Mark Powell

REPORT OF THE HABITAT COMMITTEE

The Habitat Committee (HC) met Monday and Tuesday to discuss matters related to essential fish habitat, marine reserves, the letter to the Federal Energy Regulatory Commission (FERC), Klamath and Trinity River flows, Columbia River dredging, rebuilding plans, and other matters. The HC will comment separately on agenda items F.1 and F.2 (marine reserves), C.5 and C.6 (groundfish).

FERC Letter

The letter to the Federal Energy Regulatory Commission regarding dam relicensing was sent on May 13, 2002. The Council has not yet received a response.

Klamath River Flow Issues

The National Marine Fisheries Service (NMFS) draft biological opinion (BO) on the effects of the U.S. Bureau of Reclamation's Klamath Project on coho salmon and its critical habitat in the Klamath River was released on May 16, 2002. Comments on the draft BO were due by May 24, and the final BO was released on May 31. This very short comment period precluded the development and review of the fast-track comment letter that was approved by the Council at the April 2002 meeting. The Habitat Committee recommends a letter be drafted for Council consideration at the September meeting that addresses the potential deleterious effects of the final BO on Council-managed anadromous fish species and their habitat.

The final BO covers Klamath Project operations for the ten-year period from June 1, 2002 through March 31, 2012. It guarantees full irrigation deliveries for all months during all water year types at the expense of sufficient flows below Iron Gate Dam to support the biological needs of coho salmon and other salmonids. To avoid jeopardy to coho, the final BO includes a "reasonable and prudent alternative" that provides monthly flow targets that are less than the flows recommended by the Hardy Phase II Flow Study for 78% of the water year time steps. (The Phase II flow study was commissioned by the Department of Interior to determine flow needs in the Klamath River to meet Endangered Species Act (ESA) and tribal trust needs for salmonids). Furthermore, the long-term flow targets would be gradually phased in, so that full attainment would not occur until 2010 or 2012. The BO holds the Bureau of Reclamation responsible for only 57% of the target flows at Iron Gate Dam, based on the percentage of total irrigated acreage in the upper Klamath Basin served by the Klamath Project. However, Reclamation will not be able to provide its full share of target flows until 2007. Long-term flow targets will only be met by the development of new water sources, annual leasing of water, or conservation measures during the ten-year period, so the attainment of these flows is uncertain and highly speculative. At least for the next few years, the BO will essentially allow the average monthly minimum flows attained during the 1990-1999 period. For perspective, NMFS required a flow of 2,100 cubic feet per second (CFS) in June 2001, which was a much drier water year. This June, the flow rate is about 1,000 CFS—half the 2001 rate. The Council has previously expressed its concerns regarding such low flows in letters to the Bureau of Reclamation.

The BO states that implementation of the reasonable and prudent alternative and the incidental take statement would adequately conserve coho essential fish habitat. NMFS will reconsult on chinook EFH after finalization of the Hardy Phase II Flow Study Report. We do not believe that coho salmon EFH will be conserved by the prescriptions provided in biological opinion.

Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC)

Mr. Jon Kurland, the National EFH Coordinator for NMFS, briefed the committee on the National EFH Rule and the National Environmental Policy Act (NEPA) process for EFH. The Committee also heard a report on the National EFH Workshop held this spring in La Jolla, California.

Also, Mr. Steve Copps updated the Habitat Committee on the EFH environmental impact statement (EIS). He outlined the need to conduct a risk assessment to help focus the federal decision-making process regarding EFH. A coastwide habitat map, combined with fishing effort information and biological information,

is currently being developed as part of this process. Ms. Fran Recht is also coordinating a description of gear types that will contribute to the EFH EIS effort. The HC also discussed its involvement in a workshop to describe gear types. Work on all of these activities is expected to intensify this fall.

The Habitat Committee would like to commend Mr. Copps, Mr. Jim Glock, and Ms. Marija Vojkovich for their extensive, high-quality work on the EFH and programmatic environmental impact statements.

