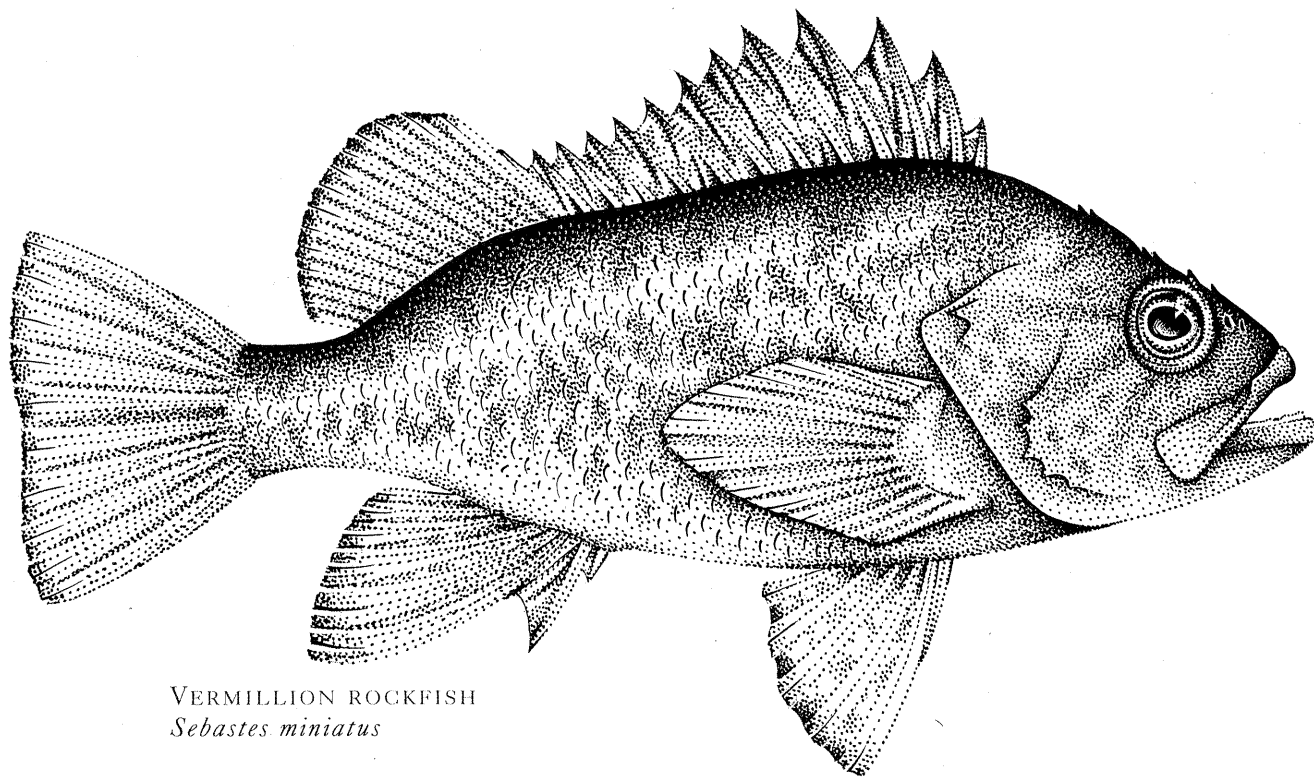


# ROCKFISH for the Future

A Solution Based, Multi-Disciplinary  
Workshop and Discussion



VERMILLION ROCKFISH  
*Sebastes miniatus*

Co-Hosted by the Monterey Bay Aquarium and the Pacific Marine Conservation Council  
Held March 26-28, 1999 at the Naval Postgraduate School, Monterey, California

# ROCKFISH FORUM FORMAL PROCEEDINGS

**Rockfish for the Future:  
A Solution-Based, Multidisciplinary Workshop and Discussion**

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# **ROCKFISH FORUM FORMAL PROCEEDINGS**

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## **INTRODUCTION TO THE FORUM**

The Rockfish Forum, a multidisciplinary workshop and discussion sponsored by the Monterey Bay Aquarium and the Pacific Marine Conservation Council (PMCC), was convened at the Naval Postgraduate School in Monterey, California on March 26-28 1999. The primary purpose of this Forum was to identify key conservation issues and solutions to problems associated with West Coast rockfish and their fisheries, and to share both the information and the process with the public. Our hope is that the report on rockfish produced by PMCC and the Forum will catalyze change in the management process, leading to better stewardship and the development of sustainable fisheries.

The Monterey Bay Aquarium is a private, non-profit public aquarium whose mission is to inspire conservation of the oceans. The aquarium pursues its mission through live exhibits, public education programs and conservation research initiatives. The aquarium is strongly committed to promoting marine conservation that is well grounded in the best available scientific information. The West Coast fishery is one of several coastal fisheries whose long-term sustainability depends on significantly improved and strengthened regulatory measures. The Rockfish Forum provided the perfect opportunity for scientists, fishermen, fisheries biologists and managers and conservation organizations to work together toward long-lasting solutions toward rockfish conservation. Since the meetings were open to the public the Rockfish Forum also provided the opportunity for the public to gain a greater understanding of the issues surrounding rockfish fishery conservation.

The Pacific Marine Conservation Council is a West Coast, non-profit organization, comprised of "Fishing communities and concerned citizens dedicated to the health and diversity of marine life and habitat." The current focus of the organization is the fishery for West Coast rockfishes. It was this focus, in combination with a concern for the declines identified in many rockfish populations, that led the organization to develop the report "Diminishing Returns: The Status of West Coast Rockfish," to describe the fishery for West Coast rockfishes and identify changes necessary in their management. The report was released in March of 1999 and presented to the Pacific Fishery Management Council as well as to other entities involved in the management of rockfish. The development and release of the report was a catalyst in the organization of the Rockfish Forum, and issues identified in the report became the focus of the eight panels convened during the Forum.

The Forum focused on eight issues: 1.) stock assessments for mixed-species rockfish assemblages, 2.) fishing gear impacts on habitat, 3.) assessments of essential fish habitat, 4.) the role of marine protected areas in management, 5.) social and economic aspects of rockfish fisheries, 6.) mechanisms to quantify and reduce bycatch, 7.) live fish fisheries, and 8.) public education. A panel comprised of a diverse group of individuals ranging from commercial and sport fishers, to scientists, economists, managers, conservationists, and educators was assigned to each issue. Their charge was to address their issues by recommending a solution statement and actions, organizations to take the lead, and an appropriate timeline.

The Forum began on Friday March 26<sup>th</sup>, with introductory remarks by the organizers, an overview of the regulatory framework for managing West Coast rockfishes, an update on the current status of the rockfish resource, overviews of each issue by the panel chairs, and an opportunity for public questions and comment. The panels met separately as breakout sessions all day Saturday. The Forum reconvened on Sunday morning for panel summary reports and closing remarks. Intended outcomes of the Rockfish Forum include the development of specific action plans and public education on issues prioritized by Forum participants as well as written proceedings from the meeting.

## **THREATS TO ROCKFISHES**

The rockfishes, of the genus *Sebastes*, are a remarkable group of animals characterized by primitive viviparity (giving birth to live young) and long lives. Roughey rockfish have been found to live at least 140 years. The genus is also quite diverse, with approximately 71 species living in the eastern Pacific from the Bering Sea to the Gulf of California. There is growing evidence of considerable declines in rockfish populations along much of the West Coast of North America, and it is likely that these declines, some of which are quite severe, are due to a combination of overfishing and adverse oceanographic conditions. These declines threaten the health of individual rockfish stocks, and continue to have an impact on the health of the marine ecosystem as a whole, commercial and sport fisheries, and the economies of coastal fishing communities. Currently four rockfish species, bocaccio, Pacific ocean perch, cowcod, and canary, are listed as overfished, with bocaccio rockfish biomass estimated at 2%-4% of historic biomass levels. The biomass status of the vast majority of rockfish species is currently listed as unknown.

Additionally, rockfishes exhibit several life history characteristics that predispose them to being vulnerable to overfishing. These include:

- Low adult mobility.
- Extreme longevity of some species (roughey rockfish have been aged to 147 years).
- Low natural mortality (M), generally less than 0.15.

- Aggregation in multi-species complexes. Rockfish tend to aggregate with other species which makes singling out a species for capture sometimes an impossible task. This especially becomes a problem when the species aggregating differ markedly in their life history traits such as maximum age and natural mortality rate.
- Fecundity increases with age. Not only do rockfish continue to reproduce as they age, evidence exists to show that older females can produce more young.
- Infrequent recruitment success.
- Low productivity and biomass compared to many other marine fish species throughout the world.
- Specific habitat requirements varying with age and species.

Background information on the state of the rockfish resource and management history was provided by the two introductory speakers Dr. Steve Ralston and Mr. Mark Saelens.

I. Steve Ralston, NMFS, Southwest Fisheries Science Center, Tiburon Laboratory, Tiburon, CA.

The following is a review of the general status of rockfish on the West Coast, discussion of the state of decline of rockfish populations, and possible reasons for that decline.

- The Pacific Fishery Management Council, which is responsible for managing the fishery resources off of the states of Washington, Oregon, and California within the Exclusive Economic Zone (extending from three to two hundred nautical miles from shore) has 52 species of rockfish in their groundfish fishery management plan.
- Many rockfish species have been heavily exploited through commercial and recreational fisheries. Over approximately the last twenty years the value of this resource has been roughly \$40 million dollars with an average of about 40,000 tons landed per year.
- Analysis of how the most commercially relevant species of rockfish are responding to exploitation is based on the results of stock assessments conducted for the Pacific Fishery Management Council (Council). Each of these assessments requires detailed information about commercial and recreational landings, as well as life history information such as growth and maturity schedules.
- The traditional fishing paradigm is that exploitable biomass is augmented by recruitment, as young fish reach an exploitable size they enter the fishery. As these fish grow overall biomass of the stock increases. Biomass is lost through natural mortality and fishing removals.

