Northeast Fisheries Science Center Reference Document 93-24

Ecosystem Perspectives on Marine Resource Management

Report of a Scoping Meeting
September 16-18, 1992
Woods Hole, Massachusetts

NOAA/National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, MA 02543-1097

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Northeast Fisheries Science Center, Woods Hole, MA
Alaska Fisheries Science Center, Seattle, WA
Southwest Fisheries Science Center, La Jolla, CA
Chief Scientist's Office, Silver Spring, MD

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To obtain additional copies of this report contact, Information Services Unit, Northeast Fisheries Science Center, Woods Hole, MA 02543 (508-548-5123, ext. 260). The correct citation for the document is: NEFSC [Northeast Fisheries Science Center]. 1993. Ecosystem perspectives on marine resource management: Report of a scoping meeting, September 16-18, 1992, Woods Hole, Massachusetts. Woods Hole, MA: NOAA/NMFS/NEFSC. *NEFSC Ref. Doc.* 93-22.

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PREFACE

A proposal to convene a conference on ecosystem management of marine resources grew out of a 1990 workshop convened by the National Marine Fisheries Service (NMFS), to discuss implementation of the 1988 amendments to the Marine Mammal Protection Act, particularly those involving marine mammal-fishery interactions (NMFS 1991). The workshop recognized that the problems presented by multi-species management responsibilities under the Fisheries Management and Conservation Act, the Marine Mammal Protection Act, and the Endangered Species Act are more complex than the problems that the current suite of single-species management tools were designed to address. The workshop participants also noted that a growing amount of information from research at the ecosystem level is available, and that this information might usefully be converted to practical application.

There is increasing interest within NOAA and NMFS in addressing the management of protected species and commercial fishing from an ecosystem perspective. This is reflected in two NOAA strategic plans, one titled "Rebuild U.S. Fisheries" and the other "Coastal Ecosystems Health." Key directions within both of these plans are to expand assessment and monitoring functions to include ecological dimensions.

With the support of NMFS, a steering committee with representatives from most of the NMFS Science Centers was formed in 1991 to plan and convene a conference to address alternatives to single-species management for ecosystems that include both marine mammals and fishery resources. Subsequently, the steering committee developed a draft proposal for a six-day conference to include (1) a three-day symposium featuring presentations of prepared papers, (2) a one-day session meeting summarizing material presented during the symposium, and (3) a two-day workshop to combine the results of the meetings into a single report. To develop this proposal, the scoping meeting was convened.

Increasing interest in ecosystem level approaches is also reflected in a proposal by the U.S. Marine Mammal Commission for a workshop to review the degree of application of principles of wildlife management which emerged from a workshop held in 1975 (Holt and Talbot 1978). Representatives of the Marine Mammal Commission participated in the present meeting, serving to clarify the relationship between the two proposals. Subsequent to the scoping meeting reported here, the proposed Marine Mammal Commission workshop was rescheduled, and is now planned for March 1994.

INTRODUCTION

At the invitation of the National Marine Fisheries Service, a meeting was held in Woods Hole, Massachusetts, on September 16-18, 1992, to design and plan a conference on ecosystem management of marine resources. Participants included representatives of the National Marine Fisheries Service, who constitute the conference steering committee, and invited participants representing a range of expertise in methods of studying ecological systems (Appendix A).

During the scoping meeting, participants reviewed and modified a conference proposal drafted previously by the steering committee, following the agenda shown in Appendix B. The group addressed the purposes and objectives of the proposed conference, outlined the organizational framework for conference sessions, suggested topics for papers within those sessions, and identified a number of individuals who might be invited to present papers or chair conference sessions.

The scoping meeting participants further identified three types of products that could logically result from the conference and addressed how these could be best developed. Funding needs were identified and a tentative schedule for the conference was proposed.

OBJECTIVES OF THE SCOPING MEETING

The purpose of the scoping meeting was to review the draft conference proposal and refine it into a document that the steering committee could carry forward for purposes of obtaining support. Specifically, the scoping meeting participants were asked to:

(1) Revise and further define the design of the proposed conference.

(2) Define topics relevant to ecosystem-level management that should be addressed at the conference.

(3) Identify specialists working in the fields of ecosystem science to make presentations and serve as session chairs for the conference.

(4) Identify any documents that should be made available at the conference.

(5) Recommend conference date and location.

SCOPING MEETING DELIBERATIONS

The conference steering committee and invited participants reviewed the conference proposal and related material. The group supported the concept of the conference as a gathering of scientists who have been working at the ecosystem level, and professionals experienced in fisheries science and in converting science to management tools. The goals would be to review the current understanding of ecosystems and to convert this information into management strategies. In devising proposed management options, the group noted the need to remain practical and to base new management schemes on data that are obtainable and affordable. It was agreed that the primary purpose of the conference is to produce applicable management tools.

Along these lines, the group agreed it was important for both the scientific and management communities to define the terms that relate to ecosystem management. In addition, it is important to identify which options or approaches have the most potential for success (*i.e.*, supportable by scientific information), as well as where research is needed to fill information gaps.