Report on Trawling and Dredging Impacts

Dr. Susan Roberts from the National Research Council gave a very informative presentation on the National Research Council's (NRC's) report on trawling and dredging impacts. (A final version of the NRC report will be released in the next ten days. An executive summary of the draft report is attached). The study, which was done at the request of NMFS, summarized existing knowledge about the effects of bottom trawling on seafloor habitats. While more information is still needed, the report concluded there is enough information on these effects to make informed decisions about trawling and dredging impacts. Given the implications of this information for essential fish habitat, the Habitat Committee recommends the Council hear this report at either the September or November Council meeting.

Columbia River Dredging

In October 1999, the Council sent a letter on Columbia River dredging to the Army Corps of Engineers expressing concern about the effects of channel "improvements" on essential fish habitat in the Columbia and lower Willamette Rivers. The Habitat Committee reviewed this letter and received an update on actions that had been taken since the letter was written. Because it appears the Corps has not followed up on most of the letter's recommendations, the Habitat Committee would like to prepare a letter to the Corps to present to the Council at the September or November meeting.

Cruise Ships

The HC discussed the effects of cruise ship anchoring practices on marine habitat. This issue has been raised during the Magnuson-Stevens Act reauthorization process. The HC will track this issue and report on it at future Council meetings.

Habitat Committee Mission Statement

The HC discussed a draft mission statement that outlined its role in coordinating essential fish habitat issues. After much discussion, the mission statement was put aside, because essential fish habitat issues already fall within the HC mission. No additional HC time and effort, apart from the typical level of involvement in these issues, is currently anticipated.

PFMC
06/19/02

Full draft report online at
http://books.nap.edu/books/0309083400/html/

Effects of Trawling and Dredging on Seafloor Habitat

Prepublication Draft

Committee on Ecosystem Effects of Fishing:
Phase 1—Effects of Bottom Trawling on Seafloor Habitats
Ocean Studies Board
Division on Earth and Life Studies
National Research Council

National Academy Press
Washington, D.C.

This publication version of *Effects of Trawling and Dredging on Seafloor Habitat* has been provided to the public to facilitate timely access to the committee's findings. Although the substance of the report is final, editorial changes may be made throughout the text, and citations will be checked prior to publication. The final report will be available through the National Academy Press in May 2002.

EXECUTIVE SUMMARY

Fishing has a variety of effects on marine habitats and ecosystems, depending on the type of gear, the level of fishing effort, and the spatial extent of fishing. Expansion of U.S. domestic fisheries after passage of the Magnuson-Stevens Fishery Conservation and Management Act of 1976 fueled technological advances in gear and navigation that greatly increased the geographical extent of these effects. However, declining fish stocks have reduced fishing activities in some areas over the last decade. Attention became focused on the impacts of fishing on the seafloor following passage of the Sustainable Fisheries Act in 1996, which required that fishery management plans address the effects of fishing on habitat. The primary fisheries involved in the controversy are the trawl and dredge fisheries, which tow gear over seafloor habitats and communities. A complete consideration of the effects of fishing on ecosystems would require evaluation not only of trawl and dredge gear, but also stationary gear (e.g., traps, pots, longlines, gillnets) and other kinds of towed gear (e.g., pelagic trawls) on both target and non-target species.

As a first step in evaluating the ecosystem-level effects of fishing, the National Marine Fisheries Service (NMFS) asked the Ocean Studies Board to study the effects of bottom trawling and dredging on seafloor habitats. Specifically, NMFS asked the committee to undertake the following tasks: 1) summarize and evaluate existing knowledge on the effects of bottom trawling on the structure of seafloor habitats and the abundance, productivity, and diversity of bottom-dwelling species in relation to gear type and trawling method, frequency of trawling, bottom type, species, and other important characteristics; 2) summarize and evaluate knowledge about changes in seafloor habitats associated with trawling and the cessation of trawling; 3) summarize and evaluate research on the indirect effects of bottom trawling on non-seafloor species; 4) recommend how existing information could be used more effectively in managing trawl fisheries; and 5) recommend research needed to improve understanding of the effects of bottom trawling on seafloor habitats.

