

SFERPM-2001 Proposal:
Reef Fish Community Dynamics and Linkages with Florida Bay

James A. Bohnsack* and Jerald S. Ault**

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**Budget: FY 2002 - \$208,500
Budget: FY 2003 - \$218,925**

A proposal to the South Florida Ecosystem Restoration Predication and Modeling Program

November 2001

SFERPM-2002: Reef Fish Community Dynamics and Linkages with Florida Bay

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Fax:: 305-361-4499
Jim.Bohnsack@noaa.gov

Administrative contact: Rose Lima (F/SECR2) 305-361-4208; Fax 305-361-4499

SEFSC Budget: FY 2001 - \$125,100
SEFSC Budget: FY 2002 - \$131,355

A proposal to the **South Florida Ecosystem Restoration Predication and Modeling Program**


James A. Bohnsack, Ph.D.
Research Fishery Biologist


Nancy Thompson, Ph.D.
~~Acting~~ Science and Research Director

11/26/01
Date

11/26/01
Date

**A RESEARCH PROPOSAL SUBMITTED TO:
THE NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION (NOAA)**

Through the

Cooperative Institute for Marine and Atmospheric Studies (CIMAS)

For the

Rosenstiel School of Marine and Atmospheric Science
University of Miami
4600 Rickenbacker Causeway
Miami, Florida 33149-1098

TITLE: SFP 2002: Reef Fish Dynamics

PRINCIPAL INVESTIGATOR: Dr. Jerald Ault

PERFORMANCE PERIOD: 03/01/02 – 02/28/04

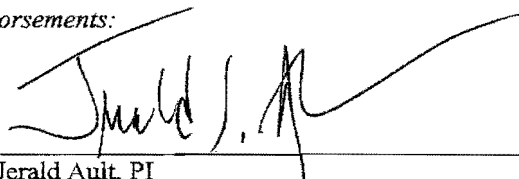
**AMOUNT REQUESTED: Year 1: \$84,600
Year 2: \$87,552**

SUBMITTING DATE: 11/29/01

CIMAS PROJECT NUMBER: NA17RJ1226 (new)

RESEARCH THEME: Theme 2: Fisheries Dynamics

Endorsements:



Dr. Jerald Ault, PI
Division of Marine Biology & Fisheries
Rosenstiel School of Marine and Atmospheric Science
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Dr. Joseph Prospero, Director
Cooperative Institute for Marine & Atmospheric Studies
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Dr. Otis B. Brown, Dean
Rosenstiel School of Marine and Atmospheric Science
Ph: (305)361-4000 / Fax (305)361-4711
Email: obrown@rsmas.miami.edu

APPLICATION FOR FEDERAL ASSISTANCE

OMB Approval No. 0348-0043

TYPE OF SUBMISSION: ☐ Application ☐ Construction ☒ Non-Construction	2. DATE SUBMITTED <i>November 26, 2001</i>	Applicant Identifier
	3. DATE RECEIVED BY STATE <i>N/A</i>	State Application Identifier
	4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

APPLICANT INFORMATION Full Name: <i>James A. Bohnsack</i>	Organizational Unit: <i>SEFSC-NMFS-NOAA-DOC</i>
Address (give city, county, State, and zip code):	Name and telephone number of person to be contacted on matters involving this application (give area code) <i>James A. Bohnsack (305) 361-4252</i>

EMPLOYER IDENTIFICATION NUMBER (EIN): 	7. TYPE OF APPLICANT: (enter appropriate letter in box)
TYPE OF APPLICATION: ☒ New ☐ Continuation ☐ Revision	A. State H. Independent School Dist. B. County I. State Controlled Institution of Higher Learning C. Municipal J. Private University D. Township K. Indian Tribe E. Interstate L. Individual F. Intermunicipal M. Profit Organization G. Special District N. Other (Specify) _____

Division, enter appropriate letter(s) in box(es) 	9. NAME OF FEDERAL AGENCY: <i>DOC, NOAA, Coastal Ocean Program</i>
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CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 1 1 4 7 8	11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT: <i>Reef Fish Community Dynamics and Linkages with Florida Bay</i>
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AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.): <i>Southern Florida</i>	14. CONGRESSIONAL DISTRICTS OF:
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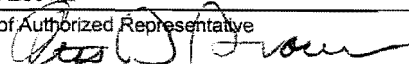
PROPOSED PROJECT Date: <i>1/02</i> Ending Date: <i>6/30/04</i>	a. Applicant <i>James A. Bohnsack</i>	b. Project <i>Reef Fish Community Dynamics</i>
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ESTIMATED FUNDING:	16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?																					
<table border="1" style="width: 100%;"> <tr> <td>Federal</td> <td>\$</td> <td style="text-align: right;"><i>427,425.00</i></td> </tr> <tr> <td>Applicant</td> <td>\$</td> <td></td> </tr> <tr> <td>State</td> <td>\$</td> <td></td> </tr> <tr> <td>Local</td> <td>\$</td> <td></td> </tr> <tr> <td>Other</td> <td>\$</td> <td></td> </tr> <tr> <td>Program Income</td> <td>\$</td> <td></td> </tr> <tr> <td>TOTAL</td> <td>\$</td> <td style="text-align: right;"><i>427,425.00</i></td> </tr> </table>	Federal	\$	<i>427,425.00</i>	Applicant	\$		State	\$		Local	\$		Other	\$		Program Income	\$		TOTAL	\$	<i>427,425.00</i>	a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE _____ b. No. ☐ PROGRAM IS NOT COVERED BY E. O. 12372 ☐ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW
Federal	\$	<i>427,425.00</i>																				
Applicant	\$																					
State	\$																					
Local	\$																					
Other	\$																					
Program Income	\$																					
TOTAL	\$	<i>427,425.00</i>																				

