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Collaborative Research: An Effective Way to Collect Data for Stock Assessments and Evaluate Marine Protected Areas in California

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Abstract.—Collaborative fisheries research (in contrast to cooperative research) is based on the intellectual partnership between scientists and fishermen and is an effective way to collect data for stock assessments and to evaluate marine protected areas. Collaborative fisheries research is discussed in the context of co-management of marine resources and how it contributes to a more democratic form of fisheries management. Many benefits result from working together, including (1) the incorporation of fishers' knowledge and expertise into the management process and (2) the development of shared perspectives derived through science-based investigations on the status of marine resources. The California Collaborative Fisheries Research Program was formed in 2006 to participate in the monitoring of marine reserves established through California's Marine Life Protection Act. This program has shown that it can serve as a model for other areas that are trying to implement collaborative research and that collaborative research can greatly contribute to the realization of community-based co-management of marine resources.

Integrated, holistic approaches to management that involve the collaboration and sharing of knowledge by stakeholders, resource managers, and scientists have been highlighted as a critical need for improving coastal resource management (Pew Ocean Commission 2003; California Ocean Action Strategy 2004; U.S. Commission on Ocean Policy 2004; McLeod et al. 2005; Millennium Ecosystem Assessment 2005; Leslie and McLeod 2007; Hildreth 2008; McLeod and Leslie 2009). There is a growing awareness that integrating science and stakeholders into the management of marine resources can result in a more effective and socially acceptable process that can lead to better management and stewardship (e.g., Sen and Nielsen 1996; Wilson 1999; Martin-Smith et al. 2004; Verheij et al. 2004; Hartley and Robertson 2006; Kitts et al. 2007; Cheong 2008; Davis 2008). Indeed, a recent historical analysis of fisheries that were managed under conditions where local communities and fishermen had rights-based catch shares show that such approaches are less likely than traditional management approaches to result in the collapse of the resource (Costello et al. 2008). Although the value of collaborative research is recognized by many scientists and federal management agencies (NRC 2004), the use of collaborative fisheries research has yet to be adopted as a mainstream tool for fisheries management. This remains true despite the recognition that scientists and fishermen acknowledge that they learn from each other in collaborative research projects (Conway and Pomeroy 2006).

Developing collaborative fisheries research is one element by which coastal communities can move toward more effective management with stakeholder and scientific knowledge as part of a more holistic management processes (Wilson 1999; Hartley and Robertson 2006; Leslie and McLeod 2007). In this article, we (1) provide a brief review of the concept of co-management as it relates to collaborative fisheries research; (2) define the differences between "cooperative" and "collaborative" research; (3) discuss different models for collaborative research; (4) present the rationale for implementing collaborative fisheries research; and (5) provide an overview of the approach we developed by describing the California Collaborative Fisheries Research Program (CCFRP).

Co-Management: The Move to Democratic Management of Marine Resources

Co-management of marine resources is defined as an arrangement in which the responsibility of management lies on both user groups and government (Sen and

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Nielson 1996). As Nielsen et al. (2004) state, modern fisheries management—and indeed most marine resource management in the United States—has been historically a top-down approach. The top-down approach has left the fishing communities largely out of the process of management and has resulted in barriers between fisheries administrators and the communities they directly manage (Nielsen et al. 2004; Hartley and Robertson 2006). Co-management processes are used to make management more resilient and incorporate a broader array of knowledge and values into the management process. Co-management will also result in more efficacious fishery administration because acceptance of management decisions is assumed to be higher when users are involved in the management process. In addition, regulations resulting from co-management actions are perceived by users to be more appropriate if measures reflect their knowledge (Nielsen et al. 2004; Jentoft 2005).

Management tasks such as creation of new policies, implementation of existing policies, or evaluation of implemented management actions can all be executed within a co-management framework. For example, the California Marine Life Protection Act (MLPA) mandates the establishment of a network of marine protected areas (MPA) in state waters and incorporates elements of co-management during the design and establishment of MPAs. In the first implementation process of the MLPA from 2005 to 2007, an integrated group consisting of user groups, environmental advocacy organizations, scientists, educators, policy personnel, and state resource managers worked together to develop and design a network of MPAs and recommended the location and level of protection of each MPA. Decision-making power was not shared equally in this situation, as the state resource managers still retained legal authority to designate the reserves; however, the government relied on the expertise and recommendations of the broader community to develop and recommend options for the design of the network.