- Many rockfish stocks are not coming into equilibrium under exploitation and are in a state of decline. The Council considers a stock to be overfished when it has declined to less than 25% of its unfished level. Several species of rockfish including bocaccio, Pacific ocean perch, canary, and cowcod are now officially overfished and will require the implementation of rebuilding plans based on rebuilding requirements of the Sustainable fisheries act of 1998.
- Why are rockfish in a state of decline? What are the contributing factors? There have been no changes in growth over time for rockfish. Natural mortality is a factor that cannot be managed. The same is true of recruitment, but this is a key aspect of the biology of rockfish. The reproductive success of rockfish shows tremendous interannual variability, with potentially a twenty-fold difference in the survival of the young from year to year. The final factor is fishing removals, which is controlled by the Pacific Fishery Management Council. The Council also makes decisions about socioeconomic and allocation issues.
- To generate harvest levels the harvest policy currently in place for rockfish is applied to the exploitable biomass and results in the calculation of an Allowable Biological Catch (ABC). The ABC is designed to be a level of catch that can be biologically sustained by the stock and is transformed into an Optimum Yield (OY), or harvest guideline, by factoring in socioeconomic and allocation issues. Generally the landings in the fisheries have pretty closely followed the harvest guidelines.
- The passage of the Sustainable Fisheries Act required that the status of fisheries stocks and biomass levels be tracked. The Council is charged with maintaining stock biomass above an “overfished” level and as a result implemented the 40-10 strategy for managing West Coast rockfish. Based on this strategy, if the stock is at or above 40% of the virgin level biomass, the ABC can be harvested through use of the designated  $F_{MSY}$  proxy. Once the stock reaches 40% of virgin biomass the harvest rate is reduced and should be zero when the stock reaches 10% of virgin biomass.
- How is has the harvest policy been set for rockfish? It has been based on a theoretical proxy for the fishing rate resulting in maximum sustainable yield ( $F_{MSY}$ ). Until recently  $F_{MSY}$  has been derived assuming a range of conditions inappropriate for rockfish and has been in the  $F_{35\%}$ - $F_{40\%}$  range. The  $F_{40\%}$  value is the fishing mortality rate that reduces the spawning potential per recruit to 40% of the unfished condition.  $F_{35\%}$ - $F_{40\%}$  rates have been deemed excessive for rockfish because they were based on calculations derived from species more productive than rockfish. In 2000 the Council changed the default exploitation rate for rockfish to  $F_{50\%}$ .
- What about the environment? In the El Nino years, rockfish recruitment and reproductive success is very low, illustrating that the environment has a very dramatic effect on the survival of young of the year rockfish. In 1977 the ocean shifted to a less productive regime exhibiting generally warmer sea-surface temperatures than prior to that time. What does this mean for rockfish? Recruitments were much lower during the warm phase than during the cold phase.

- What is the bottom line for rockfish declines? Exploitation and removal of groundfish occurred very heavily in the early part of the 1980s and is when stock sizes decreased dramatically. Because of the concurrent changes in oceanic conditions it becomes very difficult to attribute declines in recruitment to either exploitation, or to the environment. It is probably a combination of the two.

II. Mark Saelens, Oregon Department of Fish and Wildlife, Newport, OR.

The following comments cover the basic regulatory framework used to manage groundfish stocks off the coast of Washington, Oregon and California.

- For over eighty years, domestic groundfish management was under the jurisdiction of the states of Washington, Oregon and California. Starting in the 1960s, and into the 1970s, the rockfish fishery began building up dramatically, resulting in a large increase in rockfish landings in the 1980s. This initial individual management by the states led to a lack of uniformity in management goals, differences in enforcement and a variety of other problems. It became obvious that there was a need for a coordinated agency, therefore in 1947 the Pacific States Marine Fisheries Commission was established to try to coordinate and represent the fisheries interests of the three states. The states also have legislative power through their respective fish and wildlife or fish and game commissions, and have the ability within their agencies to take emergency actions. Normally those are limited in scope and must be followed up by a more permanent action at a later time.
- In 1976 the Magnuson-Stevens Fishery Conservation and Management Act (Act) was established and remains as the cornerstone piece of federal fisheries legislation. The Act created eight regional councils to manage federal fisheries. This resulted in a single regulatory body on the West Coast, the Pacific Fishery Management Council, responsible for, among other things, the development of the fisheries fishery management plan (FMP) for groundfish.
- This Act also created the National Standards for Fishery Conservation and Management. The Standards state the minimum federal requirements for how a fishery should be managed.

National Standards for Fishery Conservation and Management (Magnuson-Stevens Fishery Conservation and Management Act, Section 301):

1. Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
2. Conservation and management measures shall be based upon the best scientific information available.

3. To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.
4. Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.
5. Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resource; except that no such measure shall have economic allocation as its sole purpose.
6. Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
7. Conservation and management measures shall, when practicable, minimize costs and avoid necessary duplication.
8. Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.
9. Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.
10. Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.
  - At the same time the Act was created the groundfish fishery was going through a rapid change in terms of maturation of the fishery and expansion and growth of landings. Rockfish species along the West Coast basically reached a peak in terms of total catch in 1982, and then, through the fishing down process and other factors, have been in decline ever since.
  - Both the Act and the groundfish fishery management plan have been amended several times. Currently, the fishery is managed through trip limits, with in-season adjustments up or down depending on how fast or slow the fishery is proceeding. These adjustments are made for the purpose of following the goal in the FMP of



having a year-round fishery. In doing all of this the Council must take into consideration such factors as the social and economic impact on communities.

- At this point in time groundfish stocks have been actively managed for over twenty years and many feel that there has been a failure to provide adequate protection for stocks as well as the economic situation of the industry. In some cases rockfish stocks have been permitted to be fished below the level originally anticipated as the equilibrium level.
- What does all this mean? Regardless of what efforts are made, it is becoming abundantly clear that the fishing effort must be reduced. Every effort must be made to reduce bycatch and prevent overfishing. The economic and social impact for fishers and the local community must be considered carefully while achieving the above factors, and cooperative action must be taken to solve the problems facing the groundfish fishery today.

## **I. Panel on Stock Assessment in Mixed Species Rockfish Fisheries**

### Panelists:

Don Gunderson, Chair, University of Washington, Seattle, WA

Richard Methot, NOAA NMFS, Seattle, WA

Marty Gingras, California Department of Fish and Game, Monterey, CA

Rick Stanley, DFO Pacific Biological Station, Nanaimo, B.C.

Jack Tagart, Washington Department of Fish and Wildlife, Olympia, WA

### **Summary statement:**

Early fisheries for rockfish focused on just a few species. In the mid-1960's Pacific ocean perch were plentiful off Washington and Oregon, and were the target of intense harvests by fleets from Japan and the Soviet Union. These stocks were depleted by 1969 and fisheries were developed for other species. In the early 1970's, "red rockfish" such as Pacific ocean perch, canary rockfish, chilipepper and bocaccio were in demand, but markets for "dark rockfish" such as yellowtail were greatly restricted. Washington fishermen were on strict "market limits" for the amount of yellowtail rockfish they could bring in, and widow rockfish were not saleable. Market acceptance for yellowtail rockfish increased in the mid-1970's, and new markets were developed for widow rockfish in 1979.

Stocks of canary rockfish, bocaccio, widow rockfish, and yellowtail rockfish declined sharply in the 1980's. Small-bodied species such as green-stripe, red-stripe, sharpchin and rosethorn rockfish became acceptable in commercial markets in the early 1980's, and their landings grew substantially. In essence, the history of the West Coast rockfish fishery is one of sequential "fishing down" of those stocks which are most abundant and fetch the highest price per pound. The existing rockfish biomass on the west coast is no longer dominated by a few species, and the rockfish fishery has become a truly multispecies fishery. The allowable biological catch for the "Sebastes complex", a category encompassing some 10 or so species with significant landings, exceeds that of any single species other than shortbelly rockfish (which are still basically unmarketable). However, landings only tell part of the story, since the expansion of the fishery into virtually all parts of the ecosystem, and the inability to target on large, single-species aggregations has resulted in increased discards of many species at sea.

The multispecies nature of the rockfish fishery presents managers with significant problems, particularly in light of the fact that detailed stock assessments have been carried out for only 9 of the 52 rockfish species covered in the groundfish Fishery Management Plan. The Stock Assessment Panel identified three primary issues.

### **Issue 1. Multispecies Management**

**Problem statement:** A cowcod cannot give birth to a widow rockfish. Individual species and stocks are not interchangeable units. Single-stock assessments are required to monitor and manage individual stocks, even when multispecies quotas are employed.

**Solution statement:** We need to make our best estimates of sustainable yield for each stock and species. Since it is unlikely that we will ever be able to obtain high quality assessments for all 52 species of rockfish, particular emphasis needs to be placed on potentially "weak stocks" (those vulnerable to overfishing in a multispecies fishery) even though total landings from such stocks are low.

**Organizations to take the lead:** NMFS, state agencies, industry.

**Recommended actions:**

- 1) Institute a coordinated program of fishery independent surveys in order to develop credible relative and (if feasible) absolute estimates of abundance. Expand current trawl and scuba surveys to cover the entire distribution of rockfish, and use alternative or new technology and approaches in untrawlable and undiveable areas. Enhance the ability of industry to provide funds for surveys and participate in them, perhaps through a non-profit agency.
- 2) Increase research on the identification and geographic delineation of rockfish stocks, and the inter-relationships between them.
- 3) Develop a "screening" process for identifying "weak stocks" on the basis of spatial distribution, abundance, value (price/lb.), and productivity parameters (maximum age, gonadosomatic index, natural mortality, age at maturity).
- 4) Develop an observer program to monitor bycatch.

**Timeline for action:** Could be initiated in 1-2 years.

**Issue 2. Uncertainty in Stock Assessments**

**Problem statement:** Since roughly 50 species need to be assessed, and resources to do this are limited, the assessments will be very uneven in quality. For some stocks, estimates of sustainable yield will be based on little more than rough estimates of exploitable biomass, and sustainable exploitation rate.

**Solution statement:** Managers need to set optimum yield safely below estimates of sustainable biological catch. The margin of safety needs to be proportional to uncertainty in data and parameter estimates. This is one approach to implementing precautionary management and will provide incentives for improvements in the quality of stock assessments.

