SOUTHWEST FISHERIES CENTER

NATIONAL MARINE FISHERIES SERVICE SOUTHWEST FISHERIES CENTER P.O. BOX 271 LA JOLLA, CA 92038

JANUARY 1989

A Report on the NOAA WORKSHOP FOR ECOSYSTEMS RESEARCH PROGRAM PLANNING and AN ECOSYSTEM APPROACH TO MANAGEMENT OF THE FISHERY RESOURCES OF A SUB-TROPICAL SEAMOUNT

by

D. J. Mackett and George Boehlert

ADMINISTRATIVE REPORT LJ-89-01

A Report on the

NOAA WORKSHOP FOR ECOSYSTEMS RESEARCH PROGRAM PLANNING

held at the
Southwest Fisheries Center, La Jolla, California
April 26-28, 1988

by

D. J. MACKETT

Southwest Fisheries Center
La Jolla, California

and

AN ECOSYSTEM APPROACH TO MANAGEMENT OF THE FISHERY RESOURCES OF A SUB-TROPICAL SEAMOUNT

A Program Proposal Based on the

NOAA WORKSHOP FOR ECOSYSTEMS RESEARCH PROGRAM PLANNING

BY

GEORGE BOEHLERT

Southwest Fisheries Center
Honolulu Laboratory
Honolulu, Hawaii

JANUARY 1989

SWFC ADMINISTRATIVE REPORT LJ-89-01

A Report on the

NOAA Workshop for Ecosystems Research Program Planning

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D. J. Mackett
Southwest Fisheries Center
July 12, 1988

An Ecosystem Approach to Resource Management in a Sub-Tropical Seamount

Introduction

The Pacific Oceanic Regional Marine Ecosystem encompasses the broadest geographic range and ecological diversity of any of the Regional Marine Ecosystems (RME's) under consideration by NMFS. It is subdivided into Insular and Pelagic Ecosystems. For the purposes of the FY90 Coastal-Ocean Initiative, we will initially concentrate on the Insular Ecosystem. The interaction between Insular and Pelagic Ecosystems is greater than in continental shelf regions, however, so closer attention will need be paid the pelagic environment.

The Pacific Insular Ecosystem refers to the marine ecosystems associated with islands, atolls, reefs, and seamounts in the tropical and subtropical Pacific Ocean. These features are mostly of volcanic origin and rise from the deep Pacific floor. Near the ocean's surface, they are manifested as horizontal shelf or bank areas that have been created by wave erosion due to changes in sea level and subsidence. In some areas, flat-topped seamounts (or guyots) mimic this shape with summits at various depths. Flat shelf or bank areas are frequently found down to depths of 100 m. Deeper than 100 m, the deep slope often follows the steep contour of the volcanic cone. Coral reefs and sand patches cover the shelf areas while coral rubble, sand, and volcanic rock are the substrate in the deep slope areas.

Considerable variation in physical systems exists in the different geological features (islands, atolls, reefs, and seamounts), as well as between similar features of different size, age or latitude. On a broad geographical scale, climatic variation alters the insular marine environment; significant seasonal variation in atmospheric systems, water temperature, wave conditions, and currents all contribute to a wide range in physical conditions. Longer temporal scale events such as El Nino have important impacts on insular populations. In general, the physical conditions of insular marine ecosystems are mediated by variability in the adjacent pelagic ecosystems.

Just as the insular habitat is partitioned into a shelf and a deep slope habitat, the insular ecosystem can be partitioned into a coral reef ecosystem and a deep slope ecosystem. The coral reef ecosystem is complex and supports a rich and diverse assemblage of species linked from primary production to the apex predators in six trophic levels. The resources frequently targeted by fishermen tend to be near the top of the trophic system and include jacks, crustaceans, and shallow water snappers and groupers. Other harvesting of intermediate trophic level resources includes baitfishes and several molluscs.

At depths greater than 100 m, the deep slope ecosystem is based on either exogenous (i.e. zooplankton) or infaunal production and may have only three or four trophic levels. The deepwater snappers and groupers, deep-sea shrimps, and precious corals are the most frequently fished deep slope resources. Virtually all of the resources mentioned above can sustain relatively low yields. An exception may be found in subtropical to temperate regions, however, where seamount ecosystems are less diverse yet support a higher biomass.

As a first step in ecosystem modeling of insular systems, we propose that the initial funding for the Pacific Oceanic RME from the Coastal-Ocean Initiative proceed immediately with development of a modeling approach to a subtropical seamount ecosystem. There are several benefits to this approach. First, the complexity of tropical island ecosystems make modeling a difficult undertaking even without incorporating management considerations into the model; seamounts are less complex and thus more amenable to model development; results will later be extended to tropical islands. Second, the SWFC Honolulu Laboratory has implemented a Seamount Resources Program which takes an ecosystems approach in its current research; the costs associated with the program would thus not be as large an increment above current base budget as would a new initiative in a more complex system.

Objectives

The final objective is to understand the Pacific Insular Ecosystem and the factors that influence the productivity of its living marine resources and to translate that understanding into improved resource management that provides for the conservation and optimum use of those resources. We propose to work initially in the program element of this RME named the Subtropical-Temperate Seamounts. In the higher latitudes of the Pacific Oceanic Ecosystems, islands are relatively rare compared to tropical regions, but seamounts of varying summit depth occur in abundance; many seamounts are in international waters. There is a greater range of environmental variability, both seasonal and interannual, as the subtropical and subarctic fronts vary in latitudinal position. The fauna changes from tropical to temperate and includes many seasonal migrants. Deeper seamounts of the central North Pacific (between lat. 29° and 34°N) have supported highly productive fisheries, but stocks have been depleted. Assessment and management of such international or transboundary stocks will require international cooperation.

Within the U.S. Exclusive Economic Zone (EEZ), the pelagic armorhead and precious coral fisheries are managed by the United States under FMP's of the Council. The international armorhead fishery has ranged between 50,000 and 200,000 metric tons annually (due to high variability in abundance), with the U.S. EEZ currently closed to fishing while stocks are allowed to recover. The international precious coral fishery is worth $25 million (ex-vessel value), with many of the recent landings being

harvested in the vicinity of the U.S. EEZ. Precious coral jewelry is also an important manufacturing industry in Hawaii, where most of the raw product is imported.

Within the context of the overall objective mentioned above, we propose further to assess status of stocks and encourage international management for transboundary or international stocks of insular species. The principal resource in this program element of interest to the United States at this time is the seamount groundfish complex, mainly pelagic armorhead and, to a limited extent, alfonsin, and dory; precious corals are also important and are presently under an FMP. We will begin by modeling a single seamount; although the majority of the armorhead population is in international waters extension of the modeling effort will be relatively simple. We will take an ecosystem approach to understanding the ecology and management of the pelagic armorhead in the EEZ around Hawaii, and modeling of seamount ecosystems will be considered under objectives and milestones of the Hawaiian Archipelago Program Element. Efforts will also be expended to develop international cooperation with the goal of international management of all seamount resources should it prove feasible.

Implementation Strategy (See Flow Chart)

Developing an ecosystem approach to management of an entire archipelago, island, or seamount range is a longer range objective which must proceed stepwise. We propose to initially work at Southeast Hancock Seamount, which is within the U.S. EEZ. In the text which follows, numbers in parentheses refer to numbered boxes in the flow chart.

Implementing an ecosystem management approach to a seamount ecosystem will proceed on three parallel research tracks which all feed into model development. The first is a combination of traditional fisheries research (8,35) and fisheries oceanography (9a, 36, 7); fisheries data will be collected and analyzed and current stock levels will be assessed(10,11, 12). The historical fishery at the central North Pacific seamounts took approximately one million metric tons of pelagic armorhead over a ten-year period. Although the Japanese continue a small scale fishery on seamounts in international waters, there is a closure on fishing these seamounts within the U.S. EEZ, where Southeast Hancock Seamount is found. We have analyzed Japanese data, but lack Soviet data. More sophisticated models to analyze existing data are underway as are efforts to obtain Soviet data (1). The ultimate objective here is to reconstruct the stock dynamics, to determine the population response to exploitation, and to determine the role of environmental factors in recruitment variability (27). The latter effort will require access to oceanographic data bases covering much of the North Pacific Ocean (36, 7, 3).

The second research area is similarly traditional fisheries

respect to each pair of projects with a yes or no. A consensus was strived for, but in many instances narrow majorities determined the group's answers. In any case, a preliminary structure of the "most-important" projects was produced (Figure 1). This structure was displayed on the magnetic wall of the meeting room and the participants were invited to critique and discuss the relationships among the projects.

Later the Task Force was asked to revise the structure in light of the discussions held in the workshop and especially to resolve the large "cycle" of 11 projects that at first asking seemed to be totally mutually supportive, but under further scrutiny could be logically separated. A revised structure including the "cycle" resolution was developed (see Figure 2).

Preliminary Specification of Projects

The participants were asked to develop preliminary specifications for each of the projects that were suggested. Specifications were indicated on a form requesting project identification and title, list of major activities, resources required; (i.e., FTEs, Funds, Shiptime, Equipment) and an indication of the project's duration or time to completion. A summary of the project specifications for each project indicated in Figure 2. is given in Appendix E. The preliminary budget calls for 161 FTEs and $16.2KK over a period estimated to be between 5 and 8 years (Appendix E). Scheduling of the work has not yet been attempted.