As defined by Nielsen et al. (2004), the MLPA process in California is an "instrumental co-management" model whereby the government involves the community in the implementation process of an existing management decision, namely the establishment of MPAs. Nielsen et al. (2004) suggested that institutional co-management is a step in the right direction from the top-down approach of modern resource management but that it does not differ significantly from the top-down approach and may actually lead to more frustration if it does not achieve genuine participation and empowerment. Full empowerment requires that users be involved in defining management objectives and in identifying key issues for creating management decisions. We suggest here that a critical step toward a more democratic form of fisheries management, as put forth by Nielsen et al. (2004), is the development of genuine collaboration between fishermen and scientists to collect the data used to inform fisheries management. This is especially critical because current management models are adaptive approaches, which evolve with the provision of new information.

Collaborative versus Cooperative: Different Terms for the Same Activities?

We think it is useful to differentiate between "collaborative" and "cooperative" research so that the terms are applied appropriately to the many types of activities that involve fishermen and scientists working together. The American Heritage Dictionary defines "collaborate" as a situation whereby parties "work together, especially in a joint intellectual effort." In contrast, "cooperate" is defined as a situation where parties "work together or act toward a common end or purpose." Both terms can be used to describe a situation in which fishermen and scientists are working together toward a common goal. One of the major differences is that collaborative research involves the incorporation of fishers' knowledge into the scientific and management process.

We prefer the term collaborative research to describe the work we are advocating in this article because it explicitly suggests a "joint *intellectual* effort." This concept was articulated by the National Research Council in suggesting that true collaborative research occurs when fishermen are incorporated into all phases of the research process, including formulation of the research questions and generation of the hypothesis (NRC 2004). Cooperative activities differ fundamentally in that they involve using fishermen to help execute a particular task without seeking significant intellectual contribution. For example, a fisherman that is contracted to deploy a remotely operated vehicle for a group of scientists studying habitat associations is certainly working together with researchers and cooperating toward a common goal (i.e., collecting data on fish/habitat associations). Although worthwhile and certainly mutually beneficial, cooperative research as described in this example differs from collaborative research in that the study was developed in the absence of the fisher's input. In this case, a collaborative approach would involve fishermen helping in the development of questions to be addressed, contributing to the study design where appropriate, and generally using their expertise to improve the science and collection of data. It is the latter situation that we are advocating here, especially in cases where an adaptive management process is employed to collect data for evaluating the efficacy of previously implemented management strategies, such as MPAs or allowable catch based on stock assessments.

Models of Collaboration: How Should We Collaborate?

While working with fishermen and resource managers over the past decade, we were struck by one issue cited most often by fishers and fishing communities: the data being produced by academic and government scientists simply do not corroborate the status of the resources as discerned by the fishermen through their day-in and day-out observations on the water. We think robust collaborative fisheries research programs are the best way to acknowledge this concern by incorporating the knowledge of fishermen into the management process and to begin to develop shared perspectives on the status of the resource.