During the course of this study, the committee held public meetings in several regions with participation by fishery scientists and managers, the fishing industry, and environmental groups. Discussions at these meetings often centered on concerns that habitat protection initiatives would become avenues for the reallocation of resources among stakeholders, including various sectors of the fishing industry, recreational fishing groups, and conservation organizations. Resolution of these allocation considerations to meet ecological and socioeconomic goals has often been contentious.

The policy context for addressing the effects of fishing on habitat is found in the essential fish habitat (EFH) provisions specified by the 1996 Sustainable Fisheries Act amending the Magnuson-Stevens Fishery Conservation and Management Act. The amended act requires regional fishery management councils to describe and identify EFH for each fish stock managed under a fishery management plan, to minimize to the extent practicable adverse effects on such habitat caused by fishing, and to identify other actions to encourage the conservation and enhancement of such habitat. Most regional councils developed a single, overarching EFH amendment rather than amending each individual fishery management plan. The Secretary of Commerce approved most of the revised plans, but some environmental groups have mounted

legal challenges regarding the adequacy of some of the EFH amendments. A major complaint was that the regional councils did not sufficiently address the effects of fishing gear on benthic habitats.

The regional councils found it difficult to develop criteria for designating EFH due to gaps in existing knowledge on the distribution of benthic life stages of fishes and other species and the physical and biological characteristics of the seafloor. Similarly, the councils struggled with the requirement to assess the effects of bottom trawling and dredging because they had insufficient data on the spatial scale and extent of bottom fishing effort and lacked guidelines for generalizing the results of research on specific gears and habitats. These problems relate to the committee's task to recommend ways for using existing information in the management of the habitat effects of trawl and dredge fisheries.

A complete assessment of the ecosystem effects of trawling and dredging requires three types of information:

1) gear-specific effects on different habitat types (obtained experimentally);
2) the frequency and geographic distribution of bottom tows (trawl and dredge fishing effort data); and
3) the physical and biological characteristics of seafloor habitats in the fishing grounds (seafloor mapping).

This report summarizes the currently available data in these three areas and describes how the low spatial resolution and availability of the fishing effort and habitat mapping data restrict a full evaluation of the ecosystem effects of trawling and dredging.

Under the first category of information, many experimental studies have documented the acute, gear-specific effects of trawling and dredging on various types of habitat. The results confirm predictions based on the ecological principle that stable communities of low mobility, long-lived species will be more vulnerable to acute and chronic physical disturbance than short-lived species in changeable environments. Trawling and dredging can reduce habitat complexity by removing or damaging the biological and physical structures of the seafloor. The extent of the initial effects and the rate of recovery depend on the stability of the habitat. The more stable biogenic (i.e., of biological origin), gravel, and mud habitats experience the greatest changes and slowest recovery rates. In contrast, less consolidated coarse sediments in areas of high natural disturbance show fewer initial effects. Because these habitats tend to be populated by opportunistic species that recolonize more rapidly, recovery is also faster. Significant alterations to habitat can result in changes in the associated biological communities, potentially altering the composition and productivity of fish communities dependent on seafloor habitats for food and refuge.