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.		
Name of Authorized Representative <i>Walter D. Thompson</i>	b. Title <i>SE Science & Research Director</i>	c. Telephone Number <i>305-361-4284</i>
Signature of Authorized Representative <i>Walter D. Thompson</i>		e. Date Signed <i>11/26/01</i>

APPLICATION FOR FEDERAL ASSISTANCE

OMB Approval No. 0348-0043

		2. DATE SUBMITTED	Applicant Identifier
1. TYPE OF SUBMISSION: Application ☐ Construction ☒ Non-Construction Preapplication ☐ Construction ☐ Non-Construction		3. DATE RECEIVED BY STATE	State Application Identifier
		4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier
5. APPLICANT INFORMATION			
Legal Name: University of Miami		Organizational Unit: Rosenstiel School of Marine & Atmos. Science	
Address (give city, county, State, and zip code): 4600 Rickenbacker Cswy. Miami, FL 33149		Name and telephone number of person to be contacted on matters involving this application (give area code) Technical: Dr. Jerald Ault (305) 361-4181 Admin.: Catherine S. Wright (305) 361-4181	
6. EMPLOYER IDENTIFICATION NUMBER (EIN): 5 9 — 0 6 2 4 4 5 8		7. TYPE OF APPLICANT: (enter appropriate letter in box) J	
8. TYPE OF APPLICATION: ☒ New ☐ Continuation ☐ Revision If Revision, enter appropriate letter(s) in box(es) A. Increase Award B. Decrease Award C. Increase Duration D. Decrease Duration Other(specify): _____		A. State H. Independent School Dist. B. County I. State Controlled Institution of Higher Learning C. Municipal J. Private University D. Township K. Indian Tribe E. Interstate L. Individual F. Intermunicipal M. Profit Organization G. Special District N. Other (Specify) _____	
		9. NAME OF FEDERAL AGENCY: DOC, NOAA, Coastal Ocean Program	
10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 1 1 — 4 7 8 TITLE: Coastal Ocean Program		11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT: SFP 2002: Reef Fish Community Dynamics	
12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.): Monroe & Miami-Dade Counties, Florida			
13. PROPOSED PROJECT		14. CONGRESSIONAL DISTRICTS OF:	
Start Date 3/1/01	Ending Date 2/28/04	a. Applicant 18	b. Project 18
15. ESTIMATED FUNDING:		16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?	
a. Federal	\$ 84,600 ⁰⁰	a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE _____ b. No. ☒ PROGRAM IS NOT COVERED BY E. O. 12372 ☐ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW	
b. Applicant	\$ ⁰⁰		
c. State	\$ ⁰⁰		
d. Local	\$ ⁰⁰		
e. Other	\$ ⁰⁰		
f. Program Income	\$ ⁰⁰		
g. TOTAL	\$ 84,600 ⁰⁰	17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT? ☐ Yes If "Yes," attach an explanation. ☐ No	
18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.			
a. Type Name of Authorized Representative Dr. Otis B. Brown		b. Title Dean, UM/RSMAS	c. Telephone Number (305) 361-4000
d. Signature of Authorized Representative 		e. Date Signed 4-27-01	

ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL 	TITLE Dean	
APPLICANT ORGANIZATION University of Miami/RSMAS		DATE SUBMITTED November 21, 2001

CERTIFICATIONS REGARDING DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS; DRUG-FREE WORKPLACE REQUIREMENTS AND LOBBYING

Applicants should refer to the regulations cited below to determine the certification to which they are required to attest. Applicants should also review the instructions for certification included in the regulations before completing this form. Signature on this form provides for compliance with certification requirements under 15 CFR Part 26, "Governmentwide Debarment and Suspension (Nonprocurement)" and "Governmentwide Requirements for Drug-Free Workplace" and 15 CFR Part 28, "New Restrictions on Lobbying." The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of Commerce determines to award the covered transaction, grant, or cooperative agreement.

1. DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS

As required by Executive Order 12549, Debarment and Suspension, and implemented at 15 CFR Part 26, for prospective participants in primary covered transactions, as defined at 15 CFR Part 26, Sections 26.105 and 26.110 -

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. DRUG-FREE WORKPLACE REQUIREMENTS Alternate I. Grantees Other Than Individuals

As required by the Drug-Free Workplace Act of 1988, and implemented at 15 CFR Part 26, Subpart F, for grantees, as defined at 15 CFR Part 26, Sections 26.605 and 26.610 -

A. The grantee certifies that it will or will continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's

workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about -

(1) The dangers of drug abuse in the workplace;

(2) The grantee's policy of maintaining a drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will-

(1) Abide by the terms of the statement; and

(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to the Director, Office of Federal Assistance, Office of Federal Assistance and Management Support, HCHB Room 6054, U.S. Department of Commerce, Washington, DC 20230. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted--

(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

B. The grantee shall insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance: (Street address, city, county, state, ZIP code):

University of Miami/RSMAS

4600 Rickenbacker Cswy.

Miami, FL 33149

Check ☐ if there are workplaces on file that are not identified here.