Responsibility for Further Planning and Carrying Out the Projects

Participants were asked to indicate what NOAA organizations, by virtue of their mission, should have a role in the further definition, specification and carrying out of the program's projects. A brainstorming session was held and a list of potential participants was developed for each project. Another brainstorming session attempted to identify which agency from among those with a role should take the "lead" role in further development of each project but it was decided that the "lead role" designation should be worked out among the NOAA Directors whose agencies or offices will be associated with the program. Appendix E.

Management of the Program

The participants were asked to suggest options that should be considered for managing the California Current Ecosystem Demersal Resources Program within NOAA. Several options were suggested which can be classified under three broad alternatives: 1) utilization of the existing Chain of Command, wherein program management responsibility is vested in the upper-levels of the NOAA or NMFS hierarchy, 2) Special Program Office located somewhere within the NMFS hierarchy; and 3) various collegial

Figure 1

WORKSHOP FOR ECOSYSTEMS RESEARCH PROGRAM PLANNING: CALIFORNIA CURRENT-DEMERSAL RESOURCES

Preliminary Structure April 27, 1988

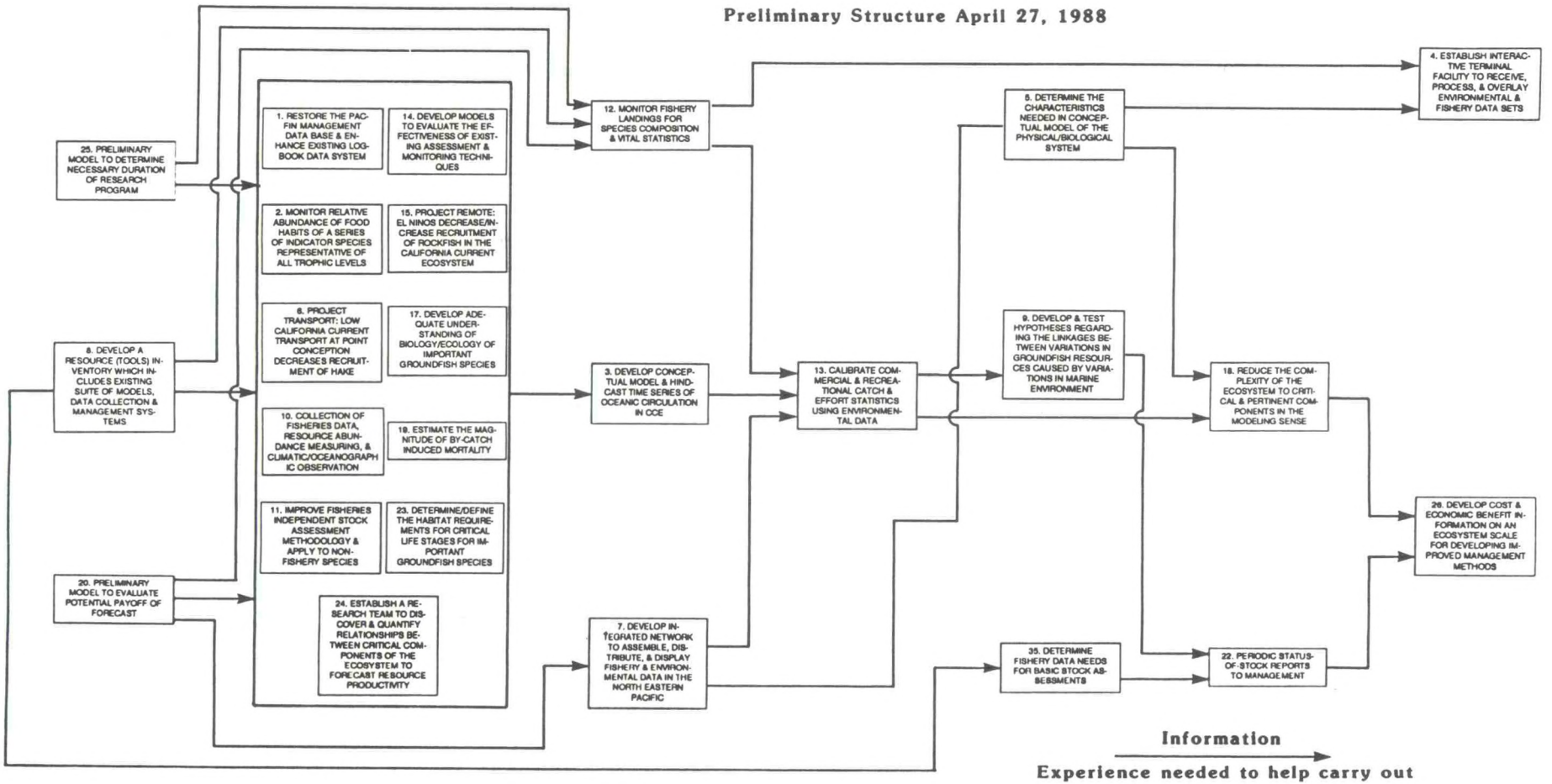
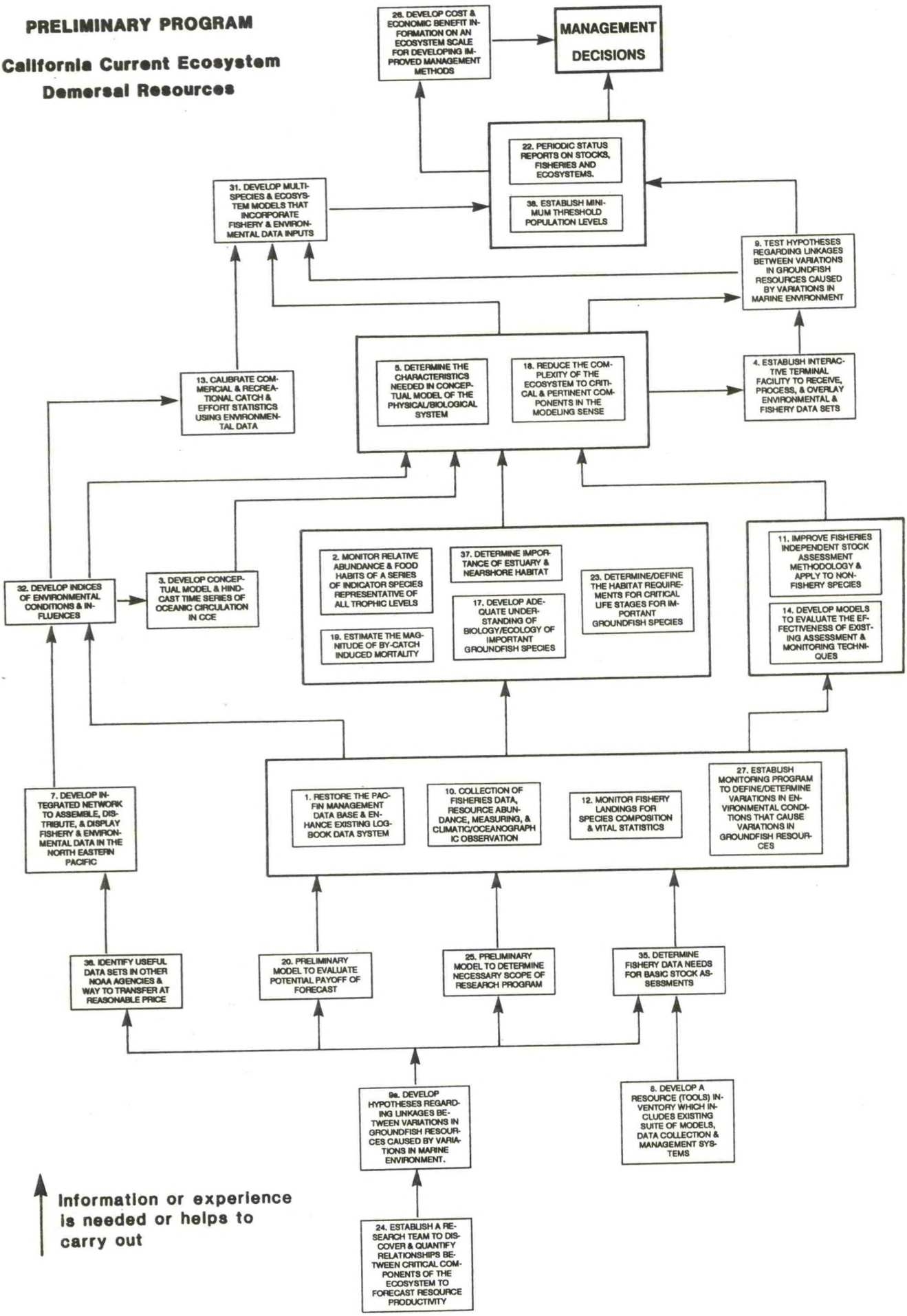