The group felt it was essential to make it clear to managers that the proposed conference is not intended as a theoretical exercise. To be useful to management, the results of the meeting should do more than identify goals; it should explain how to achieve these goals. The group agreed that user groups must also be considered in designing the conference and identifying the products that would result, because these groups customarily influence policy decisions.

One suggested objective of the conference was to assess the current state of ecosystem knowledge. What are the critical uncertainties and what can be done about them? Also, how can we encourage the incorporation of current knowledge in management?

Participants agreed that other federal agencies with responsibilities for marine resources should be encouraged to take an active role in the conference since they have relevant expertise and are a potential audience for the kinds of recommendations that might be expected to result.

It was hoped that the results of the conference would stimulate the academic community to put

thought and effort into new areas and to apply its intellectual energies in a broader context.

DESIGN OF THE CONFERENCE

The group reviewed the proposed structure of the conference as presented by the steering committee, that is:

(1) a three-day symposium comprising about 30 prepared papers;
(2) one-day summary session meetings involving chairpersons and those who presented papers in order to produce a synthesis of each session; and
(3) a two-day workshop involving sessions chairs and organizers, charged with combining the results of the various session meetings into a single report.

SYMPOSIUM

The group expressed concern that a program calling for presentation of 10 substantive papers each day was probably overly ambitious, especially if time was to be provided for discussion. Possible alternative approaches would be to hold concurrent sessions, to differentiate between "major" and "minor" papers, or to encourage joint authorship of papers.

Participants compiled a list of possible topics for scientific papers, which were combined into ten categories that might be considered as sessions of the symposium (Appendix C). Participants then separated into four subgroups to further develop session proposals and to identify possible participants to prepare papers or chair sessions. The full group then reconvened to review and refine the session proposals.

Based on these deliberations, the group proposed a symposium that would include two one-day and two half-day sessions, as follows:

Session I: Ecological Bases for Marine Resources Management (one day)

To include up to seven topic areas addressing the theme from the population level, the community level or the ecosystem level. Proposed topic areas included:

(1) Life Histories and Parameters at the Single-Species Level

(2) Single-Species Interactions at the Community Level

(3) Guilds, Functional Groups and Other Multi-Species Considerations

(4) Abiotic Context of Ecosystems

(5) Flow of Matter and Energy Through Ecosystems

(6) Space-Time Continuum, including Evolutionary Considerations

(7) Synthetic and Emergent Properties of Ecosystems

Session II: Case Histories (one day)

A series of multi-author papers on case histories, related to seven ecosystem types:

(1) Upwelling Systems

(2) Sub-arctic Shelf Systems

(3) Temperate Shelf Systems

(4) Large Lakes

(5) Estuarine Systems

(6) Tropical Shelf Systems

(7) Oceanic Systems

Session III: Methods for Ecosystem Assessment and Management (half-day)

A two-part session, the first part focusing on methods for assessing and detecting change in ecosystem states and the second on methods for determining and moving ecosystems toward desired states. These would be addressed for:

(1) Lower Trophic Levels

(2) Fish and Fisheries

(3) Higher Trophic Levels

Session IV: Managing for Desirable Ecosystems (half-day)

Representatives of various constituencies would be asked to address four questions from a global perspective:

(1) What are desirable states?

(2) How do we get there?

(3) What are the advantages and disadvantages of current management approaches?

(4) What are the future alternatives?

For each session and topic area, several candidates were suggested to serve as session chairs or to present papers. An estimated 25 authors would be involved. The detailed list, including suggested individuals, are provided in Appendix D.

The group agreed that a member of the steering committee should be appointed to work with each session chairman in a liaison role. His or her duties would include such tasks as making the initial inquiry to those selected to contribute papers and assisting the session chair on logistical matters. The session chair would be responsible for coordinating the content of the session and producing the report of the session.

The group further agreed that those invited to present papers should be required to make their papers available for review three to six months prior to the symposium. It would be necessary to provide funds to support preparation of the papers, with payment ranging from $1000 to $4000 per paper, depending on costs and the amount of travel required to integrate the work of multiple authors. It was anticipated that three or four members of the steering committee would be designated to carry out the initial review and editing of the papers. Professional editing of the final papers would be provided as part of the publishing arrangement, discussed next.

POSTER SESSION

Although the group agreed it was necessary to limit the prepared papers to a manageable number, it was also recognized that many people interested in the conference would have substantial information to offer and, further, that some would not be able to obtain support from their institutions to attend unless they were making a presentation. Therefore, the group agreed to solicit one-page abstracts for one or more poster sessions to be held during the symposium. It is possible that the abstracts that are accepted could be published as a technical document to be made available at the time of the symposium. No limit was set on the number of posters in advance of the call for abstracts.

SESSION MEETINGS

Participants envisioned the symposium's one-day session meetings as the first opportunity for speakers and session chairs to meet in individual groups to review what happened in their respective sessions and to draft summary reports of the sessions. It was anticipated that additional integration may be required. For instance, new points may have emerged that the session participants would want to see carried over into the following workshop.