Alternate II. Grantees Who Are Individuals

As required by the Drug-Free Workplace Act of 1988, and implemented at 15 CFR 26, Subpart F, for grantees, as defined at 15 CFR Part 26, Sections 26.605 and 26.610 -

(A) The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant;

(B) If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he or she will report the conviction, in writing, within 10 calendar days of the conviction, to the Director, Office of Federal Assistance, Office of Federal Assistance and Management Support, HCHB Room 6054, U.S. Department of Commerce, Washington, DC 20230. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

3. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 15 CFR Part 28, for persons entering into a grant, cooperative agreement or contract over \$100,000, or loan or loan guarantee over \$150,000, as defined at 15 CFR Part 28, Sections 28.105 and 28.110, the applicant certifies that to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee

of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

If any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above applicable certification(s).

NAME OF APPLICANT

University of Miami/RSMAS

AWARD NUMBER AND/OR PROJECT NAME

PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE

Dr. Otis B. Brown
Dean

SIGNATURE



DATE

November 21, 2001

PROJECT SUMMARY

SFP-2002: Reef Fish Community Dynamics and Linkages with Florida Bay.

J.A. Bohnsack, SEFSC, NOAA Fisheries and **J.S. Ault**, RSMAS, U. of Miami

Budget: March 1, 2002 to April 30, 2003 - \$208,500: March 1, 2003 to April 30, 2004 - \$218,925

Coral reefs and reef fish communities are the ultimate downstream performance indicators of the Everglades Restoration (ER). This proposal will provide critical data for assessing and modeling ER effects on coral reef fishes. Reef fishes represent higher trophic levels and are the ultimate downstream integrators of habitat and functional changes in the south Florida coastal marine ecosystem. Since many exploited reef fish species directly use Florida Bay as settlement and nursery habitat, any changes in Florida Bay will result in changes in recruitment, growth, and mortality that will affect reef fish species composition and population abundance, size, and distribution. Our research has developed a state-of-the-art sampling strategy and established a baseline to assess changes in the Florida Keys ecosystem. This research will continue to quantify coral reef fish community changes to achieve the following goals:

1. Provide an intensive and precise spatial and habitat specific fishery-independent visual census assessment of the reef fish communities across the range of reef fish habitats in the Florida Keys in 2002 and 2003 following the implementation of no-take zones.
2. Document trends in reef fish size and abundance within and outside no-take zones in the Florida Keys to assess and quantify on a spatially explicit basis the impacts of fishing and other extractive human activities.
3. Test specific hypotheses predicting continuing changes in reef fish communities as the result of no-take protection.
4. Provide a precise and spatially explicit database for assessing any future reef fish population changes resulting from Everglades restoration.
5. Provide managers options for optimizing long-term survey design strategies to identify reef fish population changes that are precise and cost-effective.
6. Correlate the linkages between reef fish communities and fishing, habitat, oceanographic and other physical processes to guide appropriate experimental studies on dynamic mechanisms and to develop predictive models.

Research will evaluate changes and experimentally test specific hypotheses concerning no-take zone protection for the Florida Keys National Marine Sanctuary (FKNMS) management plan. Ongoing research has shown rapid changes in FKNMS no-take zones as the result of eliminating fishing in 1997. Elucidating the impacts of fishing is essential because fishing can potentially confound, dominate, or synergistically interact with other environmental influences. This collaborative effort is focused on CIMAS Themes 2 and 3 and is consistent with NOAA science and environmental stewardship objectives. The continued quantification of spatially explicit changes in reef fish communities is critical for this effort. The data collected will be essential for assessing any future community effects resulting from changes in Florida Bay as the result of Everglades restoration efforts.

Statement of Work/Project Description/

The Problem. Over decades, Florida Bay has undergone dramatic environmental changes which are the focus of an intensive effort to restore the ecosystem by altering the hydrology to a more natural condition and taking other management actions. The Everglades restoration includes a comprehensive effort to understand and model the physical and biological processes of Florida Bay. In addition, management changes have been made as part of the Florida Keys National Marine Sanctuary (FKNMS) management plan. The most important change is the use of spatial protection including the establishment of 'no-take' marine protected areas in the FKNMS in 1997 and in the Tortugas in 2001. As the Everglades restoration is implemented, it is essential to have effective monitoring programs to assess changes and run predictive models.

The Congressionally authorized South Florida Ecosystem Restoration Project is composed of multiple restoration, growth management, agricultural, and urban revitalization projects, programs and initiatives designed to make southern Florida more sustainable. Florida Bay and the Florida Keys Reef Tract are the ultimate downstream habitat components of the Everglades Restoration. Reef fishes and fisheries will reflect the ultimate success of these efforts since any changes in water quality, habitat quality and quantity, and human activities will be reflected in the recruitment, growth, and survival of ecologically and economically important reef species.