**Organization to take the lead:** Management agencies (NMFS, PFMC, state agencies).

**Recommended actions:**

- 1) Assessment scientists should accompany their analyses with an explicit statement of the level of uncertainty associated with their estimates of sustainable yield.
- 2) Management agencies should define explicit protocols for reducing estimates of optimum yield in proportion to uncertainty when developing harvest guidelines.

**Timeline for action:** Could begin immediately.

**Issue 3. Ecosystem Influences on Assessments**

**Problem statement:** Climate change (El Nino events, interdecadal regime shifts) and ecosystem interactions (e.g. marine mammal predation, bocaccio predation on juvenile rockfish ) affect estimates of unexploited biomass and projected recruitment.

**Solution statement:** We need to improve our understanding of the relationships between climate change, species interactions and rockfish productivity.

**Organization to take the lead:** NMFS, state agencies, universities.

**Recommended actions:**

- 1) Undertake enhanced data collection on food habits and modeling of trophic interactions.
- 2) Initiate a comprehensive research program on the relation between climate change, recruitment, and changes in "unexploited biomass".
- 3) Expand existing pre-recruit surveys geographically and develop new surveys that will provide estimates of recruitment strength that are independent of stock assessment models.
- 4) Institute a network of marine protected areas to serve as controls in disentangling the effects of climate and fishing on recruitment processes.

**Timeline for action:** Long-term.

## II. Panel on Fishing Gear Impacts with a Focus on Habitat Impacts

### Panelists:

W. Waldo Wakefield, Chair, NOAA, NMFS, Northwest Fisheries Science Center, Newport, OR

Frank Donahue, Pacific Marine Conservation Council board member and fisherman, Santa Barbara, CA

Karen Garrison, Natural Resources Defense Council, San Francisco, CA

Skip McMaster, Fisherman, McKinleyville, CA

Michele Robinson, Washington Department of Fish and Wildlife, Olympia, WA

### Summary statement:

Over the past three decades there has been increasing concern over the effects of fishing gear on marine benthic habitats. The increasing level of interest in this potential problem is illustrated by the recent burst of publications on the topic of the effects of mobile fishing gear (trawls and dredges) on marine ecosystems. A recent issue of the journal "Conservation Biology" (December 1998) devoted a special section to the topic of the "effects of mobile fishing gear on marine benthos." While disturbance of the seabed by mobile fishing gear, such as bottom trawls and dredges, has received the greatest attention in recent years, one must use caution and give equal consideration to the potential impacts of static gear such as gillnets, traps, pots, and longlines. A review of the published literature on the effects of fishing gear on marine habitats reveals that the majority of the literature on this topic has resulted from studies in the North Sea and European coastline, the Atlantic Coasts of Canada and the U.S., and sites in New Zealand and Australia. Published studies along the West Coast of North America are scant, although there is one published study from the central coast of California, and there are currently a number of projects in progress, primarily in the Gulf of Alaska and Bering Sea.

A number of generalizations about the impacts of mobile fishing gear can be drawn from a reading of the five recent papers in Conservation Biology. Mobile fishing gear:

- Reduces structural diversity of the seafloor by reducing biogenic sedimentary structures, and removing biogenic structures from hard substrates (e.g. sponges, bryozoans, hydrozoans, corals);
- Resuspends sediments, and alters seafloor sedimentary environments potentially altering biogeochemical cycles which has implications for nutrient budgets;
- Reduces biodiversity while enhancing abundance of opportunistic species.
- Also, considering that marine habitats are subjected to varying levels of natural disturbance, the relative contribution of disturbance by fishing gear will be greater in areas with lower levels of natural disturbance (e.g. outer continental shelf and upper slope).

The discussion within the panel on fishing gear impacts on marine benthic habitats clearly illustrated many of the difficulties surrounding this issue. The panel was comprised of representatives from state and federal fisheries agencies, from conservation organizations, and from the community of west coast commercial fisheries, representing a cross section of gear types (note: representatives for all gear types were not in attendance). A great deal of this panel's time was devoted to a venting of frustration, concerns, and fears over the issue of fishing gear impacts. The discussion ranged from an across the board concern for the status of groundfish resources along the West Coast to specific, and at times contradictory details brought forth by individuals representing each constituency. One of the more fruitful discussions was a detailed examination of the potential impacts of a broad range of mobile, static, and recreational fishing gear. The combined knowledge of the fishers present in the panel made this discussion especially enlightening. The panel was able to reach a clear consensus on one point: fishing gear impacts in "high relief" rocky areas are of greatest concern. Trawling occurs in these areas, potentially reducing habitat complexity. Further, the use of other gear types, including longlines, shrimp pots and gill nets may have similar adverse effects.

**Problem statements:**

- 1) Both the ecosystems and the commercial and recreational fisheries of the continental margin of the west coast of North America share some similarities with the east coast of North America and other coastal areas, but given some of the major differences in the geology (e.g. passive vs. active margin), hydrology and shelf processes, and fisheries, caution should be used in applying generalizations about gear impacts gleaned from distant studies.
- 2) In addition to fishing gear, there are many factors which may have a direct impact on marine fish habitat, including loss of nearshore and estuarine habitat as a result of development, water pollution from runoff, and oil exploration (e.g., seismic studies).
- 3) There is clearly an immediate need for research on the effects of an array of both static and mobile gear types on a variety of benthic habitats.
- 4) There is a lack of non-impacted reference sites.
- 5) Stakeholders need to be involved in the decision making process.

**Solution statements and recommended actions:**

- 1) The Pacific Fishery Management Council should give top priority to reducing habitat impacts from gear in high relief areas.
- 2) In states that now lack size regulations for trawl roller-gear in the spot prawn trawl fishery, state entities should adopt regulations for that fishery that allow roller-gear no larger than nine inches in diameter.

- 3) We should enhance opportunities for training and sharing fishers' and gear manufacturers' knowledge about gear modifications, and practices that reduce habitat impacts.
- 4) As observer programs are initiated, protocols should be established to make sure that invertebrates, and all the physical and biological components of the catch are monitored (via documentary photographs if not precise counts).
- 5) As funding becomes available, initiate research on the impacts of other gear types in high relief areas.

**Organizations to take the lead:** The Pacific Fishery Management Council for groundfish trawls and longlines in the EEZ; state fish and game commissions or legislatures for fisheries within state waters (e.g, spot prawn trawl fishery and longline).

**Timeline for action:** Not identified.

### III. Panel on Essential Fish Habitat

#### Panelists:

Rod Fujita, Chair, Environmental Defense Fund, San Francisco, CA.

Milton Love, Marine Science Institute, University of California, Santa Barbara, CA.

Ed Backus, Ecotrust, Portland, OR.

Robert Lea, California Department of Fish and Game, Monterey, CA.

Tory O'Connell, Alaska Department of Fish and Game, Sitka, AK.

Rikk Kvitek, Earth Systems, Science and Policy Department, University of California, Seaside, CA.

Phil Kline, American Oceans Campaign, Washington, D.C.

#### Summary Statement:

The EFH panel started with a general description of the goals of the panel by the chair. The panel was then charged with developing recommendations for improving the description of EFH, and for defining Habitat Areas of Particular Concern (HAPCs) which could serve as points of focus for action or consultation with other agencies. The panel's discussions can be placed into three issues: describing EFH, minimizing the adverse impacts of fishing on EFH, and defining Habitat Areas of Particular Concern (HAPCs). The EFH panel identified three primary issues.

#### Issue 1. Describing EFH

**Solution statement:** The panel and audience heard a presentation by Rikk Kvitek of California State University at Monterey. Rikk showed how data at various spatial scales can be integrated and presented in a compelling and useful way. He also emphasized that very detailed habitat mapping is only possible at a relatively small spatial scale, and that methods to calibrate coarser-scale tools such as LIDAR mapping with fine-scale habitat characteristics and biological associations are needed to make possible broader geographical coverage. The ensuing discussion focused on various ways to collect habitat information, and how to coordinate ongoing and future efforts.

#### Recommended actions:

- 1) Regional Workshop. A regional workshop to synthesize habitat data and coordinate efforts was proposed, perhaps building on current plans by the California Department of Fish and Game to hold a similar workshop in California. The goals would be to adopt a uniform habitat classification scheme that could be applied regionally; to coordinate ongoing mapping efforts; to share data; and perhaps to create a strategic plan for research that would be useful for fundraising purposes. It was thought that the Pacific States Marine Fish Commission might be the appropriate convener and organizer of this workshop.
- 2) Anecdotal Information. The panel recognized the important store of knowledge that fishermen and other people who work on the water represent. The panel recommends that a process for collecting anecdotal information on habitat and biological



associations, both current and historic, be designed in collaboration with NMFS, which is initiating a Port Interview Project.

- 3) Mining Archival Data. The panel thought that much could be gained by reviewing existing data collected by state fish and game agencies.
- 4) Aggregating Physical Data with Biological Data. The panel recommends that existing video footage and other data could be analyzed to establish biological associations with physical habitat types, but warned that this process could be extremely time- and labor-intensive. Graduate students could be employed to conduct these analyses, but funding would need to be secured.
- 5) Swords into Ploughshares. The panel recommends asking Vice President Gore to direct the Navy to release underwater habitat data and to deploy existing technology to facilitate research.

## **Issue 2. Minimizing Adverse Impacts of Fishing**

**Solution statement:** The panel discussed the need for both proactive protection of EFH from the putative impacts of fishing, and for more research that is specific to west coast habitats.

### **Recommended actions:**

- 1) Establishment of EFH study zones, ranging from shore to 40 miles offshore, 3 miles wide, with passage areas to facilitate ship traffic. These zones would be enforced with vessel monitoring systems, as well as air and water surveillance.
- 2) Establishment of gear exclusion areas, covering a diversity of habitat types.

## **Issue 3. Habitat Areas of Particular Concern (HAPCs)**

**Problem statement:** The need to develop HAPCs as a way to focus efforts to protect EFH, which is now very broadly defined for groundfish as the entire west coast EEZ.

### **Solution statement:**

The panel suggests the following criteria for defining HAPCs:

- high relief hardbottom
- kelp beds
- historic productivity
- high physical and biological complexity

### **Recommended actions:**

Restrict gear that alters complexity or physical nature of habitat in HAPCs, including biogenic (biological) habitat (e.g., sponges, tunicates, corals).