The second category of information, the geographic distribution and frequency of trawling and dredging, suffers from limitations in the spatial resolution of the data and regional variation in reporting methods. For example, trawling effort data are averaged over reporting areas that range from 25 to 2,420 km^2 depending on the region. Although the data are imperfect, a few generalizations emerged from the analysis presented in this report. Estimates of the spatial extent and intensity of trawl and dredge fishing effort indicate that bottom trawling takes place over large areas of the continental shelf and slope. The level of effort varies greatly among

regions. The highest intensity of effort, based on rough estimates of the number of times a reporting area is swept (Table 3.1), occurs in the fishing grounds of the Gulf of Mexico and New England regions. In contrast, bottom trawling in the Mid-Atlantic, Pacific, and North Pacific regions is relatively light, with less than 1 tow per year in many reporting areas. Even in heavily trawled regions effort is not evenly distributed; as a consequence some areas may be trawled several times per year while other areas are trawled infrequently if at all. Throughout the 1990s and into 2001 there were significant reductions in the intensity and spatial extent of bottom trawling. These reductions reflect effort reductions, area closures, and gear restrictions instituted by managers in response to problems with declining fish stocks, bycatch, or interactions with endangered species.

The spatial distribution of different habitat types in trawled (or dredged) areas is the third category of information that must be integrated with the other two to assess the effects of trawling and dredging on ecosystems. Experimental studies on specific gear types in a few well-defined habitats provide small-scale estimates of ecological disturbance, but for most areas only coarse maps are available on habitat distribution.

The mismatch in the spatial scales of experimental results, habitat maps, and trawl effort reporting data makes it difficult to assess the ecosystem level effects of trawling and dredging. Although fisheries managers continually collect data to improve decision-making, limitations in resources and time require managers to assess the effects of fishing in the absence of complete information. In this context, comparative risk assessment provides a promising approach for evaluating the effects of bottom trawling and dredging. This method brings together the various stakeholders to identify risks to seafloor habitats and prioritize management actions within the context of current statutes. Because risk assessment requires full use of all available information on seafloor habitats, fishing methods, and effort distribution there is an immediate need to integrate the available data in a readily available format.

Recommendations

Although there are still habitats, gears, and geographic regions that have not been adequately studied and characterized, there is an extensive literature on the effects of fishing on the seafloor. It is both possible and necessary to use this existing information to more effectively manage the effects of fishing on habitat. The following recommendations fall into three categories: I) interpretation and use of existing data; II) integration of management options; and III) policy issues raised by existing legislation. These recommendations are intended to build upon the strengths of existing approaches to management rather than completely transform them.

I. Interpretation and Use of Existing Data

Recommendation: Fishery managers should evaluate the effects of trawling based on the known responses of specific habitat types and species to disturbance by different fishing gears and levels of fishing effort, even when region-specific studies are not available.

The lack of area-specific studies on the effect of trawling and dredging gear is insufficient justification to postpone management of fishing effects on seafloor habitat. The

 Copyright 2002, 2001 The National Academy of Sciences, all rights reserved

direct responses of benthic communities to trawling and dredging are consistent with ecological predictions based on disturbance theory. Therefore, extrapolations from common trends observed in other areas provide useful first-order approximations of fishing effects for use in habitat management. These estimates should be revised, as more site-specific information becomes available on the fine scale distribution of fishing effort and habitat distribution.

Recommendation: NMFS should integrate existing data on seabed characteristics, fishing effort and catch to provide geographic databases for major fishing grounds.

Management decisions about the potential impact of fishing on habitats can be improved by the simultaneous and consistent presentation of all available data on the characteristics of the seabed and fishing effort. Data exist on different seabed types and habitats and on the location and intensity of fishing for much of the U.S. continental shelf. Available datasets have been collected by different agencies and currently exist in different formats, at variable levels of resolution, in separate archives. Integration of these databases into a single, geographic information system will assist managers in evaluating regional needs for habitat conservation.