Fishes are a direct public concern and obvious measures of restoration performance and ecological success. Reef fishes in particular are an essential and conspicuous component of the South Florida Marine Ecosystem and support important commercial, recreational, and aesthetic uses in southern Florida and the Florida Keys (Smith-Vaniz 1995). They are also the ultimate downstream integrators of environmental conditions and human activities. Factors that increase mortality, such as pollution, fishing, and loss or changes in habitat, are eventually reflected in reef fish populations. Success of Everglades restoration and management changes will be reflected in reef fish fisheries and community species composition, abundance and size structure. Reef fishes are ideal indicators of success of these efforts because they are tightly linked to the southern Florida coastal ecosystem and are likely to be directly and indirectly impacted by the restoration efforts in Florida Bay. Many important reef species directly use Florida Bay and inshore habitats as nursery and juvenile forage areas before migrating offshore to the coral reefs. Obvious examples include spiny lobster (*Panulirus argus*), barracuda (*Sphyrna barracuda*), hogfish (*Lachnolaimus maximus*), jewfish (*Epinephelus itajara*), gray snapper (*Lutjanus griseus*), as well as other snappers (Lutjanidae), groupers (Serranidae), grunts (Haemulidae), and jacks (Carangidae). Even tarpon and snook closely tied to Florida Bay utilize reef habitats as adults. In most cases, however, the relative importance of different habitats in Florida Bay and offshore of the Keys has rarely been quantified for different reef species.

Scientific Objectives. The proposed research will continue to monitor and report on reef fish community trends by habitat type at sites with different exposure to Florida Bay water and under different levels of management protection along the entire inshore and offshore reef track from Miami through the Lower Keys. Study sites include areas managed by Florida, Biscayne National Park (BNP), Everglades National Park (ENP) in Florida Bay (FB) and the Florida Keys National Marine Sanctuary (FKNMS).

Fishing and other extractive activities are recognized as a major, if not the most important, disturbances to coral reefs (Jackson 1997, Jackson et al. 2001, U.S. Coral Reef Task Force, 2000). This proposal will directly test specific hypothesis involving no-take marine reserves and their importance to management based on the first 5 years of changes following the establishment of 19 no-take zones in the FKNMS in 1997. Elucidating the importance of fishing is essential for determining the causes of ecosystem change and to measure the success of the restoration effort. The establishment of one large (79 km²) Ecological Reserve and 18 smaller (0.16–4 km²) no-take Sanctuary Preservation Areas (SPAs) in the FKNMS in 1997 and 198 na mi² in the Tortugas in 2001 provide unique opportunities to address the influence of fishing. No-take zones provide a scientific basis to distinguish between changes caused by natural versus anthropogenic disturbances. Determining the response of reef fish populations to no-take protection also provides a potential estimate of rates of change that could occur with Everglades restoration. We have documented significant changes in recently established no fishing zones (see Results from Prior Support). Other research has shown that such changes can continue for well over a decade (Roberts et al. *in press*).

This proposal will collect essential data for developing experimental mechanistic studies and modeling efforts to describe and predict ecosystem changes. Although the restoration will take years and some changes may take decades to become manifest, data collected from this proposal will be necessary to demonstrate and evaluate those changes. The underlying hypothesis is that changes in hydrology can impact reef fishes by modifying habitat or changing food webs in ways that impact juvenile recruitment, growth, and survival (Herrnkind et al. 1997). Ultimately, such changes become reflected in reef fish species composition, distribution, abundance, and size structure. This proposal will provide data with a high degree of precision and spatial resolution throughout the Keys' reef tract achieve specific goals and test hypotheses listed below. Other funding will be necessary and sought to collect data from the Tortugas; to do other specific research on controlling mechanisms; and to model influences of habitat, oceanographic, and physical influences on reef fish populations.

- Goal 1.** Provide an intensive and precise spatial and habitat specific fishery-independent visual census assessment of the reef fish communities across the range of reef fish habitats in the Florida Keys during 2002 and 2003. (See Tasks 1 - 4).
- Goal 2.** Document trends in reef fish size and abundance within and outside no-take zones in the Florida Keys to assess and quantify on a spatially explicit basis the impacts of fishing and other extractive human activities. (See Task 7).
- Goal 3.** Test specific proposed hypotheses predicting changes in reef fish communities as the result of no-take protection. (See Task 7).

Ho: 1. Abundance, average individual size, and spawning potential of exploited species will increase within reserves. Alternative: There will be no difference over time or between protected and unprotected areas. We predict that the greatest proportional population increases will be among the more heavily exploited species and species with more sedentary adults.

Ho: 2. The biological response and biodiversity will be correlated with the level of protection. Alternative: there is no correlation between biological response and biodiversity with levels of protection. We predict that biological responses and biodiversity will decrease in the following order: no human access, no harvest activities, partial protection from certain harvest activities, and open access to all activities.

Ho: 3. Reserve size is important. Alternative: Reserve effectiveness has no relationship to its size. We predict that species with larger size and greater areas of activity will require larger protected areas. Results will help managers by predicting what minimum size is necessary to be effective for species with specific biological characteristics.