Scoping meeting participants concluded that the four session summaries resulting from this one-day meeting would likely represent Chapters 1-4 of a five-part report. These would be carried forward by the session chairs to the following two-day workshop, during which Chapter 5 (identified research recommendations and direction) would be developed. Thus, the task for the session meetings is for authors to advise session chairs on the summaries and what he or she should be talking about in developing the fifth chapter during the workshop that follows.

WORKSHOP

Participants concluded that the purpose of the workshop would be to distill the major information from the symposium in a way that would be useful to managers, legislators, and those who influence decision-making. The product of the two-day workshop would comprise Chapter 5 of

the report discussed earlier. It would include recommendations and research suggestions.

The group identified the following terms of reference/objectives/ goals for the workshop:

(1) Identify information needed for multi-species/ecosystem management;

(2) Evaluate/extract information and recommendations from conference sessions;

(3) Suggest improved configurations of scientific advice and management policy from an ecosystem perspective;

(4) Define ecosystem management in operational terms;

(5) Relate the workshop recommendations to existing frameworks (*i.e.*, the Endangered Species Act, Marine Mammal Protection Act, Magnuson Fisheries Conservation and Management Act, the Migratory Bird Act, and the Convention for the Conservation of Marine Living Resources); and

(6) Identify "best" targets for workshop products

Background Documents To Be Provided to Speakers

The group considered the types of background material that could be usefully provided in advance to the authors. It agreed that a final decision on this might best be left to the session chairs, who presumably would be most aware of what is current in the field. However, the group offered the following suggestions for inclusion as background material:

(1) The articles setting up the Convention on the Conservation of Antarctic Marine Living Resources;

(2) *New Principles for the Conservation of Wild Living Resources*, Wildlife Monograph #59 (Holt and Talbot 1978);

(3) A synthesis of pertinent legislation, including the Marine Mammal Protection Act, the Magnuson Fisheries Conservation and Management Act, and others;

(4) Pertinent publications from the International Council for the Exploration of the Sea, North Sea Task Force; and

(5) Reports from similar symposia or conferences.

PRODUCTS OF THE CONFERENCE

Scoping meeting participants spent some time discussing the products that ideally would result from the six-day conference. They identified three separate and distinct publications that would represent (1) scientists addressing scientists, (2) scientists addressing managers, and (3) scientists addressing users. These are:

(1) A volume of scientific papers presented during the three-day symposium, of potential value to other researchers;

(2) A five-part report that would include summaries of the four scientific sessions and a fifth section presenting research recommendations identified during the concluding workshop, for use by managers; and

(3) A brief (possibly 10 pages or less) and polished treatment of the issue aimed at focusing the interests of policy-makers, including both legislators and users, on the importance of taking an ecosystem perspective.

The group recognized that, for maximum influence, all three products should be as formal as possible. In addition, there is a need to be aggressive in disseminating the publications to ensure that the information is available to those who can make use of it.

With respect to a publisher, the group preferred to see the results of the symposium published in book form as opposed to a special volume in a scientific journal. There was agreement to try to place the publication with a large university press or a prestigious publishing house. It was also considered desirable to have the book published in both hard and soft cover so as to make a lower cost version available to students. This may be a criterion in choosing a publisher.

It was recognized that it would be necessary to hire the services of a professional rapporteur or

writer to prepare the second and third documents.

CONFERENCE MANAGEMENT, VENUE, AND DATES

It was the firm opinion of the scoping meeting participants that the proposed conference was of such importance and magnitude that it required the services of a professional conference management group.

In regard to venue, various locations were considered. It was felt that this would depend, to some extent, on who was selected to convene the meeting. It was considered that in order to attract policy-level people, the conference would have to be within driving time of Washington, D.C., that is, within 150 miles. Others felt that convening the meeting in an isolated area would lead to more fruitful discussions; otherwise people might come for only parts of the meeting.

It was suggested that some universities might be interested (for example, those participating in the Cooperative Marine Education and Research Program, such as University of Washington, University of Rhode Island, University of Massachusetts, Rutgers University) in hosting the proposed conference at their facilities.

Regarding dates for the conference, participants discussed possible conflicts with academic schedules, field seasons, and other major meetings that likely would draw some individuals that the proposed conference would attract.

In order to plan adequately for a conference of this magnitude, the group agreed that a 16-month lead time was needed. Specifically, the group suggested the following timetable:

Go/no-go decision:	At least 16 months before the Conference
Contracts let for papers:	One year before the Conference
Papers due:	Four months before the Conference

CONFERENCE BUDGET

The scoping group estimated a conference budget totaling $165,000, broken out as follows:

Preparation of Papers (including travel for collaboration by joint authors:	$65,000
Travel:	40,000
Professional Conference Management:	40,000
Rapporteur:	4,000
Publication of Results:	10,000
Miscellaneous:	6,000
TOTAL:	**$165,000**

POSSIBLE SOURCES OF FUNDING

The group considered possible sources of funding for the conference. Federal agencies identified included the National Marine Fisheries Service, the Fish and Wildlife Service, the Environmental Protection Agency, the National Science Foundation, and the National Academy of Sciences.

