

WHITE PAPER

**MARINE RESERVES:
OBJECTIVES, RATIONALES, FISHERY MANAGEMENT IMPLICATIONS
AND REGULATORY REQUIREMENTS**

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**Scientific and Statistical Committee
Pacific Fishery Management Council**

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ES. Executive Summary

ES.A. Introduction

The objective of this white paper is to facilitate Council deliberations on marine reserves by: (1) describing the rationale underlying various reserve objectives and providing an SSC perspective on the technical challenges of using reserves to achieve each of these objectives; (2) discussing the implications of reserves for fishery management, taking into consideration the objective of the reserve; and (3) describing SSC guidelines and standards regarding the technical content of proposals initiated by the Council (or submitted for Council consideration by outside entities) that involve change in fishery regulations associated with establishment of marine reserves primarily in Federal waters and, at times, in National Marine Sanctuaries.

SSC recommendations are guided by the Council's mandate to rely on best available science and adhere to Federal regulatory requirements as specified in the National Environmental Policy Act, the Regulatory Flexibility Act, Executive Order 12866 and other applicable law. As such, evaluation of marine reserve proposals should be based on the same requirements as other types of management actions considered by the Council. SSC interest in this topic is prompted by the limited extent to which reserves have been evaluated in the context of Federal regulatory requirements and the likelihood of the Council's continued engagement in this topic.

ES.B. Reserve Objectives and Rationales

Based on existing rationales and evidence regarding reserve effects, the SSC offers the following perspective regarding the extent to which available scientific evidence indicates that reserves can be reasonably expected to achieve the following objectives:

- *Reserves as insurance policy* – Reserves are uniquely qualified to provide a complete age structure for target species and thereby enhance persistence, i.e., the ability of fish stocks to withstand adverse effects associated with environmental variability and management uncertainty and error. In this sense, reserves have significant potential as a tool for mitigating uncertainty in stock assessments and managing unassessed stocks.
- *Reserves as source of fishery benefits* – Recent studies suggest that the protection of age structure provided by reserves may increase recruitment and population resilience. On the other hand, theoretical models that are used to demonstrate increases in fishery yield outside the reserve are sensitive to underlying assumptions regarding the behavior of fish stocks, the extent of exploitation prior to the reserve and the extent of effort redistribution after the reserve is established. While such models provide insights into how particular circumstances and processes might affect yield, the practical

question of how well model assumptions apply to particular fish stocks remains largely unanswered. Moreover, while the literature typically characterizes fishery benefits in terms of increases in yield, economic and social effects often matter more than yield to fishery participants and fishing communities.

- *Reserves as source of ecosystem benefits* – Cessation of fishing may yield ecosystem benefits (including protection or enhancement of habitat) within the reserve, depending on the nature and extent of fishing prior to reserve establishment. However, in evaluating more general ecosystem effects of reserves, it is important to consider effects both inside and outside the reserve, as the ecosystem itself extends to both areas. Reserves are a potentially useful tool for providing ecosystem benefits, provided that effects of effort displacement on the ecosystem outside the reserve are also managed effectively.
- *Reserves as means of achieving social objectives* – Reserves may be used to achieve objectives such as reducing social conflict among user groups, accommodating values held by various segments of the public, discouraging or encouraging particular types of resource use, or protecting areas that are deemed unique in terms of cultural or natural heritage. This objective differs fundamentally from the other reserve objectives in that the choice of criteria to evaluate achievement of this objective is a matter of policy rather than science. However, social science can be useful for evaluating management alternatives relative to the policy criteria.
- *Reserves as opportunities to advance scientific knowledge or to establish reference sites* – Reserves can allow scientists to evaluate the impacts of fishing on marine communities by comparing fished areas to protected areas inside a reserve. However, the SSC notes that fish populations inside and outside a reserve are not isolated from each other and are best studied as a system. In addition, most research reserves will not be designed primarily for research purposes. Caution must be used in generalizing from experimental observations to broad conclusions about reserve effects. Usefulness of study results depends largely on study design. Proposals for research reserves should be evaluated on the same basis as other types of research proposals. Sound research should be accommodated and encouraged even at reserves that are not established primarily for that purpose, to augment existing knowledge regarding biological, socioeconomic and ecological effects.

ES.C. Analytical Framework for Marine Reserve Proposals

SSC recommendations regarding the analytical content of reserve proposals prepared by the Council (or submitted for Council consideration by outside entities) are as follows. These recommendations are intended to be consistent with what the SSC generally expects to see in regulatory analyses.