II. Integration of Management Options

Recommendation: Management of the effects of trawling and dredging should be tailored to the specific requirements of the habitat and the fishery through a balanced combination of the following management tools:

1) Fishing effort reductions. Effort reduction is the cornerstone of managing the ecological effects of fishing, including, but not limited to, effects on habitat. Both of the other management tools (gear restrictions or modifications and closed areas) may also require effort reduction to achieve maximum benefit. The success of fishing effort reduction measures will depend on the resilience and recovery potential of the habitat.
2) Modifications of gear design or gear type. Gear restrictions or modifications that minimize bottom contact can reduce habitat disturbance. In addition, shifts to a different gear type or operational mode may be considered, but the social, economic, and ecological consequences of gear reallocation should be recognized and addressed.
3) Establishment of areas closed to fishing. Closed areas are necessary to protect a range of vulnerable, representative habitats. Closures are particularly useful for protecting biogenic habitats (e.g., corals, bryozoans, hydroids, sponges, seagrass beds) that are disturbed by even low levels of fishing effort. Because area closures may displace effort to open fishing grounds, effort reductions may be necessary in some cases to reduce habitat impacts.

The optimal combination of these management approaches will depend on the characteristics of the ecosystem and the fishery—habitat type, resident seafloor species, frequency and distribution of fishing effort, gear type and usage, and the socioeconomics of the fishery. Each of these characteristics should be considered during development of management plans for mitigating the impacts of fishing on the seafloor.

Recommendation: The regional fishery management councils should use comparative risk

assessment to identify and evaluate risks to seafloor habitats and to prioritize management actions within the context of current statutes and regulations.

Risk assessment, in general, is a scientifically informed way of clarifying public debates over environmental policy by making the environmental consequences of particular policy choices explicit. Comparative risk assessment provides the following advantages for the task of benthic habitat protection.

- It can be used even in the absence of scientific certainty because it relies on a combination of available data, scientific inference, and public values.
- It provides simultaneous analysis of a wide range of risks to benthic habitats. Mobile bottom gear is only one of many factors contributing to the degradation of benthic habitats. Other factors might include pollution, drilling and natural disturbance.
- It enables stakeholder involvement in the decision-making process.

III. Policy Issues Raised by Existing Legislation

Recommendation: Guidelines for designating EFH and habitat areas of particular concern (HAPC) should be established based on standardized, ecological criteria.

The underlying aim of EFH concept is valuable and appropriately emphasizes the need to place management of exploited fishes within the context of managing the total ecosystem. However, the present designation of EFH does not require the use of consistent criteria with respect to the assignment of habitat to each life stage of species covered by fishery management plans. Instead, the regional councils develop the criteria, often based on data availability. Typically, current EFH designations are too extensive to form a practical basis for managing fisheries. Although this approach may assist in mitigating some habitat threats, it provides little guidance for evaluating the impacts of trawling and dredging. EFH designations need to be based on a clear understanding of the population biology and the spatial distribution of each species.

HAPC form a sub-set of EFH based on the ecological value of the area, its susceptibility to perturbation, and whether it is rare or currently stressed (National Marine Fisheries Service, 1997). Because these areas are known to play a vital role in the life cycle of exploited fish populations, they require the strongest safeguards to assure habitat protection. Nevertheless, no such protection is afforded in the current policy structure. HAPC should be clearly and narrowly defined with specific guidelines for determining the types of activities allowed and a timetable for reviewing the effectiveness of the designation.

Recommendation: A national habitat classification system should be developed to support EFH and HAPC designations.

Efforts to inventory and construct regional or national habitat maps require a classification system with common designations. Such a system would facilitate tracking of changes over time and would provide the basis for determining functional links between seafloor ecosystems and fisheries production. A classification system would assist in: 1) ranking different habitats according to the resilience of their biological communities and associated

fisheries; 2) estimating the vulnerability of the habitat to disturbance; and 3) managing habitat impacts based on the generalized results of research conducted in other geographic areas.

Future Research

In the course of this study, many gaps were identified in the current understanding of the impacts of fishing on the seafloor. The following recommendations are intended to direct research towards filling these gaps. They have been organized into three primary areas of research—gear impacts and modification, habitat evaluation, and management—with some overlap between categories.