The panel was asked to recommend potential sites for HAPCs based on these criteria and their professional judgment. The panel emphasized their limited expertise (particularly the lack of experts from Washington), and the fact that the following list is not intended to be exhaustive, but rather of examples.

Gorda Ridge  
Redding Rock  
Rogue River Reef  
Stonewall Bank  
Canyon edges

Cordell Bank  
Heceta Bank  
Tol Bank  
Lausuen (14 mile) Bank  
Kelp beds

## **IV. Panel on Marine Protected Areas**

### **Panelists:**

Mark Carr, Chair, University of California, Santa Cruz, CA.

Pauk Reilly, California Department of Fish and Game, Monterey, CA.

Josh Sladek Nowlis, Center for Marine Conservation, San Francisco, CA.

Rick Starr, UC Sea Grant Marine Extension Program, Moss Landing, CA.

Craig Barbre, Commercial Fisherman, Los Osos, CA.

Fred Benko, Charter Boat Captain, Santa Barbara, CA.

Mark Hixon, Oregon State University, Corvallis, OR.

### **Summary Statement:**

The panel was charged with identifying Marine Protected Area (MPA) goals that contribute to sustainable fisheries, and provide advice on design and implementation of MPA's that address each goal from an ecosystem perspective. The panel came up with 7 broad goals in that context. There are some general considerations that are applicable to all marine protected areas and to the goals identified by this panel. There was also discussion about the growing evidence from many case histories that within a marine reserve fish numbers increase, the average size of fish increases, consequently their reproductive capacity increases, potentially supporting non-protected populations. Given this information, as well as evidence of increases in habitat quality within some reserves, there is enough information to suggest that we explore this strategy as soon as we can. What follows are the seven major goals the panel identified, keeping in mind the similarities and differences in the design criteria.

### **Problem statements:**

1. Manage adaptively, both new and existing reserves: implement pilot MPA network; evaluate and adjust (results-based feed-back).
2. Recognize the importance of, and incorporate, the ecosystem perspective of reserves.
3. Involve stakeholders in the decision process.
4. Nest and integrate existing management.
5. Include public evaluation on MPAs.
6. Establish baseline information, monitor and evaluate reserves.
7. Emphasize and evaluate approaches to enforcement.
8. Refer to existing literature (theory and empirical).
9. Recognize the ample evidence that inside reserves fish increase in numbers, size, reproductive output and diversity, and habitat quality improves.

10. Recognize the potentially long time lags (10-20 years) required for some populations (especially long-lived species) to show responses to establishment of reserves.

**Solution statements in the form of goals for MPAs:**

1. Rebuild over-fished (depressed) stocks.
2. Enhance productivity (yield, economic return, & biological productivity).
3. Precaution for unforeseen events (human & non-human) and lack of understanding.
4. Habitat restoration and protection.
5. Research tool.
6. Bycatch reduction tool.
7. Tool for allocation for non-consumptive users.

**GOAL 1: Rebuild Over-fished Stocks**

The first goal involves rebuilding depleted stocks. The PFM first needs to determine the applicability of reserves for any particular species of concern. This will be based on several life history features, such as adult movement, whether fish will remain within a reserve or migrate in and out, as well as larval dispersal and reproductive output of the species. These reserves should be cited both in existing productive areas as well as areas that are now depleted but have high quality habitat to allow development of protected populations. Existing productive populations are protected concurrently so that they export young to enhance the rebuilding of depleted stocks. The use of reserves for rebuilding requires the use of fishing industry knowledge of the patterns of species abundance and diversity. It will also require the utilization of this knowledge and fishery records, as well as existing research data, to define sites that require rebuilding or that could be particularly productive. The last item of the goal for rebuilding depressed populations involves a combination of both permanent and temporary reserves, if the intent of the reserve system is to rebuild some populations in order to reestablish fisheries at those sites.

**Recommended actions:**

- Base utilization of MPAs on adult movement, larval dispersal, reproductive output.
- Site in existing productive areas and now depleted areas with high habitat quality.
- Use existing fishery records and research data to define these sites.
- Consider a combination of permanent and temporary reserves.

## **GOAL 2: Enhance Stock/Population Productivity**

The second goal involves the idea of enhancing productivity of a stock or population, with one focus being to protect important spawning populations and high quality nursery areas. By protecting areas with high reproductive output we are protecting those areas that may be useful or important sources for replenishment outside the reserve to the populations being fished. Another focus of this goal is to protect a high diversity of habitat and to encompass as many species as possible, with the understanding that greater habitat diversity encompasses, and protects, the breadth of resources required over the lifetime of an individual. This could be done by placing a reserve network within large-scale oceanographic regimes along the entire West Coast, for the purpose of reserves contributing to the replenishment of those major oceanographic regimes. The goal is to maximize the long-term social and economic benefits by enhancing productivity through the production of larvae inside the reserve and their contribution to the replenishment of populations outside the reserve.

### **Recommended actions:**

- Protect important spawning populations and high quality nursery areas.
- Establish reserves of sufficient size to protect a high diversity of habitat & species.
- Place the refugia network within and among diverse oceanographic conditions.
- Maximize long-term social/economic benefits.
- Emphasize larval replenishment and spillover into fished areas.

## **GOAL 3: Precaution for Unforeseen Consequences of Long-term Human & Non-human Perturbations and our Lack of Ecological Understanding of Ecosystems & Species**

This third goal involves the precautionary principal, applied to mitigate for the unpredicted consequences of long-term human and non-human impacts, and for our lack of understanding of the ecology of species within coastal ecosystems. This goal, in contrast to some of the previous reserve objectives, would probably require fixed, permanent, no take reserves to protect those sites in perpetuity. Again, these reserves should be representative among the different oceanographic regimes and ecosystems and habitat types to protect the broad diversity of ecosystems along the West Coast. It would also be important to cite these reserves where they are least likely to be affected by any human activities, to reduce not just fishing impacts, but other human impacts (e.g., pollution) as well. Finally, the panel recommends that special consideration be afforded to unique habitats, and citing within the reserves that would afford the greatest protection.

**Recommended actions:**

- Large, fixed permanent no-take reserves
- Representative oceanographic regions, ecosystems and habitat types.
- Site the reserves where they are least likely to be affected by humans.
- Unique habitats should be afforded special consideration.

**GOAL 4: Habitat Restoration & Protection**

The fourth goal deals with habitat restoration and protection within reserves in the context of essential fish habitat, fishing and non-fishing impacts, and non-native species. The PFMC, because of limited jurisdiction, should advise other agencies to help reduce non-fishing impacts on reserves, this panel suggests that the PFMC identify and promote partnerships among appropriate agencies to accomplish this. Included in this goal is the idea of protecting representative habitats to ensure the diversity of habitats along the coast is maintained, and to identify and protect nursery habitats and other habitat areas of particular concern. Because habitat areas of particular concern are not synonymous with closed areas it is important to match activity descriptions to the sensitivity of the habitat potentially impacted by those particular activities.

**Recommended actions:**

- For non-fishing impacts and non-managed species, PFMC should advise other agencies to help reduce human impacts in reserves.
- The PFMC should identify and promote partnerships among appropriate agencies.
- The reserves should be sited to protect representative habitat types.
- Identify and protect nursery habitats and other habitat areas of particular concern.
- Match activity restrictions to the sensitivity of habitat.

**GOAL 5: Research Tools (distinguishing between non-human vs human effects)**

This goal addresses the use of marine reserves as research tools providing insight into the ability to distinguish between non-human and human impacts. These areas will give a base line to assess the natural dynamics of the systems. Additionally, allowing certain activities within specific reserves supports the examination of the effects of those specific uses rather than fishing or human effects in general. This type of reserve system could be utilized to evaluate fishing gear effects, provide a tool for understanding ecology and life history for exploited and non-exploited species, and should incorporate long-term monitoring projects. This tool would allow for a more accurate measure of natural mortality rates, and estimation of population sizes as well as movement of adults. Estimation and correlation of community-wide effects of removing selected species,

especially target species could also be analyzed. The PFMC should begin a process to identify research costs and funding sources. It is important to not establish the reserves without a clear financial and personnel base to evaluate the impacts.

**Recommended actions:**

- Incorporate no-take precautionary reserves.
- Consider use-specific reserves.
- Study gear and other human impacts.
- Incorporate long-term monitoring.
- Understand the ecology and life history of animals and address applied problems.
- Estimate parameters for stock assessments.
- Estimate repopulation rates and movement of adults.
- Estimate community effects of removing selected species.
- Identify both research costs and funding sources.
- Make baseline surveys a priority in and adjacent to reserves.
- Include socio/economic research.

**GOAL 6: Bycatch Reduction**

The sixth goal the panel identified involves the utilization of reserves as tools to reduce bycatch, specifically through reduction of the catch of non-target species, especially non-fisheries species within the reserves, and protection of nursery grounds to allow young fish to eventually enter the fishery. Targeting areas of high bycatch for the citing of reserves would make the use of reserves as a tool for bycatch reduction that much more effective.

**Recommended actions:**

- Reduce the take of non-targeted species (especially non-fishery spp.).
- Protect nursery grounds.
- Target areas of high bycatch for siting reserves.

## **GOAL 7: Tool for Resource Allocation for Various Users**

This final goal involves the idea of utilizing reserves as tools for resource allocation among the various users, emphasizing that no-take reserves allocate resources, particularly rockfish resources, as a resource for non-consumptive users. Reserves could also be used as a tool to allocate between recreational and commercial fishers, and within those fisheries allocation among gear types. Finally, it is important to integrate reserves with existing time/area restrictions, possibly in areas where the take of certain species is already restricted, to reduce the impact on the fishing industry.

### **Recommended actions:**

- No-take reserves allocate to non-consumptive users.
- Reserves can be used as a tool for allocation to sport, tribal or commercial fisheries.
- Reserves can be used as a tool to allocate among gear types.
- Siting should be integrated with existing time/area restrictions.