Many different forms of collaborative research have been used previously. Wilson (1999) suggests four cumulative models for defining collaboration between scientists and fishermen: (1) the deference model; (2) the traditional ecological knowledge model; (3) the competing constructions model; and (4) the community science model. In the traditional deference model, scientists are seen as experts and as providing the best source of information to get an accurate account of the status of the resource. This model perpetuates the separation of fishermen from the process of management and often leads to contentious interactions over a resource's status (e.g., Nielsen et al. 2004; Hartley and Robertson 2006; Pinto da Silva and Kitts 2006). Wilson (1999) goes on to describe the traditional ecological knowledge model that builds on the strict deference model by including fishers' knowledge and acknowledging that fishers have a different perspective than scientists due to their different training, experience, and cultures. It is important to note that in this model, scientists still hold the ultimate information on the resources and the knowledge of fishermen is meant to be supplemental to scientific information. In the competing constructions model, collaborative efforts result from competition between different perspectives on the status of the resource. The design of the network of marine reserves in California's MLPA process is an example of the competing constructions collaboration whereby different interest groups collaborate to produce proposals for the size and location of reserves. The competing constructions model relies on the professional knowledge of scientists and the traditional ecological knowledge of fishermen to construct management outcomes. Because each of the major players in the management arena (e.g., government scientists, environmentalists, user groups) tends to construct a resource status that fits that player's needs, this model often results in different perspectives on the status of the resource. What follows naturally from this situation is that the support of management solutions based on information from a given group appears to fit the particular needs of that group. As Wilson (1999) points out, this model leads government scientists to construct a description of the status of the resource that is more amenable to management (i.e., more accurate) than it really is; environmentalists will tend to construct a picture in which the resource is more threatened than is actually the case; and user groups will insist that the resource can withstand more use than is actually sustainable. The competing constructions model will inevitably lead to management decisions that are not supported by stakeholders—not out of misrepresentation of information or bad science (although that can happen) but out of genuine differences in perspective and in the use of information to construct views of the resource's status.

How can resource management move beyond this honest and inevitable perpetual conflict? We support moving beyond the conflict by employing a more integrated effort to generate the data and information needed to manage natural resources, particularly fisheries. We believe this approach leads to a more realistic view of resource sustainability. In accordance with the fourth model described by Wilson (1999), we advocate movement toward the community science model whereby competing constructs of the resource are resolved through stakeholder participation and collaborative research.

The community science model for management is currently being employed in the emerging field of marine ecosystem-based management (e.g., McLeod et al. 2005; Leslie and McLeod 2007; Wendt et al. 2009). This model focuses on evaluating cumulative impacts to ecosystem services and explicitly considering tradeoffs in services that result from competing management decisions. By design, ecosystem-based management is an adaptive management process whereby the impacts of management decisions on the resource should be actively monitored. We advocate that monitoring programs should have a strong community science component. As stated by Verheij et al. (2004), involving communities in environmental monitoring programs provides them with first-hand information on the impacts of management interventions. This can help move traditional user groups and government beyond historic tensions and controversies toward a system of shared fact finding, cooperation, and understanding.

Collaborative (Community-Based) Fisheries Research: Why Work Together to Understand the Status of the Resource?

Although relatively new on the West Coast of the United States, collaborative research has a long history in the northeast United States (Dobbs 2000; Hartley and Robertson 2006). In the first half of the 20th century, scientists and fishermen commonly worked together with relatively equal status in providing knowledge to understand fisheries (Dobbs 2000). Over the past 40 years, however, government and academic scientists (independent of fisher participation) have carried out much of the research and monitoring used to determine the status of fish stocks. This situation, combined with the fact that models used to determine stock status and optimum yield have grown increasingly complex and less understandable to nonscientists, has led to fishers' pervasive distrust of the management process. There also exists a sincere belief on the part of fishermen that the models were not consistent with their own experiences (Dobbs 2000; Hartley and Robertson 2006; authors' extensive personal communication with fishermen).

For example, catch levels for Atlantic cod *Gadus morhua* in the Gulf of Maine and Georges Bank remained level for a couple of years even though biomass estimates from models showed significantly decreasing populations (Hartley and Robertson 2006). Because the fishing community did not immediately feel the model-generated predictions, the fishermen tended to distrust the science and did not heed the warning. The result was a collapse in the Atlantic cod fishery, with tremendous ecological and economic repercussions.

We have experienced similar sentiments on the West Coast in central California in numerous encounters with fishermen. They often believe that the model predictions are erroneous and that because fishermen are not involved in generating the data used to parameterize or populate the model, it is simply inaccurate (i.e., garbage-in, garbage-out scenario). At the same time, we have heard from scientists and managers that fishermen are blatantly misrepresenting the status of the resource out of self interest and that fishermen prioritize catch volume despite the status of the resource. Whether the perspectives described are completely accurate is unimportant because it is the perception of each side that perpetuates the ongoing distrust and disbelief so often encountered in the fisheries management arena.