Figure 2


PRELIMINARY PROGRAM
California Current Ecosystem
Demersal Resources
26. DEVELOP COST & ECONOMIC BENEFIT INFORMATION ON AN ECOSYSTEM SCALE FOR DEVELOPING IMPROVED MANAGEMENT METHODS
MANAGEMENT DECISIONS
22. PERIODIC STATUS REPORTS ON STOCKS, FISHERIES AND ECOSYSTEMS.
38. ESTABLISH MINIMUM THRESHOLD POPULATION LEVELS
31. DEVELOP MULTI-SPECIES & ECOSYSTEM MODELS THAT INCORPORATE FISHERY & ENVIRONMENTAL DATA INPUTS
9. TEST HYPOTHESES REGARDING LINKAGES BETWEEN VARIATIONS IN GROUNDFISH RESOURCES CAUSED BY VARIATIONS IN MARINE ENVIRONMENT
13. CALIBRATE COMMERCIAL & RECREATIONAL CATCH & EFFORT STATISTICS USING ENVIRONMENTAL DATA
5. DETERMINE THE CHARACTERISTICS NEEDED IN CONCEPTUAL MODEL OF THE PHYSICAL/BIOLOGICAL SYSTEM
18. REDUCE THE COMPLEXITY OF THE ECOSYSTEM TO CRITICAL & PERTINENT COMPONENTS IN THE MODELING SENSE
4. ESTABLISH INTERACTIVE TERMINAL FACILITY TO RECEIVE, PROCESS, & OVERLAY ENVIRONMENTAL & FISHERY DATA SETS
32. DEVELOP INDICES OF ENVIRONMENTAL CONDITIONS & INFLUENCES
3. DEVELOP CONCEPTUAL MODEL & HINDCAST TIME SERIES OF OCEANIC CIRCULATION IN CCE
2. MONITOR RELATIVE ABUNDANCE & FOOD HABITS OF A SERIES OF INDICATOR SPECIES REPRESENTATIVE OF ALL TROPHIC LEVELS
19. ESTIMATE THE MAGNITUDE OF BY-CATCH INDUCED MORTALITY
37. DETERMINE IMPORTANCE OF ESTUARY & NEARSHORE HABITAT
17. DEVELOP ADEQUATE UNDERSTANDING OF BIOLOGY/ECOLOGY OF IMPORTANT GROUNDFISH SPECIES
23. DETERMINE/DEFINE THE HABITAT REQUIREMENTS FOR CRITICAL LIFE STAGES FOR IMPORTANT GROUNDFISH SPECIES
11. IMPROVE FISHERIES INDEPENDENT STOCK ASSESSMENT METHODOLOGY & APPLY TO NON-FISHERY SPECIES
14. DEVELOP MODELS TO EVALUATE THE EFFECTIVENESS OF EXISTING ASSESSMENT & MONITORING TECHNIQUES
7. DEVELOP INTEGRATED NETWORK TO ASSEMBLE, DISTRIBUTE, & DISPLAY FISHERY & ENVIRONMENTAL DATA IN THE NORTH EASTERN PACIFIC
1. RESTORE THE PACFIN MANAGEMENT DATA BASE & ENHANCE EXISTING LOGBOOK DATA SYSTEM
10. COLLECTION OF FISHERIES DATA, RESOURCE ABUNDANCE, MEASURING, & CLIMATIC/OCEANOGRAPHIC OBSERVATION
12. MONITOR FISHERY LANDINGS FOR SPECIES COMPOSITION & VITAL STATISTICS
27. ESTABLISH MONITORING PROGRAM TO DEFINE/DETERMINE VARIATIONS IN ENVIRONMENTAL CONDITIONS THAT CAUSE VARIATIONS IN GROUNDFISH RESOURCES
36. IDENTIFY USEFUL DATA SETS IN OTHER NOAA AGENCIES & WAY TO TRANSFER AT REASONABLE PRICE
20. PRELIMINARY MODEL TO EVALUATE POTENTIAL PAYOFF OF FORECAST
25. PRELIMINARY MODEL TO DETERMINE NECESSARY SCOPE OF RESEARCH PROGRAM
35. DETERMINE FISHERY DATA NEEDS FOR BASIC STOCK ASSESSMENTS
9a. DEVELOP HYPOTHESES REGARDING LINKAGES BETWEEN VARIATIONS IN GROUNDFISH RESOURCES CAUSED BY VARIATIONS IN MARINE ENVIRONMENT.
8. DEVELOP A RESOURCE (TOOLS) INVENTORY WHICH INCLUDES EXISTING SUITE OF MODELS, DATA COLLECTION & MANAGEMENT SYSTEMS
Information or experience is needed or helps to carry out
24. ESTABLISH A RESEARCH TEAM TO DISCOVER & QUANTIFY RELATIONSHIPS BETWEEN CRITICAL COMPONENTS OF THE ECOSYSTEM TO FORECAST RESOURCE PRODUCTIVITY

options, wherein either ad hoc or more formal "committees" of NOAA managers operate the program.

Details of some of the options are given in Appendix F.

Next Steps

The workshop participants were asked: **In the context of furthering the development of the Demersal Resources Program Plan, what are the important next steps that need to be taken?**

Most of the individuals stated that following the Task Force's one-day clean-up of the plan, the plan should be further developed either through a SWFC/NWAFC group or a more broadly constituted group. Emphasis was placed on presenting the outline of the plan to the West Coast Directors and to the NMFS hierarchy so that organizational and budgeting decisions can be made. Other aspects of the California Current ecosystem program (i.e., anadromous, littoral and pelagic) and the overall Pacific Oceanic Ecosystem Program also need to be planned.

APPENDIX A

NOAA Workshop for Ecosystems Research Program Planning

Southwest Fisheries Center

La Jolla, California

April 26-28, 1988

Convenor

Dr. Izadore Barrett
Science and Research Director,
Southwest Region
Southwest Fisheries Center
P.O. Box 271
La Jolla, CA 92038

FTS 893-7067

Facilitators

Mr. Dave Mackett, Planning Officer
Southwest Fisheries Center
P.O. Box 271
La Jolla, CA 92037

FTS 893-7069

Ms. Susan Jacobson
Computer Programmer Analyst
Southwest Fisheries Center
P.O. Box 271
La Jolla, CA 92037

FTS 893-7060

Participants

Dr. Eddie Bernard, Director
Pacific Marine Environmental
Research Laboratory
NOAA
7600 Sand Point Way N.E.
BIN C15700
Seattle, WA 98115-0070

FTS 392-6800

Dr. George Boehlert, Director
Honolulu Laboratory
Southwest Fisheries Center
2570 Dole Street
Honolulu, HI 96822-2396

FTS 808-943-1253

Mr. Steve Cook, Physical Oceanographer
National Ocean Service
NOAA
P.O. Box 271
La Jolla, CA 92038

FTS 893-7103

Dr. Doug DeMaster, Chief
Fishery-Marine Mammal
Interactions Division
Southwest Fisheries Center
P.O. Box 271
La Jolla, CA 92038

FTS 893-7165

Dr. Glenn Flittner, Acting Director
Office of Research & Environmental
Information
National Marine Fisheries Service
1825 Connecticut Avenue, N.W.
Washington, D.C. 20235

FTS 673-5366

Mr. Svein Fougner, Chief
Fisheries Management
and Analysis Branch
Fisheries Management Division
Southwest Regional Office
300 S. Ferry Street, Room 2011
Terminal Island, CA 90731-7415

FTS 795-6660

Dr. Dan Huppert, Chief
Commercial and Recreational
Fisheries Research for Management
Southwest Fisheries Center
P.O. Box 271
La Jolla, CA 92038

FTS 893-7114

Mr. Norris Jeffrey, Planning Officer
Northwest & Alaska Fisheries Center
7600 Sand Point Way N.E.
BIN C15700
Seattle, WA 98115-0070

FTS 392-4005

Dr. Mike Laurs, Leader
Coastal Eastern Pacific Fisheries
Environmental Investigations
Southwest Fisheries Center
P.O. Box 271
La Jolla, CA 92038

FTS 893-7086

Dr. Bill Lenarz, Leader
Groundfish Analysis
Tiburon Laboratory
Southwest Fisheries Center
3150 Paradise Drive
Tiburon, CA 94920

FTS 556-0565

Dr. Alec MacCall, Director
Tiburon Laboratory
Southwest Fisheries Center
3150 Paradise Drive
Tiburon, CA 94920

FTS 556-0565

Dr. Doug McLain, Oceanographer
Ocean Applications Group
National Ocean Service
c/o Fleet Numerical Oceanography Center
Monterey, CA 93940

FTS 408-646-8068

Dr. Geoff Moser, Leader
Ecology and Systematics of Fishes
Southwest Fisheries Center
P.O. Box 271
La Jolla, CA 92038

FTS 893-7129

Dr. Dick Parrish, Leader
Fishery/Environmental Linkages
Pacific Fisheries Environmental Group
Southwest Fisheries Center
P.O. Box 831
Monterey, CA 93942

FTS 408-646-3311

Mr. William Sprigg, Director
NOAA Climate Office
WSC Bldg. 5
6010 Executive Blvd.
Rockville, Maryland

Mailing Address: National Oceanic & Atmospheric
Administration
Rockville, Maryland 20852

FTS 443-8415

Dr. Gary Stauffer, Director
Resource Assessment & Conservation
Engineering Division
Northwest & Alaska Fisheries Center
7600 Sand Point Way N.E.
BIN C15700
Seattle, WA 98115-0070

FTS 392-4170

APPENDIX B

List of Background Materials for Ecosystems Planning Workshop

1. Meeting Agenda
2. List of Attendees
3. Workshop Prospectus
4. Consensus methodologies that may be used during the workshop
5. Thinking About Systems - Editorial by J. N. Warfield, Systems Research; Vol. IV. No. 4
6. National Marine Fisheries Service Program Development Plan for Ecosystems Monitoring and Fisheries Management
7. Pacific Oceanic Ecosystems Program Development Plan
8. California Current Ecosystem Program Development Plan
9. Pacific Marine Environmental Laboratory Annual Report for FY 1987
10. Climate and Global Change - An Integrated NOAA Program in Earth System Science

APPENDIX C

4/26/88

California Current Demersal Program Objectives

1. Describe the variability in populations of CCE demersal resources in response to environmental factors.

2. Describe the variability and its causes in populations of CCE groundfish species in response to functional relationships among predators, fishermen, prey, and competitors +/- 20%.

