast Study Region (SCSR), Ecotrust uses data layers characterizing the spatial extent and relative stated importance of fishing grounds for key commercial fisheries. This information was collected during interviews in the summer of 2008, using a stratified, representative sample of 254 commercial fishermen whose 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 for each fishery.

In addition, an assessment is conducted of the relative potential effects of MPA proposals on key recreational fisheries conducted in the waters in the SCSR. In order to complete this analysis, data layers characterizing the spatial extent and relative stated importance of recreational fishing grounds for key recreational fisheries are used. Recreational fishermen are also broken out by user group (i.e. commercial passenger fishing vessels, private vessels,

1 Impact analyses represent a “worst case” scenario in which fisherman cannot fish in a different location.

kayak, pier/shore and dive). This information was collected during interviews in the summer of 2008 from 119 commercial passenger fishing vessel (CPFV) operators and 504 recreational fishermen whose 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 for each fishery.

The normalized data described above is then used to 1) evaluate the potential impacts on the commercial and recreational fishing grounds and 2) conduct a socioeconomic impact analysis on commercial fisheries in order to assess the potential effects of any MPA proposal. Results are reported at both the study region and port group levels for the commercial fisheries. Port groups are defined as (from north to south) Santa Barbara, Ventura, Port Hueneme/Channel Islands, San Pedro, Dana Point, Oceanside, and San Diego. Recreational fishery results are reported by user group. Similarly, CPFV results are reported by the following port/landing groups: Santa Barbara, Port Hueneme/Channel Islands, Santa Monica, San Pedro/Long Beach, Newport Beach, Dana Point, Oceanside, San Diego. Recreational results will be reported both by user group and by county (i.e. Santa Barbara, Ventura, Los Angeles, Orange, and San Diego).

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—for example, confidence intervals—meaning they may not deliver their advertised precision. Nevertheless, this approach does allow broad generalizations about preferences of the overall recreational fishing population and the five user groups within the study area, adding increased thematic resolution to the MLPA decision-making process.

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 the boundaries of particular MPAs. 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 SCSR, 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.”

This analysis includes 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, an assessment is made of the commercial fisheries that would be affected.

Results are compiled 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. The same analytical methods are used as those developed and used in previous iterations of the MLPA process (see Scholz et al. 2008 and Scholz et al. 2006), creating a weighted surface that represents the stated importance of different areas for each fishery. More specifically, the stated importance values are multiplied 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 SCSR and not within the whole state of California. These estimates then feed into the economic impact assessment (described in more detail in Appendix B).

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 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, the percentage change in value is determined 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”.

An evaluation is also conducted to determine 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 this impact an analysis is conducted that removes the area of each proposed MPA from an individual fisherman’s fishing grounds as derived from interviews. The individual’s SCSR ex-vessel revenue and area of the fishing grounds are then summarized after the removal and percentages are calculated to

show any potential losses. The "worst-cast scenario" still applies in that individual fishermen are assumed not to adjust to different fishing grounds. For this analysis the potential impact was calculated for each fishery as well as for all fisheries in which an individual participates.

Commercial Fisheries Economic Impact Assessment

The primary purpose of this analysis is to estimate the socioeconomic impacts to the commercial fishery sector associated with each of the MPA proposals. To accomplish this, an estimate is made of a "worst-case scenario" or maximum potential economic impact of each MPA proposal (for a detailed description of the methods used, see Scholz et al. 2008, which can be found at http://www.ecotrust.org/mlpa/Ecotrust_FinalReport_NCCSR_080701.pdf). To accomplish this, methods are used similar to those utilized in the MLPA Central Coast Study Region process by Wilen and Abbott (2006). The modified analysis in Scholz et al. (2007), 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 mentioned previously, this refinement is possible due to new data gathered during the interview process on fishery specific operating costs in the study area. As part of the fishermen interview process, field staff asked several questions related to operating costs, including:

- What percentage of your gross revenue goes towards overall operating costs?
- Of your overall operating costs, what percentage goes towards crew share or labor?
- Of your overall operating costs, what percentage goes towards fuel?