Ho: 4. Reserve location is important. Alternative: the site location selected has no effect on response. We predict that in addition to size, zone effectiveness will be influenced by habitat quality, distribution, quantity, and proximity of nursery habitats. Note, related hypotheses about larval dispersal from reserves to surrounding fishing grounds and position relative to oceanographic or hydrological features (e.g. up current or down current) can not be tested within the limited scope and budget of this effort.

Ho: 5. Reserves will provide control areas to assess fishery impacts on ecosystems. Alternative: Reserve areas will be ineffective by being no different from exploited areas.

Goal 4. To provide a precise and spatially explicit database for assessing any future reef fish population changes resulting from Everglades restoration. (See Tasks 1 - 4)

Ho: 6. Florida Bay restoration will result in greater responses in areas adjacent to Florida Bay and at reefs exposed to water plumes from Florida Bay. Alternative: Areas adjacent to Florida Bay and reefs exposed to Florida Bay water plumes will be no different than at reefs more distant from Florida Bay. This is a spatial test in which reefs in the middle and lower Keys are expected to respond differently than reefs closer to Miami or in the Dry Tortugas where Florida Bay influence is minimal. The most direct anticipated changes are changes in juvenile recruitment, growth and mortality in habitats close to or influenced by Florida Bay water plumes.

Goal 5. Provide managers options for optimizing long-term survey design strategies to identify reef fish population changes that are precise and cost-effective. (See Tasks 1, 3 and 7)

Goal 6. Correlate the linkages between reef fish communities and fishing, habitat, oceanographic and other physical processes to guide appropriate experimental studies on dynamic mechanisms and develop predictive models. (See Tasks 5 and 6)

Proposed methodology. The following tasks designed to achieve the research goals are outlined as an iterative optimization process in **Figure 1**.

- Task 1.** Pre-survey Analysis - Analyze previously collected historical data to optimize the 2002 survey design.
- Task 2.** Collect 2002 field data and produce a progress report.
- Task 3.** Optimal Survey Design Analysis: Analysis of 2002 data to refine and optimize 2003 survey design.
- Task 4.** Collect 2003 field data.
- Task 5.** Determine trends due to factors outside of fishing (i.e. weather, currents, Florida Bay changes)
- Task 6.** Correlation analysis of trends leading to mechanistic model development.
- Task 7.** Produce final report assessing changes for FKNMS since zoning performance review.

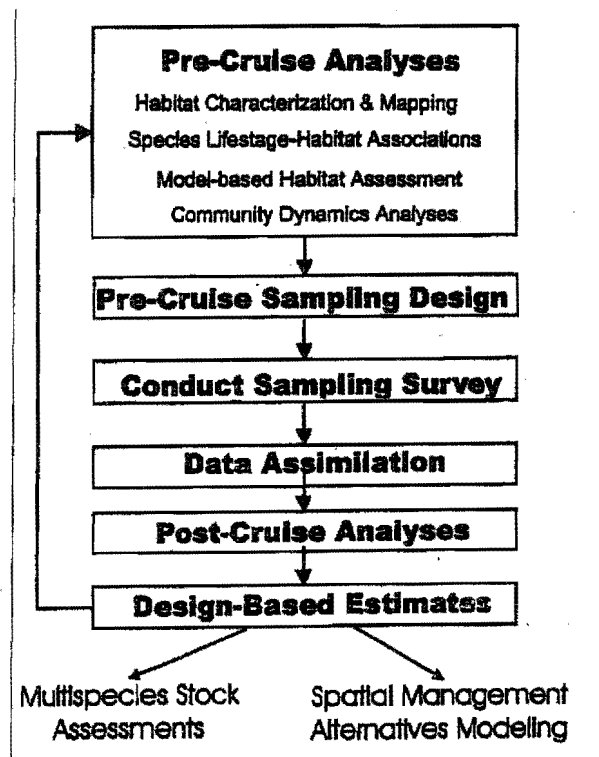


Figure 2. Methodological overview of design-based reef fish sampling survey.

FIELD SURVEYS: Biological data will be collected by standard, non-destructive, in situ, fishery-independent, visual monitoring methods by highly trained and experienced divers using open circuit SCUBA. Visual methods are ideal for assessing reef fishes in the Florida Keys because of prevailing good visibility and management concerns requiring the use of non-destructive assessment methods. Data are collected by a stationary diver centered in a randomly selected circular plot (Bohnsack and Bannerot 1986). The circular plot method is non-destructive and provides reliable quantitative estimates of species composition, abundance (density per plot), frequency-of-occurrence, and individual size composition for the reef fish community.