3. Develop techniques, including predictive models, for the management of CCE demersal resources.

4. Establish and implement data collection programs and data submission requirements in that fisheries data are adequately complete, accurate and timely to monitor fisheries.

5. Develop and test models to determine the relationships among environment, habitat, and demersal resources of CCE and incorporate results into demersal resources management advice.

7. Establish and implement environmental data collection and data retrieval programs or sources adequate to support ecosystems and predictive models.

8. Assess the condition of stocks.

9. Evaluate the effectiveness of management systems based on ecosystem models and forecasting capability.

APPENDIX D

4/28/88

List of Proposed Projects

1. Restore the PacFIN management data base & enhance existing logbook data system.

2. Monitor relative abundance and food habits of a series of indicator species representative of all trophic levels.

3. Develop conceptual model & hind-cast time series of oceanic circulation in CCE.

4. Establish interactive terminal facility to receive, process, & overlay environmental & fishery data sets.

5. Determine the characteristics needed in conceptual model of the physical/biological system.

6. Project transport: low California current transport at Point Conception decreases recruitment of hake.

7. Develop integrated network to assemble, distribute, & display fishery & environmental data in the north eastern Pacific.

8. Develop a resource (tools) inventory which includes existing suite of models, data collection & management systems.

*9. Test hypotheses regarding the linkages between variations in groundfish resources caused by variations in marine environment.

*9a. Develop hypotheses regarding linkages between variations in groundfish resources caused by variations in marine environment.

10. Collect fisheries data, resource abundance measuring, & climatic/oceanographic observation.

11. Improve fisheries independent stock assessment methodology & apply to non-fishery species.

12. Monitor fishery landings for species composition & vital statistics.

***Two separate projects were developed from the original proposal.**

13. Calibrate commercial & recreational catch & effort statistics using environmental data.

14. Develop models to evaluate the effectiveness of existing assessment & monitoring techniques.

15. Project remote: El Ninos decrease/increase recruitment of rockfish in the california current ecosystem.

16. Establish the management expectations as to scientific advice.

17. Develop adequate understanding of biology/ecology of important groundfish species.

18. Reduce the complexity of the ecosystem to critical & pertinent components in the modeling sense.

19. Estimate the magnitude of by-catch induced mortality.

20. Preliminary model to evaluate potential payoff of forecast.

21. Evaluate impact of discarded by-catch on non-target fish populations.

22. Periodic status reports on stocks, fisheries, & ecosystem.

23. Determine/define the habitat requirements for critical life stages for important groundfish species.

24. Establish a research team to discover & quantify relationships between critical components of the ecosystem to forecast resource productivity.

25. Preliminary model to determine necessary scope of research program.

26. Develop cost & economic benefit information on an ecosystem scale for developing improved management methods.

27. Establish monitoring program to define/determine variations in environmental conditions that cause variations in groundfish resources.

29. Evaluate recruitment predictions versus pre-recruit surveys.

30. Examine utility of marine mammal population management in optimum multi-species management.

31. Develop multi-species & ecosystem models that incorporate fishery & environmental data inputs.

32. Develop indices of environmental conditions & influences.

33. Develop (behavioral) model fishermen.

34. Make use of all technology to monitor environmental conditions affecting groundfish.

35. Determine fishery data needs for basic stock assessments.

36. Identify useful data sets in other NOAA agencies & way to transfer at reasonable price.

37. Determine importance of estuary & nearshore habitat.

38. Establish minimum threshold population levels.

39. Develop non-unit stock models.

40. Determine proper measurement of effort to be proportional to fishing mortality.

APPENDIX E

California Current Ecosystem Demersal Resources Program

Preliminary Project Specifications and Budget

4/28/88

Revised List of Projects Included in the Preliminary Program with Indication of NOAA Agencies Which May Have a Role in Planning or Executing Each Project

Project #	Title/Objective/Agencies
1.	Restore the PacFIN management data base & enhance existing logbook data system. (SWFC, NWAFC, OREI, SWR, NWR, NOS, NCO)
2.	Monitor relative abundance and food habits of a series of indicator species representative of all trophic levels. (SWFC, NWAFC)
3.	Develop conceptual model & hind-cast time series of oceanic circulation in CCE. (SWFC, NWAFC, NCO, PMEL, NOS)
4.	Establish interactive terminal facility to receive, process, & overlay environmental & fishery data sets. (SWFC, NWAFC, NOS, NESDIS, PMEL)
5.	Determine the characteristics needed in conceptual model of the physical/biological system. (PMEL, NCO, OREI, NOS, NWAFC, SWFC)
6.	Deleted
7.	Develop integrated network to assemble, distribute, & display fishery & environmental data in the north eastern Pacific. (NOS, NCO, PMEL)
8.	Develop a resource (tools) inventory which includes existing suite of models, data collection & management systems. (SWFC, NWAFC, NOS, OAR, MMS)
*9.	Test hypotheses regarding the linkages between variations in groundfish resources caused by variations in marine environment. (PMEL, NCO, OREI, NOS, NWAFC, SWFC)
*9a.	Develop hypotheses regarding linkages between variations in groundfish resources caused by variations in marine environment. (PMEL, NCO, OREI, NOS, NWAFC, SWFC)

***Two separate projects were developed from the original proposal.**

10. Collect fisheries data, resource abundance measuring, & climatic/oceanographic observation. (SWFC, NWAFC, OREI, SWR, NWR, NOS, NCO)

11. Improve fisheries independent stock assessment methodology & apply to non-fishery species. (SWFC, NWAFC)

12. Monitor fishery landings for species composition & vital statistics. (SWFC, NWAFC, OREI, SWR, NWR, NOS, NCO)

13. Calibrate commercial & recreational catch & effort statistics using environmental data. (SWFC, NWAFC)

14. Develop models to evaluate the effectiveness of existing assessment & monitoring techniques. (SWFC, NWAFC)

15. Deleted

16. Deleted

17. Develop adequate understanding of biology/ecology of important groundfish species. (SWFC, NWAFC)

18. Reduce the complexity of the ecosystem to critical & pertinent components in the modeling sense. (PMEL, NCO, OREI, NOS, NWAFC, SWFC)

19. Estimate the magnitude of by-catch induced mortality. (SWFC, NWAFC)

20. Preliminary model to evaluate potential payoff of forecast. (Tiburon)

21. Deleted

22. Periodic status reports on stocks, fisheries, & ecosystem. (SWFC, NWAFC, SWR, NWR)

23. Determine/define the habitat requirements for critical life stages for important groundfish species. (SWFC, NWAFC)

24. Establish a research team to discover & quantify relationships between critical components of the ecosystem to forecast resource productivity. (PMEL, NCO, OREI, NOS, NWAFC, SWFC)

25. Preliminary model to determine necessary scope of research program. (SWFC, NWAFC, OAR, NWS, PMEL, CAC)

26. Develop cost & economic benefit information on an ecosystem scale for developing improved management methods. (SWFC, NWAFC, SWR, NWR)

27. Establish monitoring program to define/determine variations in environmental conditions that cause variations in groundfish resources.

28. Deleted

29. Deleted

30. Deleted

31. Develop multi-species & ecosystem models that incorporate fishery & environmental data inputs. (SWFC, NWAFC)

32. Develop indices of environmental conditions & influences.

33. Deleted

34. Deleted

35. Determine fishery data needs for basic stock assessments. (SWFC, NWAFC)

36. Identify useful data sets in other NOAA agencies & way to transfer at reasonable price. (PMEL, NCO, OREI, NOS, NWAFC, SWFC)

37. Deleted

38. Establish minimum threshold population levels.

39. Deleted

40. Deleted

List of Acronyms

CAC - Climate Analysis Center
MMS - Minerals Management Service
NCO - NOAA Climate Office
NESDIS - National Environmental Satellite, Data, and Information Service
NOS - National Ocean Service
NWAFC - Northwest and Alaska Fisheries Center
NWR - Northwest Regional Office
OAR - Office of Oceanic and Atmospheric Research
OREI - Office of Research and Environmental Information
PMEL - Pacific Marine Environmental Laboratory
SWFC - Southwest Fisheries Center
SWR - Southwest Regional Office
TL - Tiburon Laboratory, Southwest Fisheries Center

PRELIMINARY BUDGET

Project #	Short Title	FTE	$1,000	Ship Days
2.	Monitor	1.0	40	
3.	Conceptual Model	4.0	350	60
4.	Interactive Terminals	1.0	120	
5.	Determine Characteristics	1.0	250	
7.	Develop Network	1.0	50	
8.	Tools Inventory	0.1	5	
9.	Hypothesis Tests	6.0	2000	60
9a.	Develop Hypotheses			
10.	Fish Abundance Measure	10.0	2600	
10a.	Fisheries Data	65.0	5650	300
11.	Improve Methods	4.0	250	40
13.	Calibrate Catch & Effort	3.0	150	
14.	Develop Models	2.0	100	
17.	Understanding Groundfish	7.0	200	120
18.	Reduce Complexity	3.0	250	
19.	By-catch Mortality	7.0	250	15
20.	Preliminary Model	0.25	10	
22.	Status of Stock Reports	20.0	2000	
23.	Habitat Requirements	7.0	1000	60
24.	Team, Critical Components	6.0	300	
25.	Preliminary Model Duration	0.25	10	
26.	Cost/Benefit	6.0	350	
31.	Population Assessment Using Environmental Data	2.5	100	

Project #	Short Title	FTE	$1,000	Ship Days
32.	Indices of Condition	1.5	60	
35.	Fishery Data for S-O-S	1.0	40	
36.	Identify NOAA Data			
37.	Estuarine Habitat	2.0	80	30
38.	Treshold Pop's			
Grand Totals		161.0	$16215k	685

Preliminary Specification of Projects of the California Current Demersal Resources Program

Project 1. Restore the PacFIN management data base and enhance existing logbook data systems.