With the opportunity to interview SCSR 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 fishermen knowledge interviews, two cost categories were 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, 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 and the duration of these trips. Variable costs typically include fuel, maintenance, crew share, and gear repair/replacement. For the purpose of this study, variable costs are assumed to be crew wages and fuel costs. All other costs will be considered fixed costs.

The net economic impact (NEI) of each MPA proposal is calculated for each port group, and for the SCSR as a whole. The NEI results are presented as revenue reductions in both dollar terms ($ 2007) and percentage terms. The starting point for calculating NEI is baseline gross economic revenue (Baseline GER), which is based on an 8-year average (2000–07) converted to 2007 dollars. Baseline GER is gross revenue for the fishery in question absent any MPA proposal. 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.

Impact on Recreational Fishing Grounds: Methods and Approach

The methods and approach used to assess the impact of the various MPA proposals on recreational fisheries are identical to those used to assess the impact on commercial fisheries (please refer to Appendix B of this document for a description of those methods) with one exception. The commercial fishery impact analysis assesses fishing grounds that are weighted by multiplying stated importance values from the interviews by the proportion of in-study region landings (both by landing port and by fishery), and more specifically, by ex-vessel values for those landings. In contrast, no weighting occurs in the calculation of recreational fishing grounds, but rather, the analysis is done using only stated importance values from the interviews. No weighting occurs for the obvious reason that ex-vessel values do not exist for recreational fishery landings. Again, CPFV impacts are reported by the following port/landing groups: Santa Barbara, Port Hueneme/Channel Islands, Santa Monica, San Pedro/Long Beach, Newport Beach, Dana Point, Oceanside, and San Diego. Recreational impacts will be reported both by user group and by county (i.e. Santa Barbara, Ventura, Los Angeles, Orange, and San Diego).

The recreational data presented here 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 county or port/landing level, not at the entire study region level.
- The data represents interviewees' areas of value, not areas of effort.
- The data represents interviewees' areas that are important to them 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, it is believed that the information and the manner in which it was acquired allows results that are able to speak broadly to both the preferences of the overall recreational fishing population and also each user group and county or port/landing of anglers.

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

References

Scholz, A., Steinback, C. and Mertens, M. (2006). Commercial fishing grounds and their relative importance off the Central Coast of California. Report submitted to the California Marine Life Protection Act Initiative (May 4, 2006).

Scholz, A., Steinback, C., Kruse, S., Mertens, M., and Weber, M. (2008). Commercial and recreational fishing grounds and their relative importance off the North Central Coast of

California. Report submitted to the California Marine Life Protection Act Initiative (June 30, 2008).

Appendix B. Socioeconomic Impact Assessment Methods

The primary goal of this analysis is to estimate the socioeconomic impact to the commercial fishery sector associated with each of the MPA proposals. To accomplish this, staff from Ecotrust, contractor to the MLPA Initiative, will estimate the maximum potential economic impact for each of the MPA proposals using methods developed in the Central Coast process (see Wilen and Abbott, 2006). This analysis assumes that each of the MPA proposals completely eliminate fishing opportunities in areas closed to specific fisheries and that fishermen are unable to adjust or mitigate in any way (Wilen and Abbott, 2006). The results can then be considered by each group (i.e. stakeholders, SAT, BRTF, Initiative staff, FGC) as trade-offs for protections relative to socioeconomic impacts can be weighed in siting and evaluating MPA proposals. The remainder of this paper describes the steps needed to complete the maximum potential economic impact analysis, as the process is used in the South Coast Study Region.