## V. Panel on Social and Economic Aspects of Rockfish Fisheries

### Panelists:

Susan Hanna, Chair, Professor, Dept. of Agricultural and Resource Economics Oregon State University, Corvallis, OR.

James Hastie, Economist, NOAA, NMFS, Alaska Fisheries Science Center, Seattle, WA.

Cindy Thomson, Economist, NOAA, NMFS, Southwest Fisheries Science Center, Santa Cruz, CA.

Hans Radtke, Economist, Pacific Fishery Management Council member, Yachats, OR.

Heather Munro, West Coast Seafood Processors Association, Portland, OR.

Richard Young, Fisherman, Crescent City, CA.

Scott Boley, PMCC board member, fisherman, Gold Beach, OR.

Peter Leipzig, Fishermen's Marketing Association, Eureka, CA.

### Summary Statement:

The panel on social and economic aspects of rockfish fisheries addressed the human side of West Coast rockfish fisheries. The discussions took place against a background of three conditions:

- Rockfish as a species group are second only to sablefish in value for all West Coast groundfish. In 1997 they generated \$26 million in ex-vessel value to fishermen, with additional value added to processors, wholesalers and retailers.
- Rockfish total allowable catches (TACs) have been reduced by large amounts: from 22-77% between 1996 and 1997, followed by further cuts in 1998.
- The economic and social impacts of these cuts take place against a larger background of overcapitalization in west coast fisheries – groundfish in particular – and rapidly diminishing flexibility for the industry and for management.

Rockfish, while biologically unique as species, are typical of fisheries at large. They have problems that may at first look like biological problems, but are, on closer look, biological symptoms of economic and social problems.

This is a very painful time in West Coast rockfish fisheries and in fisheries overall as the economic impacts of the decline are absorbed and as we struggle to define how we can make an effective transition to the future.

The problems in fisheries are problems of managing human effects. From the first days of this nation's fisheries, people have fished for the wealth of the sea. The New England colonies were founded on the wealth of the fishery. On the West Coast, rockfish fisheries were among the first to be developed in California, and in Oregon and Washington expanded during World War II.

The creation of wealth still drives fisheries, but over time we have developed a broader definition of what constitutes the wealth of the sea. Wealth is earned not only from the capture and sale of fish and from recreational fishing, but also from the stored value of

natural capital in the genetic information, reproductive capacity and services to the ecosystem that a fish population provides.

At a time of transition, the social and economic aspects of fisheries take on particular importance. In part, because of the economic and social impacts of the reduced catches and in part because of the economic pressures associated with overcapacity. It is also because of the incentives created by stressed economic and social conditions. These incentives encourage behavior that limits success in achieving conservation goals.

To maintain the wealth-generating capacity of fish populations, we must recognize basic truths about the linkage between humans and animals in marine systems. We easily accept as true the idea that to maintain ecological health we must constrain human actions. But it is also true that the ecological health of the fisheries is not independent of the economic and social health of the people who participate in them. If fish stocks are to remain healthy, the fisheries must remain economically healthy so that people have the financial reserves and the appropriate incentives to be stewards of the resource. Economics can be one of conservation's most effective tools.

The recent history of rockfish fisheries has been one of diminishing biological and economic health. Scientific uncertainty about rockfish has led to some species being fished down to levels low enough to require large reductions in allowable catch. The past 20 years has been a period of learning about the population dynamics of these species.

We have not had to negotiate the same learning curve for the human dimensions of the fishery. We already know what we need to know about the human end of maintaining the ecological and economic health of the rockfish fishery. We have learned the lessons in other fisheries and in other resources. To be successful over the long term, we must make sure that people who participate in the fishery have:

- The assurance that what they husband today will be theirs tomorrow
- A personal incentive to be stewards of the resource
- The dignity of economic choice
- An incentive to be innovative

The current economic situation in the rockfish fishery is not strong on these traits and has pitted interest groups against one another. The people who catch and sell rockfish are diverse. They include trawlers, longliners, jig boats, charter boats, recreational anglers, processors and direct sellers of live fish. But despite the differences, there are many common interests. All have an interest in productive marine ecosystems. All have an interest in economically productive fisheries. All have an interest in the social stability that accompanies economic productivity. And all want to find solutions to turn the current situation around.

The panel discussed ways to link the social, economic and biological aspects of fishery management in productive ways and addressed a number of questions that relate to the

underlying social and economic problems of the rockfish fishery, and the social and economic problems of fishery management.

- What is the nature of the problem in West Coast rockfish?
- What are the biological, economic and social symptoms of the problem?
- What are the root causes and how can they be addressed?
- How can management be more socially and economically effective?
- How can management better integrate economics and biology?
- Do economic incentive systems have potential to improve management?
- What other management alternatives should we consider?

Two related system-wide themes underlay the discussion of specific problems: the need to address the overcapacity problem and the need for long-term planning. The panel saw overcapacity as a pressure point for an array of short-term problems and a barrier to long-term solutions.

**Problem statement:** There is too much fishing capacity in all sectors for the available resource, resulting in a reduction of the economic and social benefits from the fishery beyond that caused by over-fishing. Over-capacity is the chronic fundamental problem that underlies all other fishery management problems.

A related problem is that participants in the Pacific Fishery Management Council (PFMC) system lack a common understanding of the present status and future options for the rockfish fishery. There is a need to develop a set of common goals and a process for resolving disagreements. The PFMC needs to plan for a smooth transition to changes in harvest policy and to reductions in fishing capacity.

**Solution statement and long-term actions:** The solution to the problem of overcapacity involves shifting the focus of management to the long term. A long-term focus has many component actions that will benefit both the resource and the people who fish it.

- Eliminate crisis management.
- Reduce time spent in allocation and micromanagement.
- Bring harvesters and processors into balance with the resource.
- Manage for resource variability.
- Reduce overall fishing effort.
- Stabilize the industry.
- Achieve economic viability for fishing businesses.
- Maintain diversity in fleets and processors.
- Maintain geographic diversity.

- Minimize spillover effects between fisheries.
- Design for operating flexibility/adaptability/innovation.

**Recommended shorter-term actions and organizations to take the lead:** Action to address specific issues will involve several different groups.

- 1) Close open access: the Pacific Fishery Management Council (PFMC) is the organization that will decide about continuing or ending open access for a segment of the rockfish fishery. The panel recommends that the Groundfish Advisory Panel (GAP) request of the PFMC that they immediately set a control date and begin the regulatory process for closing access.
- 2) Define goals and objectives for capacity reduction: the panel recommends that the PFMC immediately address the problem of reducing capacity in the groundfish fishery by establishing goals and objectives for a capacity reduction program. The panel notes that there are several approaches to the question of reducing capacity. These include the following alternatives:
  - Moratorium and limited entry in open access fisheries
  - Vessel buybacks
  - Stacking of limited entry permits
  - Individual transferable quotas (ITQs)
  - Landings taxes
- 3) Develop an individual fishing quota (IFQ) program for groundfish: the panel recommends that the GAP request that the PFMC immediately begin the regulatory process for developing an individual fishing quota program for all west coast groundfish.
- 4) Build grass roots support through education: the panel recommends that several west coast fishery and educational interests begin an educational program on capacity reduction and the long-term future of fisheries. Included would be the fishing industry, environmental organizations, PFMC, NMFS, and the Sea Grant Marine Advisory Programs of California, Oregon and Washington.

**Timeline for action:** The panel was unanimous in its agreement that the need for action is immediate. It agreed that addressing alternatives to resolve the overcapacity problem should be put on a “fast-track” decision schedule by the PFMC. To the Congress, the Panel recommends that the problem of overcapacity and other “people” aspects of fisheries be emphasized in the next reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act.

## VI. Panel on Public Education

### Panelists:

Carl F. Rebstock, Chair, Senior Interpreter, Monterey Bay Aquarium.

Don Dodson, Vice President, California Seafood Council.

Martin Hall, Ph.D., Head, Tuna-Dolphin Program, Inter-American Tropical Tuna Commission. Mary Hudson, Esq., Environmental Attorney, Law Offices of Mary Hudson.

Ralph J. Larson, Ph.D., Professor, Department of Biology, San Francisco State University.

Karen Reyna, Coordinator, Pacific Ocean Conservation Network, Center for Marine Conservation.

Mike Ricketts, President, Monterey Bay Fishermens' Association.

Brad Warren, Editor, Pacific Fishing Magazine.

### Summary Statement:

This panel addressed the contribution public education can make to developing sustainable fisheries. Our hope is that the outcome of the educational endeavors we are trying to achieve here would be that when a consumer purchases a fish in the grocery store, that they do so with a greater awareness of the process that brought it to the dinner table. The difficulties in trying to craft a good public education program are complex and best solved with input from many people. This panel recommended three courses of action.

*"There are two spiritual dangers in not owning a farm. One is the danger of supposing that breakfast comes from the grocery, and the other that heat comes from the furnace."*

### Aldo Leopold, 1949

*A Sand County Almanac*

The following was proposed to the panel:

### Assumption:

*Public education is part of successful fisheries management.* Public education is as integral to managing fisheries as is stock assessment, equipment improvement, and habitat protection. The rockfish fishery provides us the rare opportunity to engage the public in charting a future course before mandated measures are instituted:

### Problem statement:

*A problem isn't, until the public perceives it so.* To inform, we have to ask. Education is a dialogue. Five questions must be asked and answered:

- “What does the public understand about fisheries?”
- “What does the public misunderstand?”
- “What does the public need to understand?”
- “How do we hook the public’s interest in fisheries?”
- “How do we engage people in making conscious decisions?”