FTE: 65 **$5650K** **Shipdays:** 300

Duration: On-going

Major Activities:

- Coastwide network of port samplers to sample fishing vessel landings for catch of species and age composition data and to retrieve logbook data from fishermen.
- Fishing operation observers to collect catch and age composition information from vessels at sea which lands at sea or have high discord rates and to observe fishery behavior.
- Conduct surveys to measure abundance of specified resources to target/non-target stocks including plankton, juvenile and life phases.
- Monitor the oceanographic processes (currents, speed direction by deptyh over time and space, temperature and salinity and climatic conditions (winds, barometric pressure etc.) over space/seasons that are critical.

Actors: SWFC, NWAFC, OREI, SWR, NWR, NOS, NCO

Project 2. Monitor relative abundance and food habits of a series of indicator species representative of all trophic levels.

FTE: 1 **$ 40 K** **Shipdays:**

Duration: 1 year

Major Activities:

- Identify two primary prey species and two primary predator species.

- Design study to monitor trends in all four species.
- Design study to monitor food habits of four species.
- Decide to implement or not.

Actors: SWFC, NWAFC

Project 3. Develop conceptual model and hind-cast time series of oceanic circulation in CCE.

FTE: 4 **$350K** **Shipdays:** 60

Duration: 4 years

Major Activities:

- Develop environmental data time series and climatology of circulation in the demersal habitat.
- Desirable remote, local forcing of this circulation including the c space scales of variability.
- Develop statistical and physical models of circulation designed to utilize available environmental indices as model input.
- At sea development of conceptual model, current matter vs. cable lines.

Actors: SWFC, NWAFC, NCO, PMEL, NOS

Project 4. Establish interactive terminal facility to receive, process and overlay environmental and fishery data sets.

FTE: 1 **$120 K** **Shipdays:**

Duration: On-going

Major Activities:

- Develop new applications of interactive computer graphics systems in support of fisheries research.
- Base prototype on the NOAA-ERL Prototype Regional Observation and Forecast System (PROFS).
- Use existing hardware components and utility software now in PROFS inventory.

- Demonstrate application using "hindcast" data sets from the NMFS community.

Actors: SWFC, NWAFC, NOS, NESDIS, PMEL

Project 5. Determine the characteristics needed in conceptual model of the physical/biological system.

FTE: 1 **$250K** 1st, 2nd Yr. 500-1000 K/Yr in Outyears **Shipdays:**

Duration: On-going

Major Activities:

- Assess fisheries management requirements (wishes?) for forecasts of species abundance, prey and predator, etc., range and distribution...anything useful (and potentially predictable), and to monitor on a near-real-time basis, key biological/environmental factors.

- Assess availability of existing oceanographic and meteorological data, and determine data needs and ways to meet those need in monitoring/forecasting the physical environment on in designing the observation network needed.

- ....do the same for biological factors.

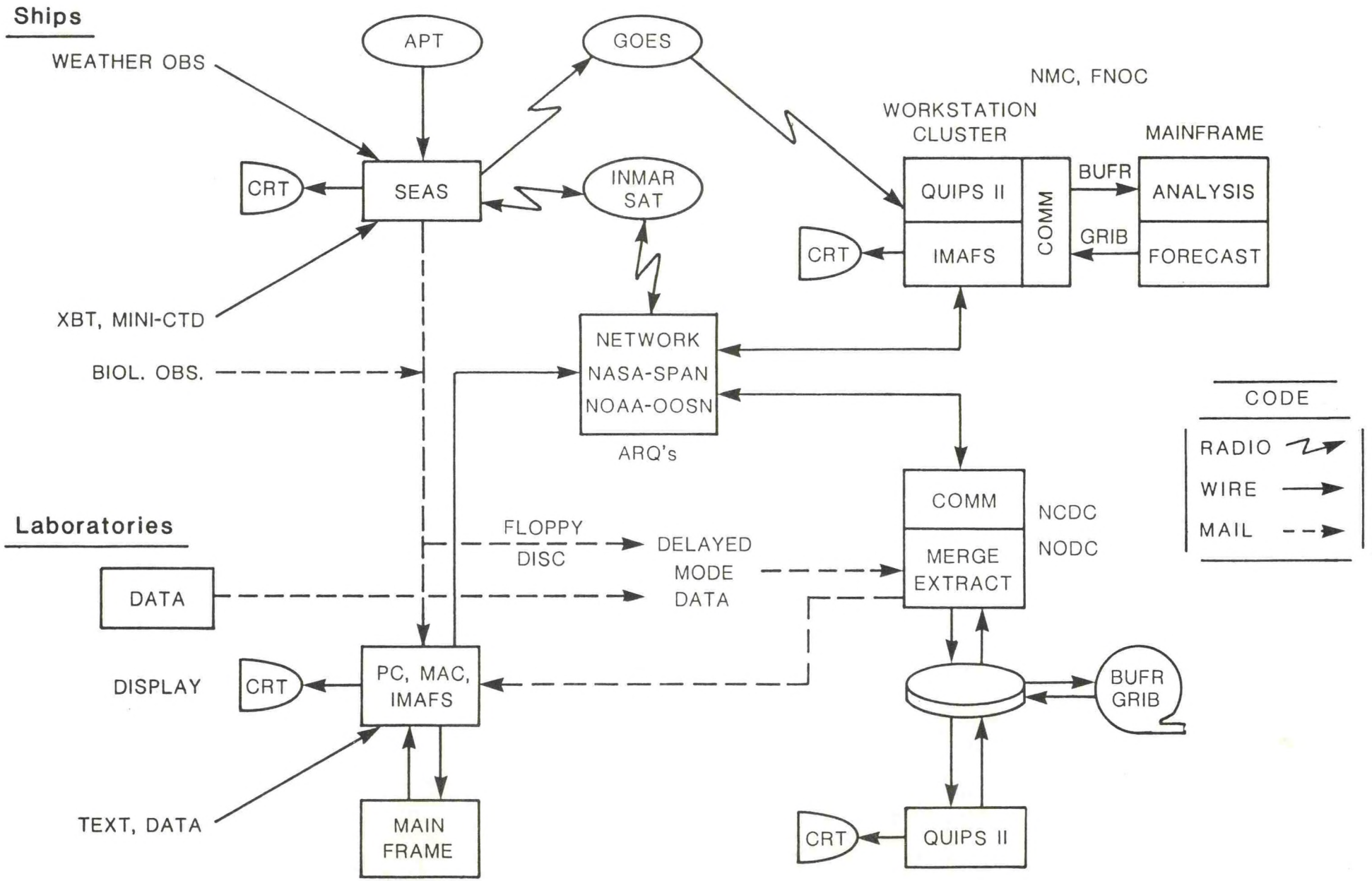
- Assess the potential for existing models to (a) forecast, design monitoring strategies and develop data assimilation techniques for the oceanographic variables important in determining species range, distribution, predator-prey relationships .... etc. (b) forecast biological variables from projected or observed environmental characteristics.

- Access/test access succeedingly more comprehensive and deterministic models.

Actors: PMEL, NCO, OREI, NOS, NWAFC, SWFC

Project 7. Develop integrated network to assemble, distribute, and display fishery and environmental data in the north eastern Pacific.