- The management objectives addressed by the proposal should be described in specific terms and in the context of relevant mandates. The proposal should describe the problem to be addressed, why the problem is significant and why the *status quo* is inadequate to address the problem.
- The proposal should include a description of the *status quo*, i.e., current and future conditions that can reasonably be expected to prevail if the proposal is not implemented. The time frame used to define the *status quo* (as well as alternatives to the *status quo*) should reflect the time period over which effects of the proposed regulatory change are expected to be realized. This is particularly important if benefits and costs are expected to change over time or to be realized over different time frames. Current (baseline) conditions may be a useful proxy for the *status quo*, but only if current conditions are expected to continue into the future.
- The proposal should include a reasonable range of alternatives to the *status quo*. If the problem identified in the proposal can be addressed only by reserves, the alternatives should take the form of different reserve configurations. If the problem can also be addressed by non-reserve management measures or by combining reserves with other measures, the alternatives considered should reflect the broader range of feasible solutions. The proposal should include a description of the operational requirements (i.e., the specific combination of regulations) associated with each alternative, as these requirements are crucial for evaluating the biological, social, economic, environmental and enforcement implications of each alternative.
- Alternatives should be compared in terms of how well they achieve the management objectives. Biological, social, economic and ecosystem effects should be documented, as well as monitoring and enforcement requirements. To the extent possible, the analysis should be based on information specific to the fish stocks, ecosystems, fishery participants and fishing communities that will be affected by the proposal. All alternatives should be evaluated on a common spatial scale, in terms of effects inside and outside reserve areas. Regulatory analysis, whether it involves marine reserves or other types of management measures, is constrained by limited knowledge and data. It is important that reserve proposals be explicit about sources of risk and uncertainty in the analysis.

- Reserve proposals should include a description of the process by which the need for reserves was identified and management alternatives were developed and analyzed. The extent of public involvement in the process and the nature of public comment should be documented.

ES.D. Conclusions and Recommendations

In considering reserves as a management measure, it is important that the management objectives be the starting point for discussion. Management effectiveness is not achieved by focusing *a priori* on any particular regulatory measure, but by determining which measure (or combinations of measures) would be most effective to address the objectives. To accomplish this, it is important that the range of feasible solutions not be restricted unduly from the outset.

Regulatory analysis plays a substantive role in the management process by providing a meaningful synthesis of the information relevant to the issue at hand, conveying that information to the public and policy makers, and moving the process forward in a systematic and well-documented way. The public cannot be expected to provide constructive input and policy makers cannot be expected to make well-informed decisions unless they have access to an analysis that is technically sound, informative and balanced.

Identifying a potential weakness in a management alternative does not, in and of itself, preclude adoption of that alternative. All alternatives have strengths and weaknesses, regardless of whether they involve marine reserves, more traditional management tools, or some combination of the two. An important role of regulatory analysis is to make these strengths and weaknesses apparent, so that policy makers have a sound basis for evaluating and weighing alternatives.

Regardless of the management objectives, the choice of a preferred management alternative is ultimately a policy decision. While science (meaning both natural and social sciences) may inform some aspects of reserve design and facilitate systematic consideration of reserve effects, all relevant factors must ultimately be weighed in ways that are beyond the scope of science. It is important to distinguish among issues that can be addressed by science and those that cannot. This distinction is important for ensuring that scientific issues receive the technical scrutiny they deserve and for clarifying the respective roles of scientists and policy makers in the management process.

The SSC recommends that the Council develop procedures for evaluating reserve proposals submitted to the Council by outside entities. The Council should assume a proactive role in reserve discussions and plans that pertain to its area of jurisdiction. This would include working with other appropriate entities to develop a

coordinated approach to marine reserves on the West coast. Such coordination would facilitate communication, avoid duplication of effort and increase the likelihood of a productive outcome for all parties. Proactive Council involvement in marine reserve planning processes would help ensure that such planning is grounded in the best available science and realistically reflects the complexities of management.

Given the Council's increasing reliance on area closures as a management tool and the interest in reserves being conveyed to the Council by other entities, the SSC sees a growing need for spatially-explicit models and increased use of spatial data. However, data collection is costly and model development is not guaranteed to improve the science needed for management. Increased spatial resolution in models will lead to more complexity and hence the estimation of more parameters. Model selection techniques will need to be applied to determine how differences in spatial resolution affect model performance and what approaches to pooling of data might be most appropriate.

An important issue for the Council in evaluating reserve proposals is the potential effect on stock assessments. Reserves may limit the use of fishery-independent surveys in reserve areas and constraints could be imposed on the conduct of such surveys. To the extent that reserves significantly interfere with the customary spatial coverage of surveys, the Council may be faced with loss of age structure information that is critical to estimating year class strengths in stock assessment models. Increased dependence on alternative non-lethal data collection methods may be needed in reserve areas to address management needs. The use of such methods also raises issues of cost and collaboration. Finally, possible changes in fish dynamics associated with reserve establishment may require changes in stock assessment models.