It was suggested that some private charitable foundations might also represent possible sources of funding. Those mentioned include the McKnight Foundation, Pew Charitable Trusts, MacArthur Foundation, and Packard Foundation.

Also mentioned as possibilities were the World Wildlife Fund and the National Fish & Wildlife Foundation.

COORDINATION WITH PLANNED "NEW PRINCIPLES" MEETING

During the scoping meeting, Dr. Lee Talbot met briefly with the group to discuss a meeting he is planning under contract to the Marine Mammal Commission (MMC). This meeting, planned for May 1993, would be a follow-on to the 1975 Airlie House meeting that resulted in the Wildlife Monograph No. 59, "New Principles for the Conservation of Wild Living Resources," by Holt and Talbot. The meeting was conceived with the idea of involving 35 to 40 participants who would "brainstorm" on issues facing wildlife management. Dr. Talbot sought the advice of the scoping meeting participants on key people whom he should contact with regard to this meeting.

Dr. Talbot explained to the scoping meeting participants that the purpose of the MMC workshop was to (1) review efforts undertaken since 1975 to improve management of wild living re-

sources, (2) review the state of knowledge and technology that would support or put into question these principles and their application, (3) review the status of management, (4) consider whether the "New Principles" monograph represents the best current thinking or whether underlying principles might have changed, and (5) address methods of implementing any changes. The meeting would focus largely on management issues but would also consider information needed in the related sciences.

Participants in the scoping meeting agreed that the product resulting from "New Principles" meeting could provide a framework for the proposed conference on ecosystem management, and that the two meetings could logically represent a continuum, with a number of individuals being involved in both. It was agreed that the two meetings were compatible and would complement one another, and that it would be important to continue to coordinate these efforts at the highest levels.

REVISED PROPOSAL

Appendix E contains the revised proposal for the Conference resulting from the work of the scoping meeting.

REFERENCES

National Marine Fisheries Service. 1991. Priorities for assessing marine mammals incidentally taken in commercial fisheries in the United States: report of the workshop held 5-7 March 1990, National Marine Mammal Laboratory, Alaska Fisheries Science Center. Alaska Fisheries Science Center Processed Report 91-19.

Holt, S. J., and L. M. Talbot. 1978. New principles for the conservation of wild living resources. *Wildlife Monograph* #59. Washington, D.C.: The Wildlife Society.

APPENDIX A

Scoping Meeting Participants

Steering Committee

Balsiger, James	NMFS Alaska Fisheries Science Center
DeMaster, Douglas	NMFS Southwest Fisheries Science Center
Fowler, Charles	NMFS Alaska Fisheries Science Center
MacCall, Alec	NMFS Southwest Fisheries Science Center
Murawski, Steve	NMFS Northeast Fisheries Science Center
Rosenberg, Andrew	NMFS Northeast Fisheries Science Center
Smith, Tim	NMFS Northeast Fisheries Science Center

Invited Participants

Ainley, David	Point Reyes Bird Observatory
Getz, Wayne	University of California, Berkeley
Hofman, Robert	Marine Mammal Commission
Jaworski, Norm	Environmental Protection Agency, Narragansett, Rhode Island
MacMahon, James	Utah State University
Rice, Jake	Pacific Biological Station, Nanaimo B.C.
Sherman, Ken	NMFS, Narragansett, Rhode Island
Siniff, Donald	University of Minnesota
Springer, Alan	University of Alaska, Fairbanks
Swartz, Steven	NMFS, Silver Spring, Maryland

Other

Baker, Jason	Alaska Fisheries Science Center
Montgomery, Suzanne	Rapporteur
Talbot, Lee	Marine Mammal Commission

APPENDIX B

AGENDA FOR SCOPING MEETING

Ecosystem Perspectives on Marine Resource Management
Woods Hole, Mass.
Sept. 16-18, 1992

First day (Weds., Sept. 16)

8:30am	Coffee/Tea welcoming
9:00am	Opening remarks, logistics and agenda.
9:10am	Presentation of objectives, goals, and background for the Scoping Meeting and how it will lead to the Conference. -explain role of non-Steering Committee participants as advisory to the Steering Committee.
9:30am	Presentation of proposed Conference design and function (as initially worked out by Steering Committee).
10:00am	Break
10:30am	Presentations by participants of Scoping Group, providing their perspective on management at the ecosystem level as it pertains to the objectives
Noon	Lunch break
1:30pm	Discussion of issues related to ecosystem management: - advantages vs. risks of single and multi-species management - what is management at the ecosystem level?
3:00pm	Break
3:30pm	Discussion and identification of topics to be covered in the main sessions of the Symposium (assuming proposed structure is maintained)
5:00pm	Assignment of subgroups (of the Scoping Group) to work on lists of participants for each topic/session, including the identification of session chairs.
5:30pm	Break for dinner and evening of informal discussion