Divers sample 7.5 m radius circular plots for 5 minutes attempting to count all fish observed within each imaginary cylinder extending from the bottom to the limits of vertical visibility (usually the surface). Divers begin each sample by facing in one direction and listing all species within the field of view. When no new species are noted, new sectors are scanned by rotating in one direction for the 5 min period. Several complete rotations were usually made for

each plot. After the initial 5 min, data are then collected on the abundance and minimum, mean, and maximum lengths for each species. Depth, bottom composition, estimated percentage cover, and maximum relief are recorded for each plot from the polar perspective of the centrally located observer. A ruler held out perpendicularly at the end of a meter stick is used to reduce apparent magnification errors in size estimates (Bell et al. 1985; Bellwood and Alcala 1988, Harvey and Shortis 1996). Sizes are converted to biomass (Bohnsack and Harper 1988; Meester et al. in press). Divers periodically calibrate their sample radius estimates with the meter stick or fiberglass tape. Species with few individuals (e.g. angelfish, barracuda, hogfish) are counted and size estimated immediately. Highly mobile species that are unlikely to remain in the area (e.g. sharks, carangids, *Clepticus parrai*) are tabulated when first observed and then ignored. For common species (e.g. damselfish, wrasses, etc.) one 360° rotation is made for each species by working back up the list in reverse order of recording to reduce potential bias by avoiding counting a species when they were particularly abundant or obvious. The time required to record each sample averages 15-20 min (range 5 - 30), depending on the habitat.

A two stage stratified random sample design is used to optimize the sampling effort and choose sampling locations and is illustrated for the middle Keys in Figure 2. Bottom features are first classified into nine reef habitat strata (Ault et al 2001b) and mapped based on bottom structure and location. The Florida Keys domain is overlain in a Geospatial Information System (GIS) with a grid of 1 km² cells. Each cell contains 25 blocks of 200 x 200 m which are the primary sample subunits. Block size was chosen such that divers can easily swim from a moored vessel to any location within the boundaries. Each block that contains reef habitat is assigned a unique number and randomly selected for sampling from a discrete uniform probability distribution to ensure that each block has equal selection probability. Sample stations are then randomly positioned on appropriate habitat in each block. There are 226 non-overlapping possible fish sampling stations within each block. Because of concerns about autocorrelation and safe diving practices, each fish sampling station consists of combined stationary point estimates from two individual divers (i.e. a "buddy pair"). A second dive pair samples ~100 m away within the same block to provide replication. About 12,000 plots were sampled from 1979 through 2001 (Bohnsack et al., 1999) including 880 plots (220 cells) in 2001 (Figure 3).