This problem statement was like a good 4-wheel drive truck in the great State of Alaska: it got us farther before we got stuck. By midmorning of the first day we found ourselves well into an expansive discussion. Just what a fisheries public education campaign should encompass proved a vexing question. By the end of our panel, we had deconstructed our beginnings into more manageable statements with bite-sized suggested solutions:

#### **Course of Action 1**

**Problem statement:** There are inadequate opportunities for stakeholders to be heard and understood.

**Solution statement/recommended action:** Promote town hall meetings using the Environmental Issues Forum (EIF) model.

**Organizations to take the lead:** Pacific Marine Conservation Council (PMCC)/Carl Rebstock (Monterey Bay Aquarium).

#### **Course of Action 2**

**Problem statement:** Educational products should intelligently address ecological and sociological trade-offs.

**Solution statement/recommended action:** Build an interactive, computer-driven model.

**Organization to take the lead:** Brad Warren (Pacific Fishing Magazine).

#### **Course of Action 3**

**Problem statement:** Urgency of the situation demands rapid distribution of reliable information.

**Solution statement:** Develop a Rockfish Homepage.

**Organization to take the lead:** Pacific Marine Conservation Council.

Of these, the first is in swing and shows great promise. PMCC will be visiting coastal communities with one purpose in mind: to get people talking. Carl is spearheading a joint endeavor with World Wildlife Fund, the Harbinger Institute, and the Monterey Bay Aquarium to develop an EIF discussion guide series. A fisheries module is first up. A related collaboration with a video production company, Habitat Productions, may net broad visibility in the form a three-part Public Television fisheries documentary. We concede that Courses of Action II and III are ambitious. There is hope that funding may be found at the National Science Foundation and that work done by Professor Milton Love, University of California Santa Barbara, and at the Naval Postgraduate School, Monterey California, may help springboard ventures of these sorts onto the Internet.

One statement made by Brad Warren, editor, Pacific Fishing Magazine, towards the end of our discussions rang clear, "The first people we need to educate are ourselves."

## **VI. Panel on Bycatch**

### **Panelists:**

Mark Saelens, Chair, Oregon Department of Fish and Wildlife, Newport, OR.

Bill Robinson, National Marine Fisheries Service, Seattle, WA.

Brian Culver, Washington Department of Fish and Wildlife, Montesano, WA.

Ralph Brown, Commercial Fisherman, PFMC member, Brookings, OR.

Jeff Boardman, Commercial Fisherman, Newport, OR.

Mandy Merklein, Fisheries Consultant, Seattle, WA.

Mark Newell, Commercial Fisherman, Toledo, OR.

John Warner, Marine Supply Store Owner, Charleston, OR.

### **Summary statement:**

This panel started their discussion by developing a definition of bycatch as: “discarded catch, and unobserved mortality of any living marine resource that results from the direct encounter with fishing gear.” Four additional areas were covered having to do with measuring bycatch, reducing bycatch, identifying impediments to the currently imposed mandatory observer program, and other issues. To address the issue of how to measure bycatch, the panel determined that a mandatory observer program should be imposed across all fishing sectors, for the purpose of, at a minimum, providing good solid total catch estimates by species and area. There would need to be a prioritization of observer coverage and identification of critical data gaps and an examination of alternative data collection methods such as logbooks to supplement observer coverage. The panel also addressed the issue that catch estimates in some cases may actually be less than assumed and suggested that efforts be directed at increasing the accuracy of landed catch statistics prior to necessarily worrying about the aspect of our unknown bycatch data. Short and long term ideas for effectively and efficiently addressing bycatch were discussed (see chart), and the panel chose to include the concept of allowing for the use of alternative gear. This would involve changing gear when one type is more effective at catching a certain species and minimizing bycatch, and the identification of appropriate harvest ratios of species. These harvest ratios should reflect, as closely as possible, the actual ratios of various species population sizes in the ocean to prevent the exacerbation of discard. Gear modification, fleet reduction, ITQ’s, bycatch caps, full retention, (with appropriate incentives and rewards), reduction in tow times and education of the industry particularly the use of excluders, are also ideas that the panel supported. Although funding remains an issue, the panel still felt that the PFMC should immediately proceed with the development of a mandatory observer program while establishing a process for prioritizing observer effort and for continuing to pursue additional sustainable funding. Finally, the panel addressed a few specific items to reduce bycatch, such as utilization of time/area closures, particularly in terms of reducing the bycatch and discard of overfished species, and permit stocking, which may or may not reduce discard depending on vessel participation and trip limits. The panel identified five separate issues.



## **Issue 1**

**Problem statement:** No clear definition exists for bycatch.

**Solution statement:** Create a working definition.

**Organizations to take the lead:** Bycatch panel.

**Recommended actions:** Created a definition: Bycatch is the discarded catch and unobserved mortality of any living marine resource that results from a direct encounter with fishing gear.

**Timeline for action:** Completed during the Forum.

## **Issue 2**

**Problem statement:** What should be done to efficiently and effectively measure bycatch in the West Coast groundfish fishery?

**Solution statement:** Immediately move to implement an observer program across all fishing sectors and strategies that is sufficiently robust to, in combination with landed catch, provide annual total catch by species and area. Provide critical support for the addition of \$2 million plus to NMFS base budget on a continuing basis to support the observer program.

**Organization to take the lead:** Pacific Fishery Management Council, including advisory panels. Knowledgeable scientists and managers from all agencies should be considered for participation in advisory groups.

### **Recommended actions 1:**

1. Establish an advisory group(s) to develop criteria for identifying bycatch data priorities.
2. Identify data gaps using criteria.
3. Develop specific observer program design (implementation committee).

**Timeline for action:** Start immediately and deploy observers for 2001.

### **Recommended actions 2:**

1. Actively pursue additional/supplemental funding sources.  
Organizations to take the lead: Federal, state and nonprofit organizations.  
Timeline for action: Start soon and continue to pursue until necessary funding level to sustain an observer program is secured.
2. Prioritize observer coverage and data gaps.  
Organizations to take the lead: PFMC and NFMS.  
Timeline for action: Annual effort. Start now to identify current gaps, evaluate necessary change on an annual basis.

3. Examine additional data collection mechanisms (e.g. logbooks, total retention, etc.) to supplement observer coverage.  
Organizations to take the lead: Federal, state, and nonprofit organizations.  
Timeline for action: Start soon, ongoing.
4. Landed catch estimates may be less accurate than our understanding of bycatch. In this case improving landing data should be emphasized over bycatch data as the best way to reduce risk to stocks.  
Organizations to take the lead: NMFS and state agencies.  
Timeline for action: Start soon, ongoing.

### Issue 3

**Problem statement:** What should be done to efficiently and effectively reduce bycatch in the West Coast groundfish fishery?

**Solution statement and recommended actions:**

Solution/Action	Short-term	Long-term	Yes/Maybe
1. Allow use of alternative gear		L	M
2. Match trip limits more closely to actual catch ratios		L	M
3. Gear modifications (square mesh, excluders)	S	L	Y
4. Gear restrictions (# of hooks, size of net, etc.)		L	Y
5. Appropriate gear for habitat fished		L	Y
6. Fleet reduction		L	Y
7. ITQs		L	Y
8. Bycatch caps	S	L	Y
9. Full retention		L	M
10. Reserve a portion of the OY or ITQ to distribute to "clean" fisheries		L	M
11. Complete mesh size study (trawl)	S	L	Y
12. Reduce tow time		L	M
13. Education/voluntary measures	S	L	Y

**Organizations to take the lead:** PFMC regarding implementation and some analysis. NMFS, state agencies, industry, university and other researchers to conduct research and analysis.

**Timeline for action:** Matching trip limits more closely to actual catch ratios could be achieved in the short term via PFMC in-season action as could the establishment of bycatch caps. Longer-term efforts should continue for both these items. All other items require a year or more for study, analysis and implementation.

#### **Issue 4**

**Problem statement:** What are the impediments to the implementation of a mandatory observer program and what is the solution? A) Sufficient funding, B) Prioritize observer effort by: fishery, fishing strategy, data gaps, C) Political/social maneuvering, D) Equity consideration.

**Solution statement and recommended actions:** Regardless of the impediments identified above, the Council should immediately proceed with implementing a mandatory observer program while establishing a process for: A) Prioritizing observer effort, and B) Continuing the pursuit of additional and sustainable funding.

**Organizations to take the lead:** PFMC, PSMFC, NMFS, state agencies.

**Timeline for action:** Immediate.

#### **Other recommendations:**

##### **Time/Area Closures**

There may be some benefits in time/area closures in reducing discard, but we currently don't have sufficient information to evaluate options. The exception may be a winter closure for lingcod which may reduce capture of nest-guarding males. Time/area closures are used effectively in the North Pacific to reduce discard.

##### **Permit Stacking**

Permit stacking probably would have more benefit in the trawl fishery than in the hook and line fishery in reducing discard. The effect on discard may not be all positive. A vessel which stacked a permit, fishing at a higher limit, may have reduced discard, however, vessels which do not stack permits may have smaller trip limits and an increased discard problem.

## VIII. Panel on Live Fish Fisheries

### Panelists:

Rob Collins, Chair, California Department of Fish and Game, Monterey, CA.

Carrie Pomeroy, Institute of Marine Sciences, University of California, Santa Cruz, CA.

Lynne Yamanaka, Pacific Biological Station, Fisheries and Oceans Canada, Nanaimo, B.C.

Kirk Solomon, Fish Buyer, Solomon Live Fish, Moss Landing, CA.

William Powell, Commercial Fisherman, Morro Bay, CA.

### Summary statement:

The live fish fishery is probably the newest of the rockfish fisheries, and it is the one that people know least about, so let's begin with the definition of a live fish. Aren't all fish live when you catch them? The answer is that a live fish is a fish removed from the ocean alive, and kept alive until sold. This panel discussed the fishery, where it's going, what its opportunities are, what problems that exist, and how can we move towards effective management of the fishery, with the goal of sustainable use of the resource? Technology has done wondrous things for us over the years, it has helped us remove fish from California waters and deliver it live to New York. There has been a large increase in this fishery in the last 5 years, from a fishery that didn't even exist 10 years ago. In California, it has been, until recently, an unregulated fishery, anybody who wanted to participate could participate, there were no size limits and no quotas. The Near Shore Fisheries Management Act, has, for the first time, put some restrictions on catches in the live fish fishery, developing size limits, and for the first time, requiring individual permits. The Marine Life Management Act mandates that the fishing agencies in California develop a management plan for the near shore fisheries, and adopt it by January 1, 2002 and the live fish fishery is one component of the near shore fishery. To complicate matters, not all the fish that are caught in the fisheries are rockfish, in Southern California, particularly, other species such as cabezon and sheephead predominate. Additionally, the species composition changes as you move either north or south.