Second day (Thurs., Sept. 17)

8:00am	Meetings of subgroups to identify invited participants and chairs, for each session
10:00am	Break
10:30am	Reconvene with presentations of recommendations of subgroups and discussion and resolution of overlaps, identify gaps, adapt a list of recommended participants to be invited, and prospective session chairs, and alternatives
Noon	Lunch break

1:30m Discussion and identification of procedures for Symposium:

-identify role of sessions chairs (e.g. contacting participants vs. having convening organization do so); writing of session overview with recommendations for final document
-identify latitude for unsolicited papers versus invited papers
-extent to which honoraria will be used to enlist participation of desired contributors
-professional organizations as options for convening

3:00pm Break

3:30pm Discussion of Session Meetings (session chairs with the speakers of their sessions)

-agendas
-terms of reference
-design of document(s) coming from each session

5:30pm Break for dinner and evening of informal discussion

Third day (Fri., Sept. 18)

8:00am Discussion of Workshop (meeting of session chairs, organizers, and documentation staff)
-chairperson
-agendas
-terms of reference, objectives, goals
-design of final document
-identify group responsible for writing report document

9:30 Documents that should be made available to (any phase) of the Conference

10:00am Break

10:30am Discussion of convening of Conference

-date and location of the Conference
-cost estimates
-identify group(s) to convene the meeting
-identify sources of funding and interested groups or agencies

Noon Lunch break - dismissal of non-Steering Committee members

1:30pm Meeting of the Steering Committee members in attendance to discuss the advice from the previous 2½ days

- define budget and needs for funding
- discuss how to use the report to seek funding from NMFS as well as from other agencies

3:00pm Break

3:30pm Discussion of process for convening meeting

- responsibilities for contracting
- review results with individuals contracted to produce report

5:00pm Closing remarks and adjourn

APPENDIX C

PROPOSED TOPICS FOR SCIENTIFIC PAPERS

(grouped into general topic areas that might serve as bases for Conference sessions)

I. Ecological Basis

- Session on first principles for ecosystems (papers on first principles that may have emerged from modeling, food web dynamics, trophic systems).
- Implications of site-specific predation patterns on exploited ecosystems.
- Environmental variability (including rare events), *vis-a-vis* ecological "crunches" and the degree to which fisheries might constitute such a vehicle.
- Current state of knowledge of the effects of human activities on ecosystem components and relationships.
- Implications to exploitation of (a) spatial heterogeneity and (b) dynamics of ecosystems.
- Review of fields of theoretical ecology in terms of what each field may contribute to advice on ecosystem management or why the field should not be used as basis for ecosystem management.

II. Tools

- Stock recovery plans in a multi-species context.
- Identifying mechanisms for returning to a desirable ecosystem state.
- Economic impacts of, and incentives for alternative management strategies.
- Technological mitigation in ecosystem management (are there ways to use specific devices?).
- Role of marine refugia for ecosystem management.

III. Management Strategies

- Some hypothetical systems of ecosystem management that we could try in the real world...alternative management strategies. ...examples of ecosystem management systems that we could test or have been tested, including moratoria. "Here's an ecosystem: If we could manage it, how would we do it?"
- What is meant by ecosystem management? (What are we attempting to do here?)
- Examples of currently practiced ecosystem management. To what degree is (has?) management of endangered species a surrogate for ecosystem management (the spotted owl syndrome)?
- Address the validity of the indicator species concept.

IV. Case Histories

- On a worldwide basis, review LMEs (Large Marine Ecosystems) and lessons that could be learned from them. Review of LME case histories.
- Causes of failures or successes of current management strategies (*e.g.*, poor advice, poor implementation, luck).
- Ecosystem states that have intentionally resulted from exploitation (with emphasis on the intention) ... what are the benefits of a manipulated system compared to one allowed to run its course?
- Current state of knowledge of the effects of human activities on ecosystem components and relationships.

V. Applied Population Dynamics

- Comparative population dynamics, including compensatory mortality and surplus production.
- Evolutionary impacts on exploited ecosystems--where it's headed due to effects of exploitation.
- Current state of knowledge of the effects of human activities on ecosystem components and relationships.

VI. Effect of Policy on Management

- Does large marine resource management based on competing legislation work?
- Review the types of decisions that currently constitute the management of marine resources, the advice it is based on, and how that advice would be different under a multi-species or ecosystem concept.

VII. Stress, Measures, and Ecosystem States

- Address how one monitors the changing states (health) of LMEs.
- Stress, mitigation, and sustainability of biomass in LMEs.

VIII. Desired Ecosystem State:

- What is a biologically desirable state or ecosystem?
- Environmental variability (including rare events), *vis-a-vis* ecological "crunches" and the degree to which fisheries might constitute such a vehicle.

IX. Biotic/Abiotic Understanding

- What's the state of knowledge or understanding with respect to ecological system relationships, biotic and abiotic?
- Environmental variability (including rare events), *vis-a-vis* ecological "crunches" and the degree to which fisheries might constitute such a vehicle.