Hartley and Robertson (2006) suggest that collaborative research is re-emerging in the northeast United States *because* of the tensions in fisheries management over the past decade. Moreover, we suggest that collaborative research is a potent mechanism that can be used worldwide to (1) provide some economic assistance to fishermen; (2) give fishermen a real voice in science and management; (3) involve communities in shared fact finding; (4) build trust and facilitate communication among factions in fisheries management; (5) develop a more accurate consensus about resource status; (6) create a co-management framework to support decentralized governance and an ecosystem-based approach to fisheries management; and (7) in some cases, decrease the cost of data collection used for management.

We have developed a collaborative research program in California that strives to build an integrated group of fishermen, managers, and scientists. What follows is a description of how we have approached our work through development of the CCFRP.

California Collaborative Fisheries Research Program

The CCFRP was formally created in 2006 as a group of scientists, fishermen, and resource managers to participate in the adaptive management of California's marine resources as implemented through the California MLPA. As an organization, CCFRP has several goals:

(1) To utilize the extensive expertise of fishermen and skippers to develop and execute a scientifically sound research program; to collect data to assess the effects of MPAs on the nearshore fish assemblage; and to collect data that can be utilized in federal stock assessments of nearshore species;
(2) To engage the public in research and education about marine conservation and stewardship and to broaden understanding of the scientific process, including hypothesis testing, appropriate sampling designs, how data are analyzed and interpreted, and how uncertainty is estimated.

The CCFRP was built on many previous years of active collaborative research between fishermen and scientists in both the Morro Bay and Moss Landing areas of central California (e.g., Starr et al. 2006, and in review; Stephens et al. 2006; Mireles et al. 2007; Starr and Green 2007; Rienecke et al. 2008; Wilson et al. 2008). Through our collective experience working with fishermen and resource managers to collect management-relevant data, we have developed an approach to collaborative research that involves several key elements:

(1) Build an open process by bringing all key players

to the table and then collectively defining research questions and developing research protocols;

(2) Implement research and monitoring; review data, interpret results, and refine approaches; and discuss management options.

One of the essential elements of any community-based research program is the involvement of the key people affecting or affected by the management process. In the case of fisheries, it is important to have credible representation of the fishing industry, academic and government scientists, staff from management agencies, and representation of the broader stakeholder community, including environmental organizations, elected officials, and municipal staff from fishing port communities. We have found that a fundamental key to successful collaboration of such a diverse array of folks is the neutral facilitation of their interactions in a transparent and open process. The CCFRP accomplished this by hiring a professional facilitator to help the group define shared goals and to establish the framework to move toward designing and executing sound science. As reported by Hartley and Robertson (2006) in an interview with Ann Bucklin, the founding Director of the Northeast Consortium,

> Our highest priority is partnership... It's impossible to create good management in an arena where nobody trusts anybody, nobody even understands anyone and nobody's listening... It is more the point that the data we produce [through cooperative research] is building the relationship between fishermen, managers, and scientists that is founded on trust and common knowledge...

The CCFRP utilizes a collaborative forum with professional facilitation to accomplish the goals that Bucklin highlights. The integrated ecosystem group includes both commercial and recreational fishermen, government fisheries scientists from the California Department of Fish and Game and the National Oceanic and Atmospheric Administration Fisheries, ecologists and fishery scientists from academic institutions, local government and port officials (e.g., harbor masters and harbor commissioners), and staff from environmental nongovernmental organizations.

The collaborators assembled in response to the establishment of MPAs in September 2007 by the California Fish and Game Commission. The main objective of the MPA monitoring activities of CCFRP was clearly defined at the outset: to bring fishermen into the monitoring process, which is currently dominated by government and academic scientists. The rationale was that the data sets collected for adaptive management of the MPAs (that inform future decisions about the effectiveness of the reserves) should incorporate recreational and commercial fishers' knowledge. We believe this promotes a shared understanding between all factions, ameliorating the contention generated by management decisions.