1: Generate Baseline Estimates of Gross Economic Revenue

The first step involves calculating a baseline estimate from which to derive estimates of the socioeconomic impact associated with changes in commercial fisheries that might be induced by each MPA alternative and against which to compare those estimates. The baseline estimate is generated using gross fishing revenues from regional landing receipts. A seven-year average, 2000-2007 derived from the California Department of Fish and Game (DFG) landing receipts reported for ports in the South Coast Study Region is used, and then these values are converted into current dollar values (i.e. $2007).

More specifically, to generate baseline estimates of gross economic revenue (GER), for any fishery, *f*, $BGER_f$ is the average ex-vessel value of the fishery in 2007 dollars, where

$BGER_f = \sum_{p \in P} BGER(f, p)$ the sum of the baseline estimates of GER for this fishery over all ports.

Staff also define the fisheries specific to each port, or in other words, create a baseline estimate of gross economic revenue for each port. For a specific port, *p*, being considered in the South Coast Study Region the baseline estimate ($BGER_p$ can be calculated as the sum of the baseline estimates of GER for this port over all fisheries:

$BGER_p = \sum_{f \in F} BGER(f, p)$.

The baseline gross economic revenue ($BGER_{TOT}$ forall commercial fisheries ($f \in F$ being

considered in the South Coast Study Region is therefore

$$BGER_{TOT} = \sum_{f \in F} BGER_f = \sum_{f \in F} \sum_{p \in P} BGER(f, p)$$

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equivalently, $$BGER_{TOT} = \sum_{p \in P} BGER_p = \sum_{p \in P} \sum_{f \in F} BGER(f, p)$$.

2: Generate Gross Economic Revenue for the Various MPA Alternatives

The next step involves using results from the Ecotrust mapping exercise, specifically stated importance indices from the fishing grounds, to estimate the socioeconomic impact associated with changes in the commercial fisheries that might be induced by each MPA alternative. For a description of the methods used to create stated importance indices, please see Scholz et al. (2006).

For any fishery, *f*, port, *p*, and any MPA alternative, *a*:

$$GER(f, p, a) = BGER(f, p) - GEI(f, p, a)$$

where $GEI(f, p, a)$ i the estimated gross economic impact on fishery,*f*, at any port, *p*, under any alternative, *a*.

Therefore,

$$GER_f(a) = \sum_{p \in P} GER(f, p, a)$$ an $$GER_p(a) = \sum_{f \in F} GER(f, p, a)$$

as well as

$$GEI_f(a) = \sum_{p \in P} GEI(f, p, a)$$ and $$GEI_p(a) = \sum_{f \in F} GEI(f, p, a)$$.

Gross economic revenue under any alternative, *a*, ($GER_{TOT}(a)$) forall commercial fisheries ($f \in F$ being considered in the South Coast Study Region can be calculated as:

$$GER_{TOT}(a) = \sum_{f \in F} GER_f(a) = \sum_{p \in P} GER_p(a) = \sum_{f \in F} \sum_{p \in P} GER(f, p, a) = \sum_{p \in P} \sum_{f \in F} GER(f, p, a)$$

From this it can be said that, for any MPA alternative, *a*,

$$GEI_{TOT}(a) = BGER_{TOT} - GER_{TOT}(a)$$

where GEI_{TOT_a} is defined as the total gross economic impact on all commercial fisheries under any alternative, *a*. Therefore,

$$GEI_{TOT}(a) = \sum_{f \in F} GEI_f(a) = \sum_{p \in P} GEI_p(a) = \sum_{f \in F} \sum_{p \in P} GEI(f,p,a) = \sum_{p \in P} \sum_{f \in F} GEI(f,p,a)$$

3: Generate Baseline Estimates of Net Economic Revenue

In order to compute net economic benefits, staff 1) estimate the share of gross fishing revenues represented by costs, and 2) scale the baseline estimate (i.e. gross fishing revenues) calculated in Step 1 using the estimated cost shares. In the Central Coast process, an estimate of 65% was used across all fisheries (Wilen and Abbott, 2006). For the South Coast process, several cost related questions are asked during interviews with fishermen in an effort to improve on this estimate as well as allow for the ability to account for cost variability between different fisheries in this analysis. After all interviews are completed, the cost data are broken out by fishery or fisheries. For example, cost data for a fisherman who fished both salmon and crab would be aggregated with only other interviewees participating in both those fisheries. A mean or median cost estimate is then calculated for each category.