X. Quantitative Frameworks

- Quantitative frameworks (tools) for multi-species management (modeling is a subset of this).

APPENDIX D

PROPOSED SESSIONS AND SESSION PARTICIPANTS

Session I: Ecological Bases for Marine Resources Management (one-day session)

P = population level C = community level E = ecosystem level

1. Life Histories & Parameters at the Single-Species Level (P)

Roger Doyle	Jon Roughgarden	Eric Charnov
John Shepherd	Ray Hilborn	

2. Species-Species Interactions at the Community Level (C)

Kjarten Magnuson	L. Okcakaya	James Kitchell
Jake Rice	Peter Sale	Michael Rosenzweig
Nils Daan		

3. Guilds, Functional Groups and Other Multispecies Considerations (C)

Tom Schoener (good contact for names)		Mary Power
Steve Hall	Steve Carpenter	Gary Polis
Dan Simberloff	George Sugihara	John Emlen
Jim Estes	Don deAngelis	

4. Abiotic Context of Ecosystems (E)

Anne Hollowed	Cliff Dahm	Tom Osmund
Ken Drinkwater	Bob Francis	John Hart
(also names from El Nino book)		

5. Flow of Matter and Energy through Ecosystems (E)

Steve Carpenter	Colleen Moloney	Geoff Evans
Robert Wissmar	Don Dugdale	
(also names from Benguela current symposium)		

6. Space-Time Continuims, incl. Evolutionary Considerations (E)

Wayne Getz	Si Levin	George Hunt
Bob Vrijnhoek	John Avise	

7. Synthetic and Emergent Properties of Ecosystems (E)

Steve Hall	Si Levin	John Steele
John Magnuson	Paul Dayton	Richard Wiegert
James MacMahon	Don Strong	Dave Schindler

Session II: Case Histories (one-day session)

Invited multi-author papers on a series of case histories related to seven ecosystem types; each paper to focus on:

1) Identifying the changes that have happened in the systems
2) Identifying the realized exploitation (usage?) patterns
3) Identifying the nominal policy objectives (these can be quite different from #2), and
4) Integrating the identified changes, realized exploitation patterns and policy objectives

The seven types of ecosystems:

1. **Upwelling Systems (Beneguela, Peru, California currents)**

   Robert Crawford, Dick Parrish, Dave Duffy
   Alec MacCall, (plus other Beneguela Current Symposium participants)

2. **Subarctic Shelf Systems (Bering, Barents, White Sea and Newfoundland area), focusing on marine mammal/fisheries interactions**

   John Pope, Odd Nakken, Allan Springer
   Peter Shelton, Terri Quinn, J. Walsh

3. **Temperate Shelf Systems (NW Atlantic, Georges Bank, Scotian Shelf, Yellow Sea, North Sea)**

   Niels Daan, Bob Furness, Andy Rosenberg
   Andy Foyle, Ram Myers

4. **Large Lakes (Laurentian Great Lakes, African Rift Lakes and Lake Baikal**

   John Magnuson, Jim Kitchell, Henry Regier

5. **Estuarine Systems (Chesapeake Bay and SF Bay), addressing demise of oyster fishery & boom of blue crab, nutrient loading, death of eelgrass beds, *i.e.*, connection of pollution/ environment/fisheries production ... or mouth of the Rhine/North Sea ... or Bristol Channel)**

   Bob Ulanowitz, Scott Nixon (URI)

6. **Tropical Shelf Systems (Gulf of Thailand, Philippines, Gulf of California, Great Barrier Reef, Gulf of Mexico)**

   Keith Sainesbury, Don Pauly

7. **Oceanic Systems (a catch-all category, global in nature)**

   Liz Edwards, Tom Polacheck, Bob Francis

These papers to be followed by a panel of the seven presenters discussing management successes: are they intrinsic to the ecosystem, intrinsic to the policy, or intrinsic to the realized exploitation (usage) patterns?

Session III: Methods for Ecosystem Assessment & Management (half-day session in two parts)

Part 1: Methods for assessing and detecting change in ecosystem states: a series of short (15-min.), co-authored papers on three topics, all to include abiotic and pollution considerations, followed by a fourth synthesis paper

1. **Lower trophic levels**

   Bob Dixon, Lowestoft, U.K.
   Peter Wiebe, Woods Hole
   Mike Mullen, Scripps
   Mike Fogarty, NMFS, Woods Hole

2. **Fish & fisheries**

   John Pope, Lowestoft
   Steve Murawksi, NMFS, Woods Hole
   Mike Fogarty
   Inigo Eversen, B&SS
   Geoff Kirkwood, Imperial College, London

3. **Higher trophic levels**

   John Croxall, B&SS
   Doug DeMaster, NMFS
   David Ainley, Point Reyes
   Geoff Kirkwood, Imperial College, London

4. **Synthesis (a modeler)**

   Mark Mangel and/or Si Levin

Part 2: Methods for deciding the direction and moving ecosystems toward the desired state (environmental impact assessments, multi-species recovery plans, refugia, technological fixes, regulations and incentives)