The CCFRP is also interested in developing research protocols that would begin to build the necessary long-term data sets that are so important for stock assessment models in federal and state fisheries management. The state of California relies heavily on the federal government to set catch levels in state waters (less than 4.83 km [3 mi] from shore). There are many species in California's Nearshore Fishery Management Plan (CDFG 2006) that are not assessed by federal scientists (Leet et al. 2001). This leaves a large gap in knowledge of nearshore species and creates an immense need to develop ways to increase our understanding of the status of many nearshore species. One purpose of the CCFRP is to engage both scientists and fishermen to help fill the information void. In doing so, we want to incorporate the knowledge of fishermen in designing new studies. We have had countless interactions with fishermen in which they express frustration that the study protocols developed by scientists are inadequate because "...scientists don't know how to fish. They don't know how to use fishing gear, they don't know where to go, and they don't know when to go." On the other hand, scientists suggest that simply chasing fish and always trying to maximize catch compromises appropriate sampling techniques. Fisheries biologists often state that "the behavior of fishermen when fishing is not what generates the most accurate picture of how many fish are in the water."

Through the CCFRP, we developed a survey with sampling protocols that incorporate fishermen knowledge and expertise within a scientifically sound sampling design. We accomplished this through a series of facilitated meetings that included representatives from all interested parties. This collaborative approach increases the chances that state and federal managers will utilize the data coming from our study to conduct stock assessments and to evaluate the effectiveness of MPAs. We describe below some specifics of our study design to illustrate how we combined the expertise and knowledge of scientists and fishermen into the study protocols.

The general protocol we developed for monitoring MPAs was based on a stratified random sampling design wherein we used fishers' knowledge to stratify the sampling areas (MPAs and corresponding reference sites) into good and poor habitat for nearshore rockfishes *Sebastes* spp., cabezon *Scorpaenichthys* *marmoratus*, and hexagrammids, which are the most abundant fished species in nearshore waters of central California (Starr et al. 2002; Stephens et al. 2006) and thus were the target groups for our study. During the workshops, fishers used maps of the MPAs and surrounding areas to delineate good and poor habitats. We used the information to place most of our sampling intensity in areas with good habitat. The areas identified on maps by fishermen were then divided into as many 0.5- × 0.5-km cells as possible; a subset of these cells was chosen at random for a given day of sampling.

Specific sampling protocols balanced the scientific need to standardize sampling methods, the collaborative need to incorporate fishers' expertise into the sampling design, and the desire to incorporate gear and techniques used by anglers along the breadth of central California. For our hook-and-line surveys, we used three types of tackle that were specified by the fishermen as being the best collectively at catching a broad array of species. Importantly, the final gear selected was representative of tackle used in a variety of ports along the central California coast. Each type of fishing gear was fished with equal effort, and the time each angler fished was measured to obtain an accurate estimate of catch rate.

For trap surveys, fishermen developed the size of the trap; the funnel and mesh sizes; and the type, placement, and size of the bait container. Scientists developed protocols that met the need for standardization and repeatability. For example, when fishing with traps, fishermen often re-use bait during multiple deployments of a trap. Scientists emphasized the critical need for standardization of bait attractiveness, and thus the protocol specified the replacement of bait for each set. The final sampling design also reflected the need for standardization of fishing time and for following consistent sampling protocols.

Fishers were also involved in the execution of the study. Recreational or commercial fishermen were responsible for all of the fishing, and captains assisted us in choosing optimal fishing locations within the designated survey area. For example, on a given sampling day the skippers were provided the coordinates of four randomly selected grid cells. Once in a cell, the skippers and fishermen utilized their expertise to maximize catch by using standardized sampling methods within the randomly selected cell. We have found that this approach is well received by fishermen because they feel "like they have the opportunity to show that there are still a lot of fish in the ocean." This approach prevents concerns from the fishing community that scientists don't know how to catch fish and thus cannot provide reliable data. Similarly, scientists know that the catch data are reliable because they have been collected in a consistent, standardized, scientific manner.

Part of our collaborative fisheries management process involves bringing the data back to our program participants for review and discussion. We do this through publication of information on websites (www.slosea.org/collaborative or seagrant.mlml.calstate.edu/research/ccfrp/; Moss Landing Marine Labs 2009; SLOSEA 2009) and also through facilitated workshops conducted at the end of the sampling season with fishermen, managers, and scientists. At these workshops, we seek interpretation of data and feedback from program participants to help explain observed patterns in the data and also to improve sampling protocols.