Gear Impacts and Modification

Fishermen's knowledge and experience should be used to study gear impacts and develop new gear technologies. Their active engagement in research will help ensure that mitigation strategies are practical, enforceable, and acceptable to the fishing community. Further research on gear effects will be required to develop a predictive capability to link gear type and effort to bottom disturbance, fish production, and recovery times in particular habitats. New research should be directed toward:

- identifying the forces that injure and dislodge a range of benthic organisms;
- developing fishing gear with lower impacts, in terms of both habitat and other conservation goals such as bycatch reduction and maintenance of biological communities; and
- determining the relationship between fish production and bottom disturbance, especially for areas that continue to support fish despite chronic impact by fishing gear.

Habitat Evaluation

Most previous research studies have addressed habitat disturbance at small spatial scales with observations of short-term, acute disturbance and have focused on animal communities rather than ecosystem processes (e.g., productivity, nutrient regeneration). Closed areas should be used as control sites to study the chronic effects of seabed disturbance by trawl or dredge gear. Future research should examine:

- cumulative effects of trawling on sites that have been trawled repeatedly;
- repeated disturbances by fishing gear to determine the dose-response relationship as a function of gear, recovery time, and habitat type;
- recovery dynamics, with consideration given to estimating large-scale effects at current fishing intensities;
- acute and chronic effects of trawling in deeper water (>100 m); and
- recovery rates in stable and structurally complex habitats for which the return time will be measured in years to decades.

Evaluation of the indirect effects of bottom trawling and dredging will require experimentation, modeling, and comparison of different habitat types to analyze trends in benthic production and community structure relative to trends in fisheries production. This evaluation should include:

- impacts of habitat fragmentation on biological communities and the productivity of exploited fish stocks;
- rates and magnitude of sediment resuspension, nutrient regeneration, and responses of the plankton community in relation to gear induced disturbance; and
- long-term trend data on benthic production versus fisheries production.

Management

Productive interactions among stakeholders and policymakers should be enhanced through increased participation in research on the effects of fishing on the seafloor and development of alternative gears and practices. Interactions can be facilitated through user group funding of research and collaborative research between scientists and fishermen.

Development of better quantitative data for risk analysis will require research on the habitats and population dynamics of non-target species, specifically:

- adequate baselines for particular habitats and regions to document the effects of various fishery practices;
- testable hypotheses about how communities in different habitat types will respond to fishing;
- quantitative models to predict fishing effects in areas that have not been studied; and
- mortality estimates for non-target species.

NMFS should establish protocols for studying existing trawl and dredge area closures to evaluate the ecological, social, and economic impacts of habitat management strategies. This will facilitate assessment of various management alternatives in other locations. Aggregation and analysis of existing information on habitats, fishing effort, and efficacy of various management measures will help the regional fishery management councils meet their mandate to protect EFH. Research that will facilitate management decisions include:

- analysis of community structure and life history parameters to validate the use of frequency dependent distribution approaches for designating EFH and HAPC; and
- collection and analysis of data on the social and economic characteristics of trawl, dredge, and non-mobile gear fisheries to assess the tradeoffs among various management alternatives.

Conclusion

Integration of the available data on the effects of trawls and dredges, level of fishing effort, and distribution of seafloor habitats can provide practical, initial evaluations for informing management decisions regarding EFH. Current and new management measures should be assessed regularly to provide a better understanding of how various restrictions affect fish stocks and habitats, and to determine the socioeconomic impacts on the fishing industry and local communities.

However, existing data are not sufficient for optimizing the spatial and temporal distribution of trawling and dredging to protect habitat and sustain fishery yields. Resolution of the different, and at times conflicting, ecological and socioeconomic goals will require not only a

 copyright 2002, 2001 The National Academy of Sciences, all rights reserved

better understanding of the relevant ecosystems and fisheries, but also more effective interaction among stakeholders.