The Live fish panel explored the status of live fish fisheries on the West Coast of North America. British Columbia's fishery is the most advanced, with a fishery management history of more than 15 years. The Province has in place the most advanced management, followed by California, which still was in its infancy.

The panel explored the problems being experienced in these fisheries using a modified Nominal Group Technique (NGT) process. The most persistent problem in both areas appeared to be that of over harvest due to an excess number of participants. British Columbia was considering reducing its fleet size by one-half to bring the harvest into line with expected sustainable yields. Although the number of participants in California's fishery was unknown at the time of the Forum, California fishery participants present also favored the imposition of some sort of limited entry on the fishery. Many felt that the size limits recently enacted would not have a significant impact on the management of

the fishery and would lead to increased discards by the fishery participants. The use of no harvest zones (marine protected areas) was advanced as a possibly effective management tool. Some participants felt that as much as 20 percent of the fishable area would need to be protected to make this management tool effective.

The most valuable part of this panel's work appeared to be the dialog, which occurred between people with different concerns and perspectives. We are hopeful that dialog will be continued and expanded during the development of California's Nearshore Fishery Management Plan.

The panel recognized that the term "live-fish fishery" is a misnomer, the fishery is for near shore finfish, but the live fish market drives that fishery, and landings in this fishery have increased. What follows is a subset of the list of problems, opportunities, and solutions developed by the panel (see below for the full list). The group developed a list of thirty issues of concern (representing input from all in attendance at this panel) then for purposes of discussion, was reduced to the six most important, identified by the people in the group. The number one issue is that there are too many people participating in this fishery. Additional issues included a lack of information on the stocks being fished, particularly stock size, and a lack of education and outreach to inform the public, ourselves, and people making the regulatory decisions about the fishery. The pros and cons of reserves were discussed and the feeling from the panel was one of caution, to not jump into reserves without strong indication that they are effective management tools, as was the idea of increasing the data to support stock assessments. Some of the recommendations, particularly for California, were to separate the nearshore groundfish fishery from the offshore, and not manage them as a single unit, and to involve the public in making management decisions. The group thought that by combining the knowledge and history of all the people along the coast, the fishermen, fishery managers, sociologists and economists, and environmental groups, there was a real opportunity to get it right the first time in creating a management scheme for this fishery. The final portion of the meeting focused on developing a shopping list of possible solutions including increased funding for research, education and outreach, and continued public input at all levels of the process.

**Problem statements:**

1. Too many fishermen
2. Lack of stock info.
3. Education and outreach
4. Reserves
5. Getting good data
6. User conflicts

**Prioritized goals:**

1. Develop a sustainable fishery.
2. Separate near/offshore (quotas) and management.
3. Involve everyone.
4. Develop management correctly the first time.
5. Take advantage of others' experience.
6. Combine knowledge.

**Problem statement 1: Too Many Fishermen****Solutions statements and recommended actions:**

- Do not discriminate against small skiff fishers.
- Develop gear limits.
- Raise license fees.
- Limit participation in the fishery to those participating prior to 1996.
- Cut the number of participants to a level that would take \_ of current amount of pounds landed.
- Cut the number of participants to those who get  $\geq 75\%$  of livelihood from the fishery (or some index related to livelihood).
- Investigate the idea of individual quotas (IQs) (no transferability) and individual transferable quotas (ITQs).
- Restrict access to those participating the longest in fishery (or some sort of qualifying history).
- Investigate the idea of area permits.
- Utilize temporal closures – all ports or other area restrictions.
- Set a moratorium on the fishery immediately until studies are done that show the stocks can support fishing pressure.
- No area restrictions to limited entry.

**Problem statement 2: Lack of stock information****Solution statements and recommended actions:**

- Provide funding for sampling, surveys, and research.
- Collect fishery independent data and develop a reliable stock index.
- Collect information from log books, improved landings tickets and mandatory landing receipts.
- Contract or enlist support and help from fishers to provide information.
- Identify total fishing mortalities.

### **Problem statement 3: Insufficient education and outreach**

#### **Solution statement and recommended actions:**

- Hold public meetings and seminars and advertise them well.
- Support more input from fishers speak.
- Fund the seafood council for education.
- Develop a California Department of Fish and Game quarterly newsletter with data, issues and events.
- Post port-specific flyers and accurate news releases after meetings – collaborate with all partners.
- Stress to the media the need to avoid sensationalism report issues fairly.
- Invite the media and public more to local pertinent meetings.
- Bring in background info with statements and admit limitations.
- Identify funding sources.
- Cooperate with all involved.
- Demonstrate how live fishing works.
- Communicate with consumers about purchasing and eating fish.
- Be proactive – get the message out and keep it simple and concise.
- Create a live fish fishers organization to promote positive public relations.
- All parties should collaborate to develop information for the media and public and should effectively disseminate it.
- Forum participants from today should give positive input on meetings.

### **Problem statement 4: Marine reserves**

#### **Solution statements and recommended actions:**

- Use already existing resources to determine the effectiveness of marine reserves (larval settlement, juvenile habitat, adult recruitments).
- Support reserves as complete no-take zones.
- Educate on value of reserves in conservation. How do they help? Effectiveness?
- Develop smaller reserves, from 80 – 150 feet.
- No more reserves – need data from existing ones.
- Work with fishermen on location and configuration of reserves avoiding clumping of reserves into one area, and placing in launch areas.
- Close some marine reserves to all take and leave some open.
- Demonstrate how to evaluate commercial fishing.
- Include user groups in data collection.

### **Problem statement 5: Getting good data**

#### **Solution statements and recommended actions:**

- Develop new landing receipts.
- Use Logbook information (CPUE, species/location).
- Enforce monitoring evasion (data collection tied to permits).
- Gather first-hand knowledge from fishers.
- Deploy observers to collect information.
- Set up research to incorporate suggestions from this Forum.
- Limit entry into the fishery.
- Develop an equitable management plan with commercial and recreational interests.
- Educate fishers in biology / educate biologists in fishing (more education and outreach with fishers regarding the importance of information).

### **Problem statement 6: User Conflicts**

#### **Solution statements and recommended actions:**

- Identify and document existing conflicts.
- Increase communication, education, outreach and involvement.
- Develop state controlled and run monitoring stations.
- Allocate take by documenting historical use.
- Allocate based on: economic returns / gear and time, gear that causes the least amount of discards, IFQs.
- Landing receipts should also be required for recreational fishing, providing take and discards.

## **SUMMARY AND CONCLUSIONS**

Three common themes emerged from the recommendations of all the panels. 1) meaningful stakeholder involvement in the management process and development of mechanisms to incorporate qualitative information into that process, 2) increased research and data collection including assessing currently unassessed stocks, mapping essential fish habitat, developing marine reserves, quantifying total fishing mortalities, and researching the effects of ecosystem change on rockfishes, and the impacts of fishing gear on habitat, 3) issues of excess fishing capacity, fleet reduction, and the need for an increase in public education on fisheries issues.

The most contentious issue discussed at the Forum, and possibly the issue that will require the most significant increase in communication and research is that of fishing gear impacts on habitat. The two most widely supported recommendations were the implementation of an observer program for the purpose of quantifying bycatch and the need to reduce overall fishing effort and capacity.

References to the Rockfish Forum are hopefully indicative of the usefulness of the meeting and the information that resulted from it. PMCC took the summary information



on the road after the Forum and presented it at town-hall meetings in Washington, Oregon, and California coastal communities. The Forum has also been mentioned in the NMFS strategic plan for groundfish research, planning meetings for research on nearshore rockfish, several PFMC meetings at committee and Council levels, PFMC strategic planning committee meetings, Marine Fish Conservation Network National Steering Committee meetings, discussions on disaster relief for the west coast groundfish fishery, and Pacific Fishing magazine.

Many changes have occurred in the management of, and the fishery for, West Coast rockfish since the Forum was convened. One of the most notable was the formal declaration of a fishery disaster by the Secretary of Commerce and resulting efforts to design a disaster relief package. Other significant management actions occurring since the Forum have included a workshop on the “appropriate” harvest rate for groundfish species, which resulted in a proposed harvest rate for rockfish of  $F_{50\%}$ . Additional actions, such as the designation of cowcod and canary rockfish as overfished, development of rebuilding plans for all overfished rockfish species, reduction in harvest levels to accommodate rebuilding and the change in harvest rate, development of the PFMC strategic plan for groundfish, and a vote by the PFMC to support development of an observer program, have also been taken since the Forum was convened.

Information from the Forum has also helped shape much of PMCC’s testimony on sustainable rockfish management at PFMC and other meetings and will serve as part of the foundation for development of a longer-term plan focused on rebuilding rockfish. PMCC has also discussed with other organizations the idea of taking the lead on other critical issues identified at the Forum.

These proceedings are a summarized version of transcribed tapes and summary information presented by the panels. For further information contact:

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We would like to thank the panel chairs and panelists for their leadership role in this Forum and extend our thanks and appreciation to all those who attended. We would also like to thank Ginger Hopkins for orchestrating a venue so conducive to productive dialog.

## NOTES

## NOTES

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## COMMENTS ON SARDINE ALLOCATION FOR 2001

### RECOMMENDATIONS

The Coastal Pelagic Species Advisory Subpanel (CPSAS) met on March 9<sup>th</sup> to consider many issues. The majority (motion passed 7 to 1) of the CPSAS makes the following two recommendations:

1. The Council should ask the Coastal Pelagic Species Management Team (CPSMT) and CPSAS to begin the process of analyzing the current allocation scheme for its appropriateness and draft options for potential changes to the allocation scheme if warranted. The CPSAS believes that in the long-run a system must be identified and implemented that benefits all users in the fishery.
2. For the 2001 season change the re-allocation date set forth in the fishery management plan (FMP) from 9 months following the start of the sardine season to 7 months following the start of the season. Instead of reallocating all unused quota on October 1<sup>st</sup>, the CPSAS believes that the reallocation should occur on August 1<sup>st</sup>. This is a short-term fix for the 2001 season and an appropriate move to prevent possibly precluding one geographic user group from participating in this valuable fishery during their usual season.