The CCFRP has completed 2 years of sampling. We have worked with both the recreational fishing community and the nearshore commercial trap fishing community. To date, we have captured and tagged more than 20,000 fish representing 38 different species in California waters from Point Buchon (south of Morro Bay) to Año Nuevo (south of Half Moon Bay). During the 2 years, we have worked with six commercial trap fishermen and their crews, 10 different skippers and crews on commercial passenger fishing vessels (also known as "party boats") from four different ports, and more than 350 different volunteer recreational fishermen for a combined fishing time of more than 814 volunteer angler-days.

The information produced by the program is beginning to provide a baseline data set that can be utilized by the state of California for the evaluation of MPAs and by the federal government in future stock assessments of the nearshore species. Although the focus of this article is not to review the data collected from our program, we would like to briefly highlight some of our findings to demonstrate that the collaborative sampling protocol we developed is producing valuable, robust data that can be used by managers. In particular, we will discuss some of our data collected through the commercial passenger fishing vessel collaboration.

Comparisons between the Old and New Portions of the Point Lobos State Marine Reserve

The Point Lobos Ecological Reserve, near Carmel, California (located at approximately 36°31.70′N, 121°55.55′W), was designated in 1973, and since that time fishing inside the reserve has not been permitted (McArdle 1997). In September 2007, the reserve area grew by a factor of 4.75 when the California Fish and Game Commission expanded its borders to create the Point Lobos State Marine Reserve (SMR; Figure 1).