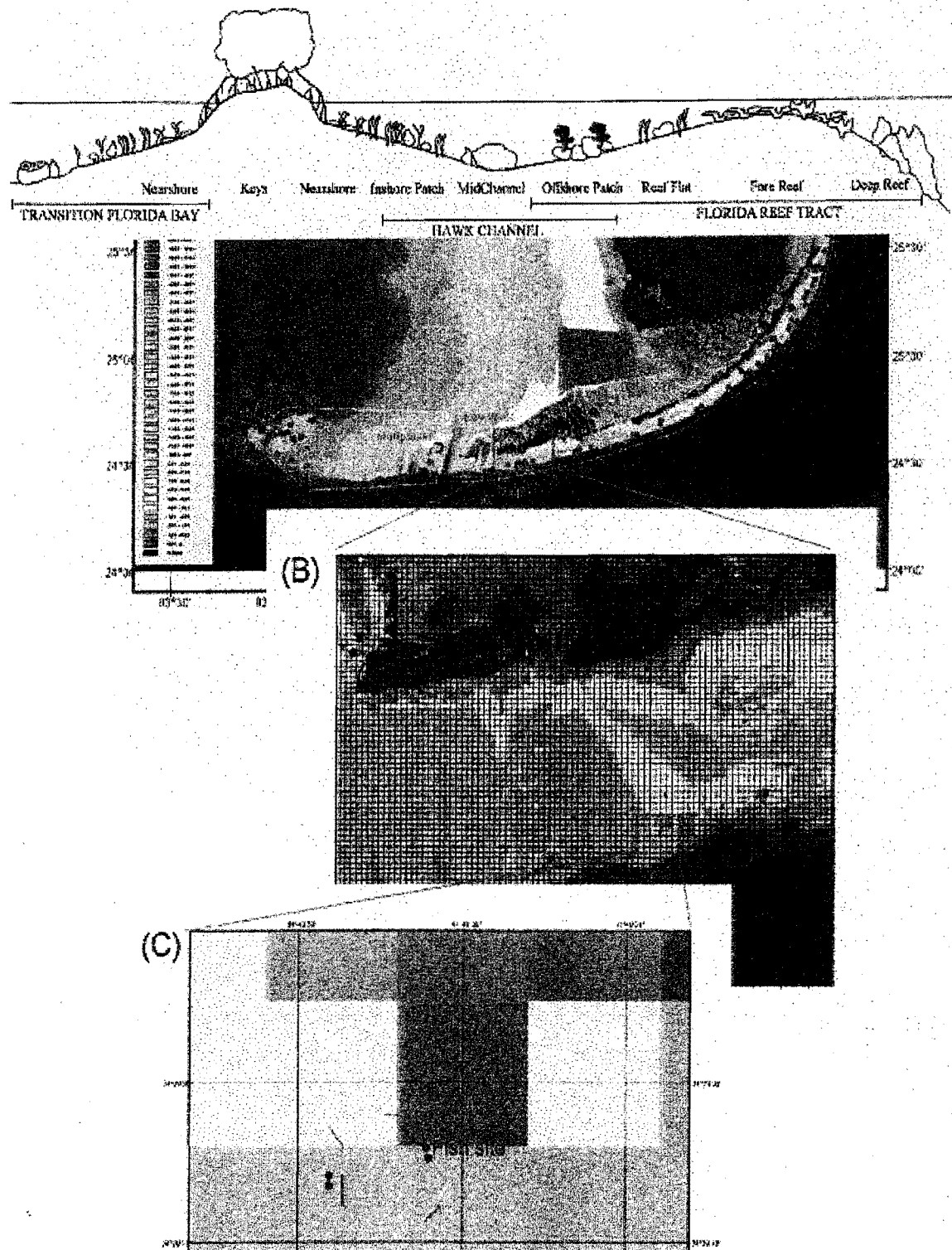


Figure 2. Illustrated sample stratification strategy. The top shows cross-shelf (N to S) bottom features used for habitat classification. Maps show the lower Keys with a superimposed grid overlay showing randomly selected primary dive site subunits (blocks). The bottom map shows an example block with replicated two-man dive team sample sites and NURC coral team sample sites.

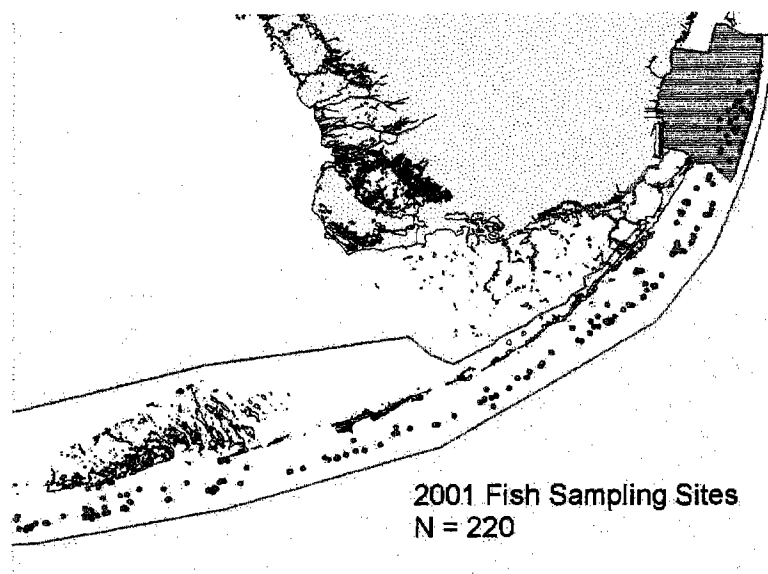
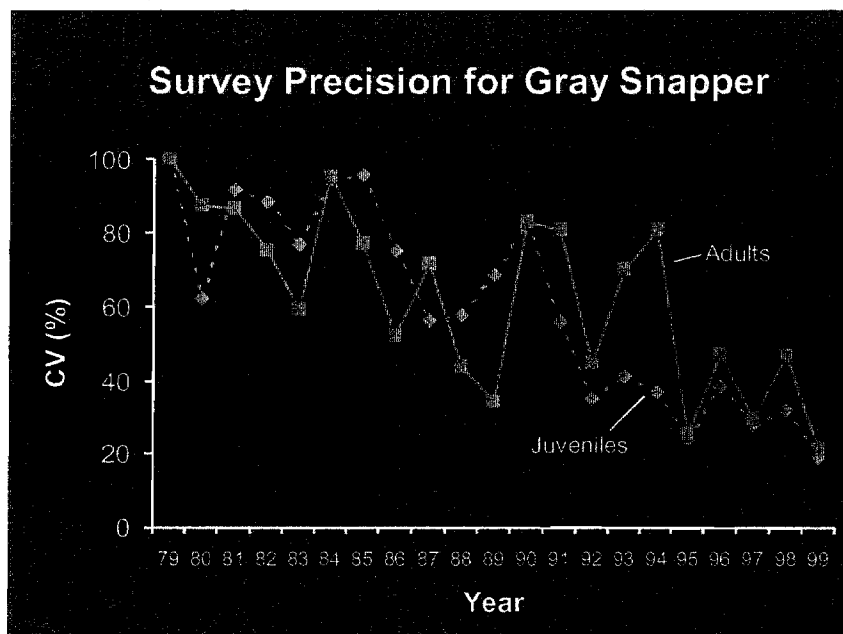


Figure 3. Location of 220 random stationary fish sample sites in the Florida Keys sampled in 2001. The Florida Keys National Marine Sanctuary is outlined in purple and Biscayne National Park in shaded green.

We propose to collect a minimum total of 1600 visual point samples (i.e. 800 station samples or 400 cells) using this habitat-specific stratified random sampling design. We estimate 90 field days are needed to collect data based on an average of 6 samples per diver per day and 4 divers per trip. Sampling will involve RSMAS and SEFSC divers and will be concentrated in the spring, summer and fall when sea conditions are most suitable for diving. Approximately an equal number of days will be needed to enter, check, and maintain the database. Analysis will include additional complimentary data collected from other programs in Biscayne Bay, Florida Bay and nearshore waters.

Figure 4. Improved precision in population estimates for juvenile and exploitable phased gray snapper densities in the Florida Keys based on increased sample size involving a two part stratified random sampling design.