Proposed integrated network to assemble, distribute and display fishery and environmental data in the northeast Pacific



Interactive access to all data; common data formats: BUFR & GRIB

ALPHABET SOUP

APT	Automatic Picture Transmission.
ARQ	Automatic Response to Query.
BUFR	Binary Universal Format for Records. BUFR was developed by European Center for Medium Range Weather Forecasts and has been approved by WMO for operational real-time transmission of environmental data.
CD-ROM	Compact Disc, Read-Only Memory.
COMM	Communications system.
CRT	Cathode Ray Tube.
GOES	Geo-Orbiting Earth Satellite.
GRIB	WMO binary format for processed data in the form of grid-point values.
IMAFS	Interactive Marine Analysis and Forecast System. Being developed by OAR/PROFS in Boulder, CO. for display of marine data.
INMARSAT	International Maritime Satellite. Operated by the International Maritime Satellite Organization, London.
NCDC	NESDIS National Climatic Data Center, Asheville, NC.
NMC/OPC	NWS National Meteorological Center - NWS/NOS Ocean Products Center, Camp Springs, MD.
NODC	NESDIS National Oceanographic Data Center, Washington, DC.
MAC	Apple MACintosh microcomputer.
MINI-CTD	MINI Conductivity Temperature Depth profiler.
OOSN	NOS Office of Ocean Service Network. Based on Digital Equipment Co. DECnet.
PC	Personal Computer; generally IBM PC compatible.
QUIPS2	Quality Improvement Profile System. QUIPS2 is being programmed by Compass Systems, Inc. and installed at NMC/OPC for editing real-time marine weather and subsurface profile reports. A QUIPS2 is proposed to be installed at NODC for editing historical ocean profile data.
SEAS	Shipboard Environmental data Acquisition System. Developed by NOS Office of Ocean Services and installed on about 70 vessels. Present system based on PC-clone microcomputers.
SPAN	NASA Space Physics Analysis Network.
XBT	Expendable BathyThermograph.

FTE: 1 in SWFC; other (non-SWFC) 5-10 **$50K** 100-500K **Shipdays:**

Duration: On-going

Major Activities:

- Elements are:

  1) get more observations: use existing tools such as SEAS and mini-CTD's.

  2) use fewer data formats: work towards WMO and IOC standard formats of BVFR, GRIB, and GF-3.

  3) develop better communications: use existing systems such as NASA Space Physics Analysis Network (SPAN).

  4) quality control the data: use NOS QUIPS systems.

  5) display the data: use PC's Macintosh's, and NOS Micro-VAX IMNAFS systems.

  6) include international data: WWW, IGOSS, IODE, etc.

Actors: NOS, NCO, PMEL

Project 8. Develop a resource (tools) inventory which includes existing suite of models, data collection and management systems.

FTE: 0.1 **$5K** **Shipdays:**

Duration: On-going

Major Activities:

- Develop inventory procedures (categories/questionnaire).
- Survey participants/users.
- Compilation
- Dissemination
- Periodic updates.

Actors: SWFC, NWAFC, NOS, OAR, MMS

Project 9. Test hypotheses regarding the linkages between variations in groundfish resources caused by variations in marine environment.

FTE: 4-8 **$2,000 K** **Shipdays:** 60

Duration: On-going

Major Activities:

- Assumptions:

1. Single species approach.
2. Early life cycle (0-2 months)/environmental interactions will determine recruitment.

- Criteria for species selection:

1. Economically important (ex vessel x4 > $30M)
2. Habitat understanding:

A. Biological - 1) spawning location, duration, 2) eggs and larvae time series.

B. Environmental - 1) critical environmental forces (currents, temperature, etc.) at spawning, 2) time series or adequate spacial coverage at appropriate time of spawning.

- Process:

1. Team selected (1/2 Bio + 1/2 Env).
2. Hypothesis developed.
3. Science Plan review of plan.
4. Implementation of plan

Actors: PMEL, NCO, OREI, NOS, NWAFC, SWFC

Project 9a. Develop hypotheses regarding linkages between variations in groundfish resources caused by variations in marine environment.

Specifications not yet determined.

Project 10. Collect fisheries data, resource abundance measuring, and climatic/oceanographic observation.

FTE: 10 **$2600 K** **Shipdays:**

Duration: On-going

Major Activities:

- Restore funding base lost by reductions, cost increases, program deletions over last 7-8 years for Pacific Coast.

- Enhance funding base to accommodate requirements for new fishery data and to acquire process and interpret ocean environmental data affecting ecosystem stocks.

  [Note: While group consensus was that 'restore funding base' was not to be considered, I believe it still is important in the reconfiguration and enhancement of an already beleaguered system. Headquarters needs to hear from the field on this ... thus the writing as presented.]

Actors: SWFC, NWAFC, OREI, SWR, NWR, NOS, NCO

Project 11. Improve fisheries independent stock assessment methodology and apply to non-fishery species.

FTE: 4 **$250 K** **Shipdays:** 30 to 50 days

Duration: 6 years

Major Activities:

- Evaluate egg production method for broad species range.

- Assess area-swept methods for small mesh trawl survey.

- Work on hydroacoustic applications.

- Miscellaneous methodology tests - video; camera; fixed gear.

- Field test above methods.

- Statistically assess validity of resulting estimates.

- Based upon results of projects 2 and 18, choose appropriate species to assess.

- Conduct field assessment of chosen species.

- Periodically re-evaluate need for further work or alternate species.

Actors: SWFC, NWAFC

Project 12. Monitor fishery landings for species composiltion and vital statistics.

Specifications not yet determined.

Project 13. Calibrate commercial and recreational catch and effort statistics using environmental data.

FTE: 3 **$150 K** **Shipdays:**

Duration: 3 years

Major Activities:

- Compile computer files containing recreational catch and trip information
- Compile computer files of commercial logbook and landings info by catch area, gear type, vessel class and species target
- Obtain environmental data and indices on interactive terminal facility (including SST, wind direction, large scale events)
- Overlay CPUE and environmental data, looking for fruitful hypothesis
- Test hypothesis

Actors: SWFC, NWAFC

Project 14. Develop models to evaluate the effectiveness of existing assessment and monitoring techniques.

FTE: 2 **$100 K** **Shipdays:**

Duration: 2 years

Major Activities:

- Select 2 or 3 basic assessment/monitoring techniques.
- Develop model that incorporates population dynamics and distribution of target species; influence and environmental variables, and fishery data.
- Run model to explore specific parameter space to investigate sensitivity of models to assumption about spatial/temperial distribution.

Actors: SWFC, NWAFC

Project 17. Develop adequate understanding of biology/ecology of important groundfish species.

FTE: 6-8 **$2000 K** **Shipdays:** 120 days

Duration: On-going

Major Activities:

- Criteria for species selection
  1. economically important (ex vessel x4>$30M)
- Determine age/growth
- Understand reproductive biology - spawning time, location, duration, age at spawning, spawning potential, etc.)
- Understand natural mortality
- Define stock structure

Actors: SWFC, NWAFC

Project 18. Reduce the complexity of the ecosystem to critical and pertinent components in the modeling sense.

FTE: 3 **$250 K** **Shipdays:**

Duration: 5-10 YEARS

Major Activities:

- Small team composed of biological and oceanographic scientists with support from computer programmer.
- Develop mathematical algrithms to describe relationship.
- Develop framework for thinking about and conceptualize an ecosystem model that is structured to produce output that forecasts:

  1) important fishery resources productivity

Actors: PMEL, NCO, OREI, NOS, NWAFC, SWFC

Project 19. Estimate the magnitude of by-catch induced mortality.

FTE: 4 + 3 obs. **$250 K** **Shipdays:** 15 days on research vessel plus time on fishing vessel

Duration: 4 years

Major Activities:

- Identify potential impacts of all fishing gears on non-target species (and non-target sizes of target species)
- Statistical design of survey using observers on fishing vessels
- Research vessel cruises to estimate impacts on non-retrieved animals (i.e. mortality of extruded animals)
- Modeling of total impacts

Actors: SWFC, NWAFC

Project 20. Preliminary model to evaluate potential payoff of forecast.

FTE: 0.25/case **$10 K** **Shipdays:**

Duration: 0.25 years/case

Major Activities:

- Do on a case-by-case basis (e.g. Hake recruitment forecast).
- Restrict to use of <u>available</u> information.
- Construct simple age-structured resource model.
- Construct simple model of environmental influences.
- Construct simple fishery-economic model.
- Determine range of potential economic benefits given range of conceivable parameters/formulations.

Actors: Tiburon

Project 22. Periodic status reports on stocks, fisheries, and ecosystem.

FTE: 20 **$2,000 K** **Shipdays:**

Duration: On-going

Major Activities:

- Data collection - fishery independent/dependent
- Data analysis
- Report preparation and dissemination

Actors: SWFC, NWAFC, SWR, NWR

Project 23. Determine/define the habitat requirements for critical life stages for important groundfish species.

FTE: 6-8 **$7,000 K** **Shipdays:** 60 days

Duration: On-going

Major Activities:

- Determine distribution - by life stage.
- Determine migration patterns.
- Define environmental conditions/habitat requirements for critical life stages favorable for using concurrent measurements of biology and environmental conditions.

  Approach:

  1. Establish multidisciplinary research team, develop hypothesis, develop science team to test hypothesis, review research plan (internal and external), implement plan.
  2. Several species may be investigated simultaneously.

Actors: SWFC, NWAFC

Project 24. Establish a research team to discover and quantify relationships between critical components of the ecosystem to forecast resource productivity.

FTE: 6 **$300 K** **Shipdays:** Included in IO

Duration: 10 years

Major Activities:

- Identity hypothesis/relationship by species/species complex
- Set up research team to carry out science/plan experiments
- Research vessel time is included in IO
- Collect data
- Analysis data/estimate parameters/confirm relationships

Actors: PMEL, NCO, OREI, NOS, NWAFC, SWFC

Project 25. Preliminary model to determine necessary scope of research program.