Costs will be broken into two categories: fixed costs and variable costs. Fixed costs include costs that are independent of the number of trips a vessel makes or the duration of these trips. For example, vessel repairs and maintenance, insurance, mooring and dockage fees typically considered fixed costs. On the other hand, variable costs include costs that are dependent on the number of trips a vessel makes of the duration of these trips. Variable costs typically include fuel, maintenance, crew share, gear repair/replacement. For the purpose of this study, variable costs are assumed to be crew wages and fuel costs. All other costs will be considered fixed costs.

For any fishery, *f*, net economic revenue is calculated as:

$$BNER_f = BGER_f - C_{X_f} - C_{V_f}$$

where C_{X_f} i the fixed cost associated with any fishery,*f*, and is set as a fixed dollar value, and C_{V_f} i the variable cost associated with any fishery ,*f*, and is a fixed percentage of $BGER_f$ For further explanation, please see the Appendix.

Baseline net economic revenue ($BNER$ forall commercial fisheries ($f \in F$ being considered in the South Coast Study Region can be calculated as:

$$BNER_{TOT} = \sum_{f \in F} BNER_f$$

4: Generate Estimates of Net Economic Revenue for the Various MPA Alternatives
In order to compute net economic revenue for each of the various MPA alternatives, staff analysis 1) estimates the share of gross fishing revenues represented by costs under each MPA alternative, and 2) scales the estimated gross fishing revenues for that alternative accordingly. Costs will be calculated using the methods described in Step 3.

For any fishery, *f*, and any MPA proposal, *a*,

$$NER_f(a) = GER_f(a) - C_{X_f} - C_{V_f}.$$

For any MPA alternative, *a*, net economic revenue for <u>all</u> commercial fisheries ($NER_{TOT}(a)$ can be calculated as:

$$NER_{TOT}(a) = \sum_{f \in F} NER_f(a)$$

5: Generate Estimate of the Potential Primary Economic Impact for the Various MPA Alternatives

Using the results from the previous steps, the potential primary net economic impact (NEI) of a particular MPA alternative, *a,* on a particular fishery, *f,* can then be calculated as:

$$NEI_f(a) = BNER_f - NER_f(a).$$

The potential primary NEI of any MPA alternative, *a,* on <u>all</u> commercial fisheries ($f \in F$ can then be calculated as:

$$NEI_{TOT}(a) = BNER_{TOT} - NER_{TOT}(a).$$

Example of Estimate Costs

For fishery *f*, assume the following proportion of gross economic revenue goes to the following costs:

- 20% = fixed costs
- 20% = crew wages
- 10% = fuel costs à 30% = variable costs

Assume that baseline gross economic revenue equals $10,000.00. Under the baseline, fixed costs equal $2,000 and variable costs equal $3,000, resulting in total costs of $5,000. Assume that under MPA alternative *a,* gross economic revenue now equals $5,000. Under this alternative, fixed costs will still equal $2,000; however, variable costs will be recalculated as:

$5,000 * 0.3 = $1,500

This results in total costs of $3,500 under MPA alternative *a.*

References for Appendix B

Scholz, Astrid, Charles Steinback and M. Mertens. 2006. Commercial fishing grounds and their relative importance off the Central Coast of California. Report submitted to the California Marine Life Protection Act Initiative. May 4, 2006.

Wilen, James and Joshua Abbott, "Estimates of the Maximum Potential Economic Impacts of Marine Protected Area Networks in the Central California Coast," final report submitted to the California MLPA Initiative in partial fulfillment of Contract #2006-0014M (July 17, 2006)