John Beddington and Colin Clark

Session IV: Managing for Desirable Ecosystems (half-day session)

Objectives

1. What is a desirable state(s)?
2. How do we get there (the big picture)?
3. Current management approaches .. pros and cons
4. Future alternatives ... specific steps in implementing a regime to research these desirable states

Representatives of the following constituencies will be asked to address these four objectives from a global perspective

1. Non-governmental organizations

   Roger McManus (CMC)
   Bill Sutton (WWF)

2. Fisheries agencies

   Lee Alverson
   Andy Kammener
   NE Region rep

3. Ecological scientists

   Saul Saila
   Bud Cross
   Brian Rothschild

4. Legislative groups

   Rep. Gerry Studds
   Karen Steuer (Rep. Studds' office)
   Jeff Pike

5. Intergovernmental organizations

   Jim Joseph (IATTC)
   Derry Powell (CCAMLR)

6. Synthesis (Chair)

   Peter Larkin
   Warren Wooster

Dinner Speaker: Gerry Studds, Al Gore

APPENDIX E

Proposal for a Conference
ECOSYSTEM PERSPECTIVES ON MARINE RESOURCE MANAGEMENT

STATEMENT OF SIGNIFICANCE

The proposed Conference addresses fundamental assessment issues, and is of national significance in meeting explicit requirements placed on the National Marine Fisheries Service (NMFS) by the Marine Mammal Protection Act (MMPA) and the Fisheries Conservation and Management Act (FCMA). Population assessments of both marine mammals and fisheries must be conducted within an ecosystem context. Developing means to manage resources at the ecosystem level is imperative. Whether or not current assessments are scientifically sound is of fundamental importance. The proposed Conference is responsive to recommendations by the Marine Mammal Commission to move toward incorporating ecosystem principles in management objectives and assessment procedures.

INTRODUCTION AND BACKGROUND

It is widely recognized that single species approaches to resource management have met with limited success. The Fisheries Conservation and Management Act and the Marine Mammal Protection Act, (as well as some international agreements) require management at the ecosystem level. Specific requirements include determining current carrying capacity for managing marine mammals, and more generally, maintaining the health and stability of ecosystems. It is necessary to interpret ecosystem conditions to infer estimates of carrying capacity for managed species. NMFS is responsible for multiple stocks of fish and marine mammals that are subject to management mandated within the context of their interactions and ecosystems.

A principal recommendation of a workshop (Seattle, 1990) on implementation of the 1988 amendments to the MMPA was to hold a conference dealing with long-term solutions to management of marine mammal/fisheries interactions. The Marine Mammal Commission (MMC) has also recommended that a conference be held to work toward more realistic management including management in an ecosystem context. While NMFS is primarily concerned with marine systems, there are issues of common concern to managers of terrestrial and freshwater ecosystems as well. Considering ecosystems in general will facilitate the development of approaches to marine ecosystem management.

Since the early 1970s scientists have learned a great deal about the structure and function of ecosystems and biological communities. A great deal of information has been collected on both terrestrial and marine ecosystems. These data can be used to compare ecosystems with the goal of discerning patterns and principles of practical importance. It is imperative that this knowledge be applied to address the challenges of managing interacting species. Approaches for applying such knowledge to achieve legislatively required management need to be clearly prescribed.

To deal with the concerns described above, a group of scientists within NMFS (the Ecosystems Steering Committee) was formed to organize and seek funding for holding a Conference on ecosystem management. The general objectives of the Conference are to 1) translate knowledge of general ecosystem principles into improved ecosystem-level management methods, particularly in application to fishery and marine mammal interactions, 2) provide longer term alternatives for the existing interim management strategies to deal with marine mammals, fisheries and their interactions; and 3) address the general matter of how to approach the management of marine ecosystems. Specific objectives and design of the proposed Conference were worked out at a three-day scoping meeting held in Woods Hole, Massachusetts (September, 1992). The Steering Committee and ten invited specialists from other agencies and universities participated in the scoping meeting. Other accomplishments of the scoping meeting include:

1) A list of topics relevant to ecosystem-level management to be addressed at the Conference.

2) A list of potential Conference participants from specialists working in the field of ecosystem sciences.
3) Approximate dates and location for the Conference
4) Funding requirements and potential sources.

The participants at the scoping meeting view this Conference as an essential step in addressing fundamental assessment issues, and is of national significance in meeting explicit requirements placed on the NMFS by the MMPA, the FCMA and several international agreements.

METHODS

The proposed six-day Conference would consist of three parts. First, about 20 to 30 invited papers would be presented and discussed during a three-day **Symposium** composed of topic sessions. Second, one day would be devoted to **Session Meetings** where chairpersons and the people who presented papers would draft a synthesis of the practical implications and methods for applying the material presented in each session. Third, a two-day **Workshop** attended by the session chairs and a small support crew would be held to present and discuss the material contained in the session reports and to draft a final report and recommendations.