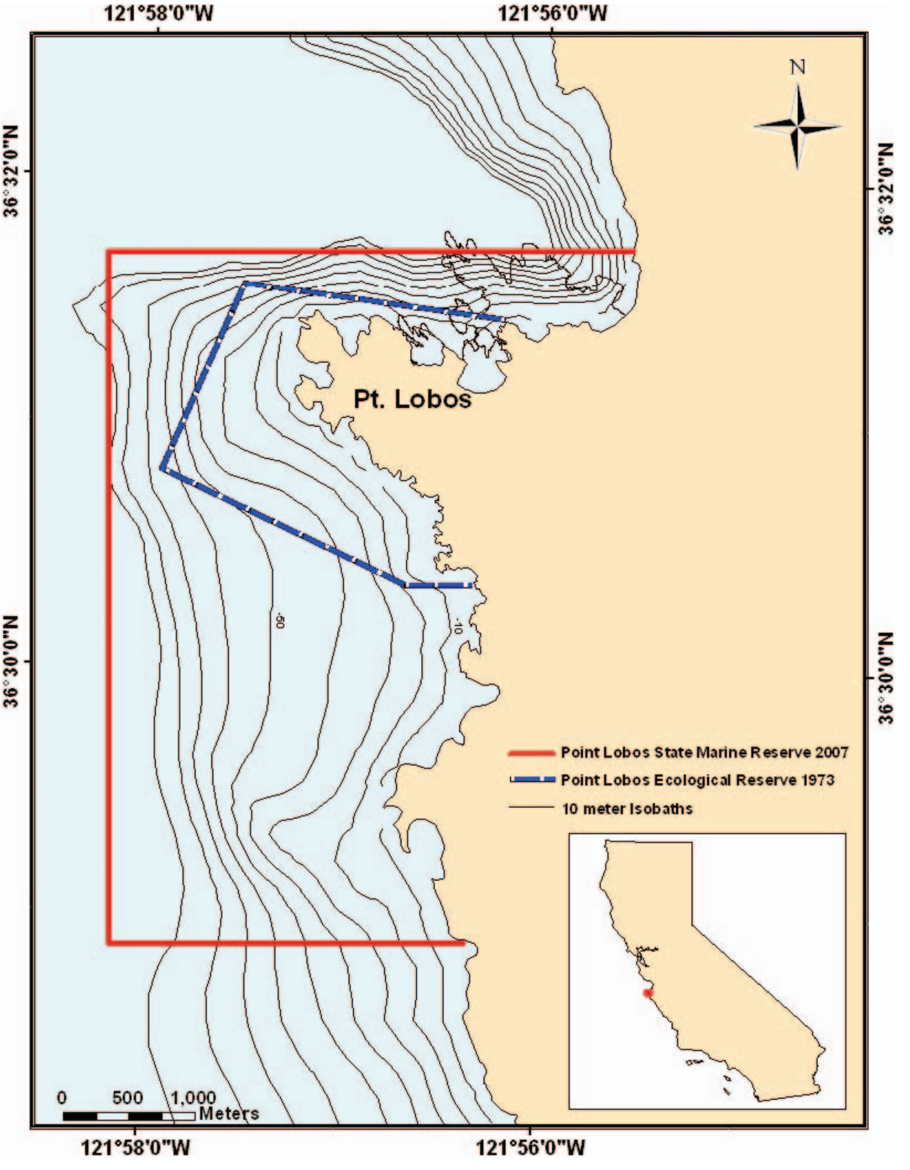

FIGURE 1.—Boundaries of the Point Lobos Ecological Reserve, California, established in 1973 and the Point Lobos State Marine Reserve designated in 2007.

Given that fishing has been allowed in the recently closed area since 1973 and that the "new" portion of the MPA has similar habitat, we predicted that this new section of the Point Lobos SMR would serve as a good reference for change in the "old" section of the reserve, which has been closed for over three decades. We predicted that the old section would yield higher density, biomass, average length, and diversity of species based on a summary of reserve effects from existing MPAs in other parts of the world (Halpern and Warner 2002). Data from our study indicate that the characteristics of the fishes in the old portion of the reserve are significantly different from those in the new section of the reserve. Overall catch rates in the old section were substantially higher than those in the new section, and catch rates of 5 of the 10 most frequently caught fishes were also significantly higher in the old section than in the new section (Figure 2). Additionally, average lengths of 3 of the 10 most frequently caught fishes were significantly larger in the old

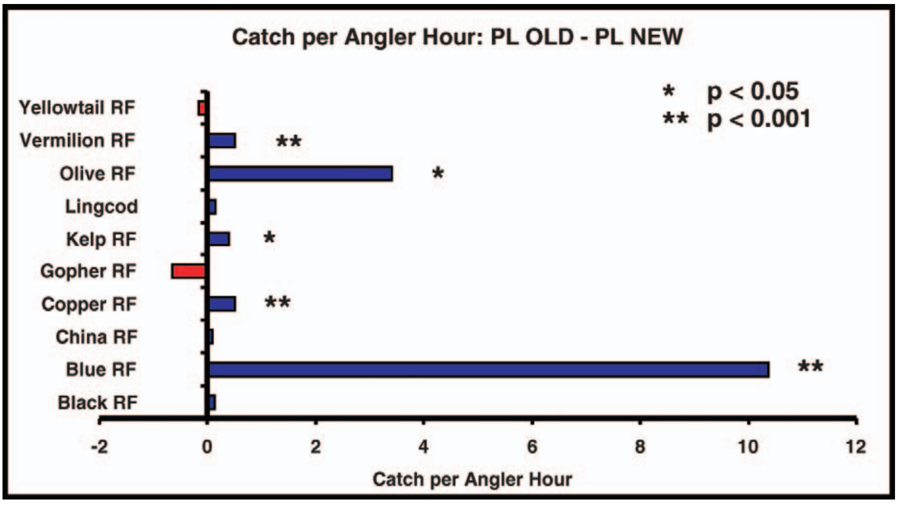

FIGURE 2.—Difference in the average fish catch per angler-hour between the old and new sections of the Point Lobos (PL) Marine Protected Area (old minus new), California, for the 10 most frequently caught species (yellowtail rockfish *Sebastes flavidus*, vermilion rockfish *S. miniatus*, olive rockfish *S. serranoides*, lingcod *Ophiodon elongatus*, kelp rockfish *S. atrovirens*, gopher rockfish *S. carnatus*, copper rockfish *S. caurinus*, China rockfish *S. nebulosus*, blue rockfish *S. mystinus*, and black rockfish *S. melanops*). The old section of the PL Marine Protected Area has been closed to fishing since 1973, and the new section was closed in September 2007. Significance (indicated with asterisks) is based on results from a two-sample *t*-test on $\log_e(x + 1)$-transformed data.