FTE: 0.25/case **$10 K** **Shipdays:**

Duration: 0.25 years/case

Major Activities:

- Do on a case-by-case basis (e.g. Hake recruitment forecast.
- Restrict to use of <u>available</u> information.
- Construct simple age-structured resource model.
- Hypothesize likely time series properties of environment.
- Generate likely response of measured variables (e.g. stock, recruitment).
- Determine corresponding auto-correlation spectra.
- Use summation formula to determine ratio and "effective sample size" to measured sample size.

- Use t-test statistics to infer necessary sample size (viz. duration of study at 1 point/year) to test hypothesis at given confidence level.

  Side-Benefit: possible improvement of project design

Actors: SWFC, NWAFC, OAR, NWS, PMEL, CAC

Project 26. Develop cost and economic benefit information on an ecosystem scale for developing improved management methods.

FTE: 6 **$350K** **Shipdays:**

Duration: On-going

Major Activities:

- Scoping for components of economic and social benefits from fishing: settle on set of measures.
- Obtains existing inventory of information from economics, demographics, and other data bases.
- Organize and implement data collection efforts to fill in gaps in data available.
- Develop indices of benefits and costs for a wide variety of fishery outputs (commercial catch values, recreational trip values).
- Insert value functions into ecosystem models.
- Simulate various management strategies and compare cost and benefit measures.

Actors: SWFC, NWAFC, SWR, NWR

Project 27. Establish monitoring program to define/determine variations in environmental conditions that cause variations in groundfish resources.

Specifications not yet determined.

Project 31. Develop population assessments that incorporate fishery and environmental data inputs.

FTE: 5 **$40 K** **Shipdays:**

Duration:

Major Activities:

- Establish interdisciplinary team to act as steering committee and assemble data as needed.
- Evaluate existing modelling approaches for incorporating environmental data, e.g., Laevastre, Bledsoe, etc.
- Evaluate feasibility to accomplish task and estimate resources required.

Actors:

Project 32. Develop indices of environmental conditions and influences.

FTE: 1.5 **$60K** **Shipdays:**

Duration: To some extent ongoing, as interactions become identified, but mainly a 1 to 2 year project focused on development of methodology and some indices of general utility.

Major Activities:

- Achieve data reduction, so that environmental data are manageable and well-behaved.
- Use various approaches depending on use of indices:
  - Principal components analysis to produce statistically independent variates,
  - indices based on suspected biological-environmental interactions (e.g. North Pacific Index).

Actors:

Project 35. Determine fishery data needs for basic stock assessments.

FTE: 1 **$40 K** **Shipdays:**

Duration: Occasional review of standards may be appropriate.

Major Activities:

- Designate "team" to carry out the assignment.

- Determine stocks/units for which assessments should be completed.
- Establish standards for stock assessment accuracy, precision, timing, etc., and cost limit.
- Define data sets needed to complete assessments that meet the standards.

Actors: SWFC, NWAFC

Project 36. Identify useful data sets in other NOAA agencies and way to transfer at reasonable price.

FTE: **$** **K** **Shipdays:**

Duration: 1 year (but occasional changes may be made)

Major Activities:

- Dependent on completion of inventory (proj. #8) which identified data collection and management systems
- Stock assessment, modeling and management staff review data bases to determine potential use in fishery models
- NMFS staff meet with other NOAA staff to discuss and evaluate different ways to access/retrieve data found to be useful or likely to be useful; includes potential use of network (proj. #7)
- Establish/implement data access mechanisms or appropriate and review occasionally

Actors: PMEL, NCO, OREI, NOS, NWAFC, SWFC

Project 38. Establish minimum threshold population levels.

FTE: **$** **K** **Shipdays:**

Duration: Review and adjustments may be needed from time to time.

Major Activities:

- Determine which stocks to consider
- Establish basic life history characteristics, reproductive rates, and estimated mortality/survival rates in absence of fishing

- Establish population level for each stock at which fishing would have to cease for (a) 5 years and (b) 10 years for stock to recover to a level of .5 or some alternate minimum stock level, arraigning average spawning success and recruitment (basic purpose is to be able to tell managers that if a stock is reduced to a certain level, regardless of the cause, fishing may have to be curtailed or stopped to allow the stock to rebound to a given stock size

Actors:

APPENDIX F

Options for Management of the Program

Participants were asked what options should be considered for "managing" the CCE Demersal Program within NOAA?

The purpose of the question was to solicit a preliminary list of program management ways and means to be considered by the West Coast Directors of NOAA agencies. At present no formal machinery exists within NOAA for developing from the bottom-up a multi agency program that is critically reviewed by all levels of management and explicitly accepted, (or rejected), funded and integrated into the management and chain of command of the agency. However, an ecosystem program requiring the expertise, data, and resources of at least a half-dozen NOAA agencies to run efficiently and to meet its goal appears to require some formal structure to the overall management of the program.

The options suggested by the group are as follows:

A. Chain of Command Options

The Administrator of NOAA establishes objectives, funding levels, and assigns planning and management responsibility through the NOAA chain of command.

The Assistant Administrator for Fisheries establishes objectives, funding levels, and assigns planning and management responsibility through the NMFS chain of command.

B. Special Program Office

A single office within NMFS is responsible for planning, allocation of funds and management of the NMFS CCE Demersal Program.

C. Collegial Options

1. Management is carried out by a committee composed of the Ad Hoc NOAA administrators who are charged with the responsibility for the CCE demersal complex.

2. Ad Hoc committee similar to the above with the addition of a separate policy board.

3. Ad Hoc committee and separate policy board similar to the above with the addition of technical representatives from each line office involved.

4. Management is carried out by a committee of the NMFS principal investigators who are charged with the responsibility for research on the CCE demersal complex.

5. Limited collegial approach: That is don't have a CCE Demersal Program, and instead propose limited programs similar to the current sablefish program.

CalCOFI Equivalent:

Management by a committee consisting of Ad Hoc representatives from a small consortium of State and Federal agencies and Universities engaged in the research program. The committee has a salaried coordinator who is responsible only to the committee.

FOCI Equivalent:

Management by a committee of Ad Hoc administrators from several NOAA agencies with a critical review or policy board consisting of an appointed, permanent committee of academic researchers selected to provide a broad representation of marine disciplines.

Strawman Approach:

The program would start with a well defined "strawman" or "white paper" describing the proposed program and agencies or universities can buy (or not buy) into the program.

Groundfish Authority Option:

Management based on a groundfish authority similar to that in England. This system may be the same as having management of NOAA research delegated to the Fishery Management Councils.

SWFC Reorganization Option:

Establish a separate SWFC planning division to design the CCE Demersal Program and when it is established the other divisions can be brought into the program. This planning division would do the writing, and provide the brainpower and horsepower to carry out the planning. This would take the heat off the other divisions.

Lottery Sweepstakes or NSF Approach:

Keep submitting research proposals and initiatives to D.C. until one of them is funded.

An Ecosystem Approach to Management of the Fishery Resources of a Sub-Tropical Seamount

A Program Proposal Based on the

NOAA Workshop for Ecosystems Research Program Planning

Southwest Fisheries Center

La Jolla, California

April 26-28, 1988

George Boehlert
Southwest Fisheries Center
Honolulu Laboratory
Honolulu, Hawaii

REPORT OF THE NOAA WORKSHOP FOR PLANNING THE CALIFORNIA CURRENT ECOSYSTEM DEMERSAL RESOURCES PROGRAM

Introduction and Background

The National Marine Fisheries Service (NMFS) has instituted a multispecies, ecosystem approach to the planning and development of fisheries research and management programs. The explicit attention to ecosystems principles coupled with an emphasis on inter-agency cooperation and coordination in the collection and dissemination of data will expand the effectiveness of future fisheries management and add to the efficiency of operations.

NMFS' Southwest Region has carried out a previous interactive planning session to address the need for improved ecosystems applications in the Region's programs. The first planning session involved the development of managerial and scientific goals for the California Current and Pacific Oceanic Ecosystems. Also, at that time, each of the two major ecosytems were sub-divided into programmatic study areas or "sub-ecosystems" and managerial and scientific objectives were defined for these as well. The results of this planning effort together with a substantial amount of background information and descriptive material about the ecosystem, were summarized in the Framework Plans submitted to the NMFS Headquarters in March 1988.

The present planning effort is aimed at extending the overall strategic planning to the operational level. The specific approach is one of providing a more detailed plan for meeting the scientific goals and objectives for one of the sub-ecosystems or programs of the California Current Ecosystem namely the Demersal Resources Program. It is intended that the results will be used as a template for further planning of programs for the other sub-ecosystems.

The Demersal Resources Program was selected as the first subject for more detailed planning because a) it represents one of the most important set of resources and fisheries within the ecosystem, b) the types of scientific multi-species problems within the program are sufficiently complex so that effort spent on the demersal program planning would yield experience and knowledge useful for planning other ecosystem research programs, and, c) the proper expertise and exercise of responsibilities at the scientific level required to tackle the job successfully are sufficiently dispersed among the various NOAA elements to warrant an attempt at intra-NOAA program planning along the lines envisioned by the creators of the ecosystem initiative.

With the foregoing in mind the Southwest Fisheries Center as the scientific advisor to the Southwest Regional Office of NMFS (which has been assigned the programmatic responsibility for the California Current Ecosystem Monitoring and Fisheries Management Program) convened an intra-NOAA planning workshop, April 26-28, 1988, at La Jolla, to address the scientific aspects of monitoring and management within the Demersal Resources Program of the California Current Ecosystem.