Symposium

Individuals selected to present papers would be required to submit manuscripts to their session chairs three months in advance of the Conference. The session chairs would read the papers and prepare draft session reports to be available at the Symposium along with copies of the papers. During the Symposium the session chairs would coordinate the presentation of papers, and modify their session reports based on the oral presentations and any discussion.

Eight to ten papers would be presented each day. Sufficient time would be allowed for questions and discussion of each paper and ample breaks would provide for further discussion. Attendance by people not presenting papers should be encouraged to promote discussion and to allow related information to come to the attention of presenters and chairs. To help in this regard, poster sessions would be scheduled during the Symposium. Issues raised during such discussion would later be considered in developing session reports. Following the Symposium, the papers presented would be published collectively as a book or special issue of a recognized journal.

Session Meetings

The specialists who presented papers at the Symposium would meet on the day following the Symposium to work with their session chairpersons. During these meetings, each group would discuss the content of their session. They would review the draft session report and produce a synthesis of each session to be included in their report. The Session Meetings and the resulting reports would have three goals:

1) To present the practical management value of the material covered in each session. Specifically, the session reports should contain suggested management strategies, criteria, or prescriptions for decisionmaking. Alternative management options should receive particular emphasis if they appear to meet management needs better than single species approaches.
2) To identify research that would improve management of interacting species and ecosystems.
3) To explore the limitations of specific ecosystem-level management methods regarding their potential for practical application. This exercise would help to avoid expending energy on research in areas which are unlikely to have any practical application, or are unlikely to be more successful than a single species approach.

Workshop

Following the summary sessions, the chairpersons of each session will meet for a two-day Workshop led by a chairperson other than one of the sessions' chairs. This group would require the services of a rapporteur (not a session chair but intimately familiar with the general focus of the meetings) and a facilitator.

During the Workshop each session chair would present their report for discussion. These reports would be modified, if necessary, and compiled for the workshop report.

The Workshop would focus on the applicabil-

ity of the information from the Symposium presentations and resulting management strategies. Particular attention would be given to practical strategies that are of direct use to managers of biological resources. The final workshop report should list simple explicit formulations for management action as the document of most significance to managers and the agency.

An important activity of the Workshop would be to evaluate the recommendations resulting from the Symposium and Session Meetings. Single species management approaches would be a reference point for evaluation since the intent is to improve management in multispecies systems. Alternative management methods may be intended to complement existing strategies. Such methods need not be better than existing techniques. Others may be suggested as complete replacements for existing approaches under certain circumstances. In this case, the participants of the Workshop would need to decide if the potential alternatives can be judged to be better than current single species approaches and why.

Proposed sessions with topics for scientific papers -

I. Ecological Basis for Ecosystem Management

This session would examine the basic scientific principles of for ecosystem management, which may have been demonstrated by theory, or studies involving modeling, or fields such as food web dynamics, and trophic systems. Branches of theoretical ecology would be reviewed to determine what they can and cannot contribute to ecosystem management. The management implications of site-specific predation patterns on exploited ecosystems, environmental variability (including rare events and the effects of fisheries), and spatial heterogeneity would be treated. Related topics would include comparative population dynamics (including compensatory mortality and surplus production), and the evolutionary impacts of exploitation on ecosystems. This session would need to consider what constitutes a biologically desirable state for an ecosystem as a reference point for stress evaluation mitigation and sustainability of biomass, particularly in large marine ecosystems. This session would address the state of knowledge or understanding with respect to ecosystem relationships, both biotic and abiotic. Quantitative frameworks for understanding multi-species systems, including modeling, would be evaluated.

II. Instruments for Management & Monitoring

In this session, tools for ecosystem management would be identified and evaluated. Examples include stock recovery plans in a multispecies context, mechanisms for returning an ecosystem to a desirable state, economic impacts and incentives for alternative management strategies, the technology of mitigation, and the role of marine refugia for ecosystem management. An important discussion would be on how to achieve biologically desirable states of ecosystems. Other important topics include the means for monitoring changing states (health) of ecosystems, and the validity of the indicator species concept.

III. Case Histories of Ecosystem Management

In this session, previous successes and failures of ecosystem level management would be presented and evaluated. This group would review ecosystems world wide, their management, and the lessons from these experiences. The successes or causes of failures of current management strategies (*e.g.*, poor advice, poor implementation, luck) would be addressed. In this context, this session would consider the current state of knowledge of the effects of human activities on ecosystem components and relationships. The group would consider ecosystem states that have intentionally resulted from exploitation to determine what the benefits and disadvantages of manipulated systems are compared with unaltered or undisturbed systems. The record of management based on competing legislation will be evaluated.

IV. Management Strategies

Participants in this session would address testable or tested systems of ecosystem management, including moratoria. This group will address the definition of ecosystem management and (in common with at least one other session) means for achieving biologically desirable states of ecosystems. This session should review the types of decisions that constitute marine resource management, the advice management is based on, and how that advice would be different under a multi-species or ecosystem management regime. Evaluation of ecosystems and measures of ecosystem level stress, together with measures for mitigation and achieving sustainability of bio-