section than in the new section (Figure 3). The number of species (i.e., richness) found in the old section, however, was not significantly different from that in the new section or the reference sites. The results imply that the community composition has not changed but that the old portion of the Point Lobos SMR has promoted growth and/or longevity and abundance of the species present. However, given that there was no baseline survey of the old section of the reserve, we are inferring the benefits of the original reserve based on differences between fishes inside and outside the old section. Strictly speaking, the differences we observed could be simply the result of existing habitat differences and therefore not the result of the reserve designation made 35 years ago. This highlights the importance of having a thorough baseline survey when a reserve is established and the value of intermittently sampling populations and communities through time to identify their responses to reserve implementation. Indeed, the data are critical to adaptive management processes. The surveys that we are currently conducting will serve as a baseline to evaluate future changes.

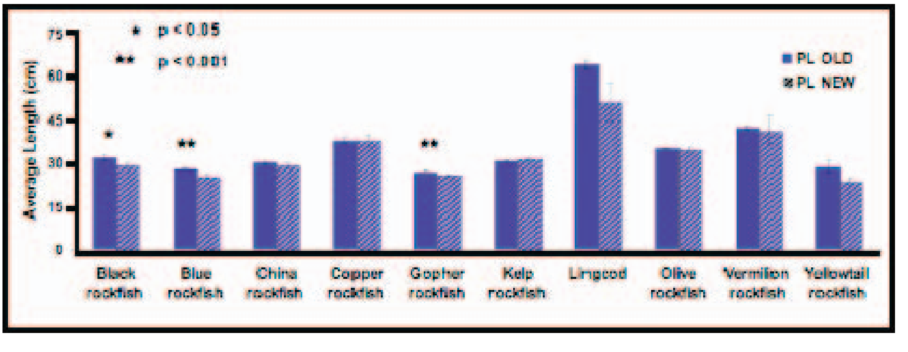

FIGURE 3.—Comparison of the average (±SE) total lengths (cm) for the 10 most frequently caught fish species in the old and new sections of the Point Lobos (PL) Marine Protected Area, California. The old section of the PL Marine Protected Area has been closed to fishing since 1973, and the new section was closed in September 2007. Significant differences (indicated with asterisks) were determined with a two-sample *t*-test.

Conclusions

Historically, scientists have worked cooperatively with fishermen in projects that have been designed by scientists and completed with help from a chartered fishing vessel. These types of projects have often involved a sampling plan designed by the scientist and carried out by the fisherman. Despite this cooperative research, tensions still exist between the fishing community and management agencies—in large part because of distrust among groups about the reliability of the data being used in the fishery management process. Some of this distrust is because of the disconnect between the coastwide scale of management and the fine scale of fishers' knowledge about fish distribution. Emerging resource management concepts, such as ecosystem-based fisheries management and dedicated access privileges, acknowledge the great spatial variation in the distribution and relative abundance of marine resources. If implemented, these new concepts will allow greater delineation and more efficient use of regional resources. Some of these new concepts require more localized information than is currently available, yet fishery management agencies are often unable to afford the costs of traditional stock assessments on even large sections of the coast. Because of this dilemma, there has been an increase in the interest of utilizing collaborative research projects to promote the collection of data needed to manage marine resources at finer scales. We have been conducting collaborative research projects for several years to develop trust among resource managers, scientists, and the fishing community and to provide information for the evaluation of new MPAs and for future use in stock assessments. Our work has shown that by bringing resource managers, scientists, and the fishing community together to develop true collaborative research projects, it is possible to design, evaluate, and implement statistically rigorous research projects. The data derived from our collaborative fishing projects are sufficiently robust to detect significant differences in fish abundance and sizes. In addition to the scientific credibility of the data, fishermen accept the value of the information because they or their peers were involved in collection of the data. We suggest that the CCFRP can serve as a model for other areas that are trying to implement collaborative research and that collaborative research can greatly contribute to the realization of community-based co-management of marine resources.

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