Meeting Objectives

The meeting had the following desired outcomes or objectives:

1. A NOAA plan - to the project objectives level - for the ecosystems research initiative in support of NMFS fishery management objectives for the California Current Demersal Complex.

   A. Specification of the important research projects that will be required to meet the California Current ecosystem objectives for the demersal resources element.

   B. Delineation of supporting relationships among the projects (e.g. PERT-chart).

   C. Development of options for design of management and coordination of the program.

2. Increased knowledge and experience that will help facilitate the design of other ecosystem research programs.

I. What Happened at the Meeting

Representatives from a number of NOAA Agencies which have missions related to the scientific objectives of the California Current Ecosystem Monitoring and Fisheries Management Program (CCEP) were invited to the planning workshop to participate on an equal basis as knowledgable experts[1/]. The meetings were facilitated by the Planning Officer of the Southwest Fisheries Center who was assisted by a small Task Force of SWFC Scientists.

Background materials, agendas and logistic information were sent to the participants approximately two weeks before the workshop (Appendix B).

After introductions and an explanation of the workshop's purpose by the Science Director, SWR, representatives from each NOAA entity gave an overview of their respective research programs in progress. Background material on the Ecosystems Initiative and on

1/ Representatives of NOAA Climate Office, Pacific Marine Environmental Laboratories, National Ocean Service and NMFS' OREI, NWAFC, SWFC, and SWR attended the meeting (Appendix A).

the results of planning to date were presented by the Science Director, SWR and the Director, Office of Research and Environmental Information.

Scientific Objectives

Considerable time was spent in reviewing, clarifying and improving the text of the scientific objectives for the Demersal Resources Program. New and expanded versions of the objectives were decided by consensus of the group and used as a basis for further planning (Appendix C). Nevertheless, an original objective dealing with the Food Technology aspects of the program was not addressed because no one of the group felt qualified to develop the required program. This objective was set aside for treatment under different circumstances.

Project Identification

Development of the research program to meet the Demersal Resources program objectives was begun with a Nominal Group Technique facilitation to identify the projects required to meet the program objectives (or make substantial progress toward them) by the year 2000. The Trigger question asked of the participants was:

In the context of developing a plan, what important projects need to be initiated or completed to make substantial progress toward California Current Ecosystem Demersal Program objectives by the year 2000?

The group listed some 40 projects in response to the question (Appendix D). Each of these proposed projects was discussed and the meaning clarified by the group. Afterwards, the Planning Task Force edited the list of projects in conformance with the group's discussions.

Project Structure

The relationships among the projects were explored through the establishment of a preliminary structure of the projects. The projects were structured through the use of a computer assisted Interpretive Structural Modeling (ISM) session wherein the particpants were asked the following trigger question :

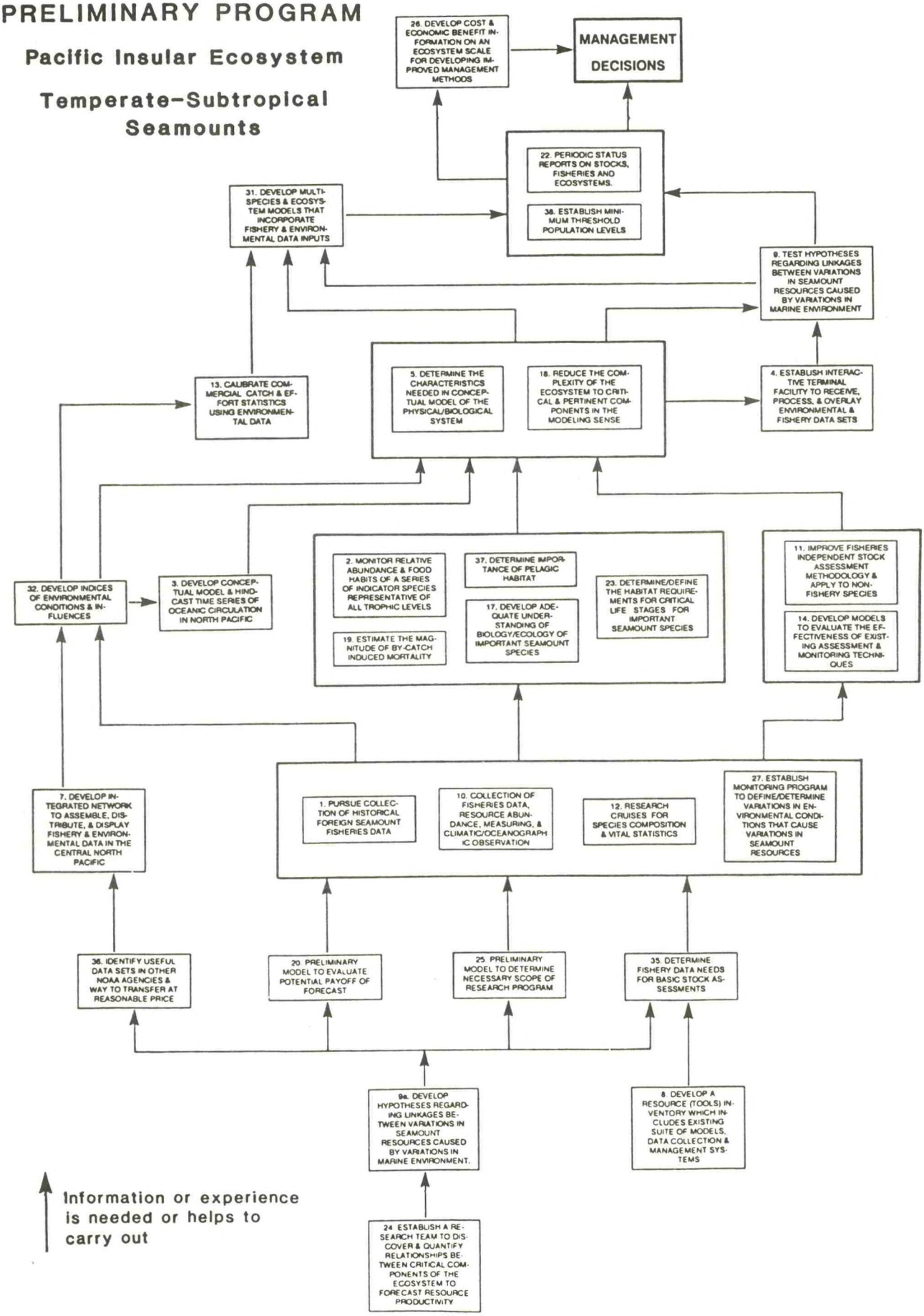
For meeting the CCE Demersal Program objectives, will information or experience from Project X be needed to help carry out Project Y?

Pairs of projects were selected by the computer and displayed within the trigger question (as X or Y) on a large screen for the convenience of the group. Through facilitated discussion in developing an answer to the question further clarification of the meaning was gained and some of the implications of each project were realized. The group answered the trigger question with

PRELIMINARY PROGRAM

Pacific Insular Ecosystem

Temperate–Subtropical Seamounts



biology; we must characterize the biology of the most important species on the seamount. Here, studies of life history, reproduction, age and growth, habitat requirements, and other vital statistics will provide information critical to the other research activities (19.17,23). We have made significant progress in this research effort to date.

A third area is in the collection of ecological data necessary to implement ecological models (25). Island and seamount ecosystems are bounded by and dependent upon the pelagic ecosystem. While insular and pelagic ecosystems are sufficiently distinct to be independent modeling units, the significant overlap and energy exchange between oceanic and island or seamount systems must be taken into account (37, 2). Although tropical coral reefs have often been cited as "oases" in a "desolate" oceanic environment, there is little doubt that insular ecosystems derive significant biological input from impinging ocean currents; further, many island taxa have early life-history stages that utilize the surrounding pelagic habitat. Local production, evident in some cases as the "island mass effect," may enrich local waters. The interface between pelagic and insular systems thus becomes a site of aggregation of prey and consequently enhanced abundance of pelagic species and their young. While the zone of overlap is not presently well defined, it is the topic of great scientific interest to marine scientists. Our research in this area will include assessment of non-fishery target species (2), trophic interrelationships among important species, input of exogenous energy to the seamount system from production in distant pelagic waters (37), and physical oceanography as necessary to understand the interaction of currents with topography, local upwelling, and mechanisms of advection of distant prey to the seamount ecosystem. We will also need to address the issue of pelagic predators removing energy from the seamount ecosystem.

The above research areas will provide the data necessary to develop ecosystem models. By concentrating on Southeast Hancock Seamount, the model can be sufficiently detailed to provide meaningful ecosystem management information (5, 18, 31). We would then extend the modeling effort to other seamounts and also modify it to use in island ecosystems. The species fished throughout the insular Pacific are often geographically widespread, so fisheries depend upon the same species or those which are ecologically similar. Thus, knowledge about important species at one area will be applicable to other areas; carefully designed research conducted at one location can often be beneficially applied to other areas. Further, the replicate nature of Pacific insular ecosystems can allow natural comparisons and broad scale ecological experiments to be conducted.

Proposed Budget

The existing Seamount Resources Program at the SWFC Honolulu Laboratory is currently conducting several portions of the research described above. Support is requested primarily for selected work on the ecological component, for improved access to oceanographic data, and for the modeling effort. The required funding would be $125K per year for three years beginning in FY 1990.