### BACKGROUND

In February of 2000 Oregon Department of Fish and Wildlife asked the CPSMT to analyze whether a separate harvest guideline or quota for sardine fisheries north of California was needed. The perception was that the northern California fishery could potentially preclude Oregon and Washington fishing opportunities if the allocation was fully utilized prior to the northern states beginning their fishing seasons. The CPSMT analyzed the situation and reported to the Council in June of 2000. The CPSMT recommendation was to defer any consideration of establishing a separate quota, because the coastal pelagic species (CPS) FMP had been only recently implemented. The CPSMT further recommended the Council continue with the current plan, at least through the first year, to see if any allocation problems would be identified.

As the industry continued to develop in Oregon and Washington, it became apparent there was a possibility for an additional allocation problem. Amendment 8 outlines the current allocation scheme for sardine as two-thirds of the harvest guideline available for the south (Pt. Piedras Blancas, California to the Mexican border) and one-third for the north (north of Pt. Piedras Blancas to the Canadian border, including Oregon and Washington). For 2001, the 134,737 metric ton harvest guideline is allocated 44,912 metric tons to the north, and 89,825 metric tons to the south. The FMP also provides a reallocation (50/50 to north and south) of unused quota after nine months from the start of the fishery (October 1). The northern states begin their seasons (May or June) prior to northern California (August or September). Oregon and Washington continue to increase their processing capacity which indicates the real possibility that in 2001 the northern harvest guideline could be significantly utilized by Washington and Oregon before northern California begins their season later in the summer.

At the November 2000 Council meeting the CPSAS recommended to the Council that the allocation scheme outlined in Amendment 8 should be suspended for 2001 and be replaced with a coast-wide quota. The CPSAS also recommended that the process for outlining options for future management and allocation schemes should be started. There was public comment provided by industry members to the same effect. The Council chose at that time not to suspend the current allocation.

As Washington and Oregon continue to gear up for the upcoming season, concern persists by many industry members that Monterey fishermen could be precluded from their share of the allocation by the northern states. Estimates of 30,000 tons of sardine being landed in Washington and Oregon combined continue to be made. Hence, the CPSAS once again recommends the Council consider implementing an alternative to the allocation scheme outlined in the FMP.

ATTN: PUBLIC COMMENT

# PACIFIC OCEAN CONSERVATION NETWORK



AMERICAN OCEANS CAMPAIGN



March 23, 2001

**Re: Protecting habitat and fish productivity**

Dear Members of the Habitat Steering Group:

Our organizations are writing out of concern about the need for additional habitat protection measures for groundfish. Two thirds of the assessed rockfish managed by the Council are now or will soon be under rebuilding plans. To help ensure that those plans work, to prevent more groundfish species from becoming overfished, and to meet the requirements of the Magnuson-Stevens Act, we believe it is imperative that the Council take proactive steps to protect groundfish habitat and learn more about the impacts of fishing practices, so that habitat protection measures can be made more effective over time. We propose that the Habitat Steering Group help define how the Council will move forward on habitat protection measures, working closely with the National Marine Fisheries Service and with Council members.

As a first step, we suggest that the HSG devote a significant part of the agenda of its June meeting (perhaps a half-day session) to scoping groundfish habitat issues, inviting members of the Council and NMFS habitat experts to participate. The goal of the session would be to develop a set of groundfish habitat protection options and a workplan that the HSG would then propose to the full Council. The plan should include recommendations for structural steps, such as the formation of a groundfish habitat subcommittee of the HSG, that are needed to ensure the workplan is carried out. To help guide that process, we have attached our suggestions for measures that should be considered as part of an effort to protect habitat—in addition to marine reserves, which are already identified in the strategic plan.

We would be pleased to assist the HSG on this project in any way we can, and we appreciate your consideration of this proposal.

Sincerely,

Karen Garrison, Natural Resources Defense Council

Rod Fujita, Environmental Defense

Mark Powell, Center for Marine Conservation

Phil Kline, American Oceans Campaign

CC: Dr. Don McIsaac



# PROTECTING HABITAT AND FISH PRODUCTIVITY

Presented by the Pacific Ocean Conservation Network

March 22, 2001

The Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act require Fishery Management Plans to “minimize to the extent practicable adverse effects” on essential fish habitat caused by fishing (16 U.S.C. Sec.1853 (a)(7)). The same requirement applies to rebuilding plans. If depleted rockfish are to recover and be managed sustainably, American Fisheries Society scientists have concluded that an essential step in addition to reductions in fishing mortality rates is adoption of management strategies that protect the physical habitat of these fish and allow for a full complement of age classes. (S.J. Parker et al. Management of Pacific Rockfish, Fisheries V25 N3, March 2000, p. 26).

To fulfill the Essential Fish Habitat mandate, and more importantly, to increase understanding of fish populations and habitat-based productivity, to accelerate rebuilding of depleted fish populations by protecting habitat, and to prevent the depletion of other (unassessed) species which could lead to further constraints on the groundfish fishery, the PFMC and NMFS should take the following actions:

- (1) Impose a freeze on the introduction of new types of gear and changes in fishing practices, until and unless credible scientific information shows that impacts on habitat are within acceptable limits. This freeze should not apply to the use of gear and practices that have proven conservation benefits (such as lowering bycatch or reducing habitat impacts).
- (2) Conduct research aimed at the development of gear performance standards, designed to minimize habitat impacts
- (3) Implement proactive habitat protection
  - Gear restrictions (e.g., footrope size limit)
  - Gear-specific closures
- (4) Establish long-term study areas (including reference areas that are closed to fishing and areas used solely by a specific gear type) to make possible rigorous scientific research on fishing impacts on an ongoing basis, and distinguish fishing impacts from those caused by changes in ocean conditions.

The PFMC has implemented gear limitations that may have the effect of protecting some shelf habitats. The prohibition on landings of shelf rockfish species caught while fishing with large footrope trawl gear appears to have shifted trawling effort away from some



rocky bottom shelf habitats. However, our ability to fully assess the benefits of this measure has been limited by the fact that there are no reference areas that could provide a standard for comparison. This proposal focuses on the need to move forward with habitat protection measures, and in particular to establish Study Areas to help scientists gather credible long-term information on the impacts of fishing.

#### Rationale for Study Areas

The purpose of designating Study Areas is to provide a means of assessing the impacts of the major types of fishing under the jurisdiction of the PFMC on all of the major habitat types within this jurisdiction, in order to facilitate the timely development of habitat protection measures. Such measures (e.g., performance standards, marine reserves, gear restrictions/modifications, specific gear closures) are necessary not only to fulfill the Council's EFH mandate, but more importantly to protect the habitats upon which the productivity of target and non-target populations depend. NMFS recommended forming an advisory body to work on siting and design of no-fishing reference areas in its March 1998 draft Proposed Recommendations: Essential Fish Habitat for Pacific Coast Groundfish (p. 29). The longer we delay establishing reference areas, the more uncertainty will remain regarding the effectiveness of rebuilding plans and the PFMC's strategies for sustainable management of rockfish.

The purpose of Study Areas is distinct from the purposes of marine reserves. Marine reserves will be implemented primarily to accelerate the rebuilding of depleted populations, protect habitat, and provide insurance against management errors. A substantial body of scientific evidence shows that certain types of fishing have adverse impacts on fish habitat. However, there is a paucity of studies on the impacts of fishing on the specific habitats under the jurisdiction of the Pacific Fishery Management Council. Rigorous scientific assessment of the impacts of fishing will require Study Areas in which the effects of different kinds of fishing can be separated from natural variations, on an ongoing basis.

The effects of fishing on habitat are likely to vary with habitat type and gear type. To rigorously examine these variables, each must be held constant in experimental treatments with replicates.

Attempts to quantify the impacts of fishing on habitat will be confounded and difficult or impossible to interpret if reference areas (where no fishing is allowed) and carefully controlled treatment areas (where certain kinds of fishing are allowed) are not established.

Reference areas should include examples of all major habitat types under the PFMC's jurisdiction (e.g., shelf rocky reef, shelf soft bottom, slope high relief, slope soft bottom, nearshore rocky reef, nearshore soft bottom), replicated to increase the statistical power of the research. The California Dept. of Fish and Game is currently considering creating study areas in nearshore habitats, so any efforts by PFMC should be coordinated with state agencies.

Treatments should include all major fishing gear types and practices (e.g., trawling with and without roller gear, traps/pots, bottom longlining, etc.) and all major habitats in which these types of fishing take place.

Example of experimental design:

HABITAT TYPE	TRAWLING	TRAWLING WITH ROLLER GEAR	TRAPS/POTS	BOTTOM LONGLINING	REFERENCE AREAS – NO FISHING
Shelf – high relief (rocky reefs/banks)	?	X	X	X	X
Shelf – soft bottom	X	X	X	X	X
Slope – high relief (canyon walls)	?	X	X	X	X
Slope – soft bottom	X	X	X	X	X
Nearshore – high relief (rocky reefs)	?	?	X	X	X
Nearshore – soft bottom	?	?	X	X	X

? – May not be practical or legal in some areas.

For each habitat type, study areas should be established off Washington, Oregon, Northern California and Southern California, and/or in each major biogeographic province under PFMC jurisdiction. The areas should be large enough to allow separate fishing experiments using each practical and legal gear type. Combining habitat types into a single study area would reduce the number of study areas required. For example, one Northern California study area in Monterey Canyon could include high relief slope habitats and soft bottom slope habitats, or a single large study area could extend from nearshore to slope habitats and encompass all habitat types.

Study Areas (reference areas and treatment areas) should be set up quickly (within 1 year) to gather information required to fulfill the EFH mandate and inform the development of other measures to protect habitat. Information gathered from Study Areas would be expected to elucidate the impacts of fishing on habitat, and aid in the design of habitat protection performance standards.

Study Areas are consistent with recommendations in the EFH Environmental Assessment, the Groundfish Strategic Plan, and the Marine Protected Area Executive Order.

#### ACTION ITEMS

The PFMC and NMFS should begin immediately a design and implementation process for establishing Study Areas (including both reference and treatment areas) to evaluate fishing impacts on habitat.

The PFMC and NMFS should allocate or obtain resources necessary to support monitoring and studies in these areas.