ANALYTICAL METHODS: Analysis used to optimize the allocation of sample effort is based on data variance by habitat and is refined annually through an iterative process. Statistical power is obtained by allocating sampling effort over more sites (Figure 4). Previously collected data will be analyzed to optimize subsequent surveys. GIS habitat maps will be continuously updated and refined. Analysis will ultimately lead to the development of optimal sampling strategies and new tools for management decision-making as was applied to Biscayne National Park (Ault et al. 2001a) and Dry Tortugas National Park (Ault et al. 2001b). Most statistical analysis will be based on standard multivariate techniques (Kleinbaum and Kupper 1978; Sokal and Rohlf 1981; Neter et al. 1985). Although the approach is simple, the number of sites, species richness, and levels of treatment require considerable statistical sophistication to provide an efficacious quantitative assessment of the reef fish communities. Analysis is essential to increase statistical precision, lower sampling costs, and increase the degrees of freedom.

We use 'average size in some phase of an exploited stock' for each population as a measure of the relative condition the reef fish community. The physiological variable is a sensitive indicator of direct and indirect stress on the entire marine ecosystem, because over their life history, ontogenetic shifts in habitat use distinguish species or taxa assemblages and thus integrate "stressors" over a broad spatial and temporal scales. This approach is strategic because it capitalizes on the fact that the average size of the fraction of the stock removed by fishery catch should be equivalent to the average size of the exploitable phase of the population remaining in the sea. When the limits of integration are set at the exploitable phase (i.e., size of first capture L' to maximum size in the stock L_λ), an algebraic recasting of the average size $\bar{L}(t)$ integral provides an unbiased estimator of total mortality $Z(t)$ (Ault and Ehrhardt 1991; Ehrhardt and Ault 1992; Ault et al. 1998)

$$\left[\frac{L_\infty - L_\lambda}{L_\infty - L'} \right] \frac{Z(t)}{K} = \frac{Z(t)(L' - \bar{L}(t)) + K(L_\infty - \bar{L}(t))}{Z(t)(L_\lambda - \bar{L}(t)) + K(L_\infty - \bar{L}(t))}$$

where K and L_∞ are parameters of the von Bertalanffy equation. Average length of reef fish in the exploitable phase of a fish stock (or population if closed inter-breeding unit) is strongly correlated with population size in both numbers and biomass, and thus can be used as indicator variable of population health. The statistic is robust to population estimation measure (i.e., visual or headboat survey data). Iterative application of the method over data for each species provides time-series information on reef fish mortality rates, and thus abundance, for all the species in the survey. To assess the status of the multispecies fishery, we developed a computer model called REEFS (reef-fish equilibrium exploitation fishery simulator) and parameterized it for the Florida Keys (Ault et al. 1998, Ault et al. 2000). We use the REEFS stochastic simulation model to assess population risks relative control rules (e.g., SEFSC 1999). The REEFS computer model is a size-based algorithm that embodies a stochastic age-independent model for ensemble number at a given length $\bar{N}_y(L_y, t)$ for the entire population (Ault and Rothschild 1991, Ault and Meester 2000)

$$\bar{N}_y(L_y, t) = \int_{t_r}^{t_h} R(\tau - a) S(a) \Theta(a) P(L_y | a) da$$

where $R(\tau - a)$ is recruitment, $S(a)$ is survivorship at age a , $\Theta(a)$ is sex ratio at age, and $P(L | a)$ is the probability of being length L given the fish is age a . Population dynamics parameters for each fish stock are gleaned from the taxa-specific literature. This model has been generalized to incorporate space as well as time (Ault et al. 1999, 2000).

The REEFS model was configured to assess several fishery management decision making endpoints, yield-per-recruit (YPR), and spawning potential ratio (SPR). Fishery management endpoints are relatively robust measures of potential yields and recruitment. As such, they help to focus on biological (size) and fishing (intensity) controls for managing current and future fishery production. Since biomass $B(a, t)$ is the product of numbers-at-age times weight-at-age, yield in weight Y_w from a given species s was calculated as

$$Y_w(F, L', t) = F(t) \int_{L'}^{L_h} B(L | a, t) dL = F(t) \int_{L'}^{L_h} N(L | a, t) W(L | a, t) dL$$

Yield-per-recruit can then be calculated by scaling yield to average recruitment from the right hand side of the above equation. Mature or spawning stock biomass $B_m(t)$ is a measure of the stock's reproductive potential or capacity to produce newborn, ultimately realized at the population level as successful cohorts or year classes. Spawning stock biomass is obtained by integrating over individuals between the minimum size of first maturity L_m , and maximum reproductive size (here assumed to be the maximum size L_h) in the stock

$$B_m(t) = \int_{L_m}^{L_h} B(L | a, t) dL$$

Combined with the survey data, the above computations can be used as the basis for determining control parameters and alternative for control rules for stocks under jurisdiction of the South Atlantic and Gulf of Mexico Fishery Management Councils (SEFSC 2000, Ault et al. 2001b).

These baseline computations will allow managers to understand the current status of the resources prior to spatial changes caused by the Everglades restoration. This is accomplished by recasting attributes of the environment into strata that correlate with reef fish population density and variance. These stratifications are further used to 'paint' the stock's spatial abundance-at-size distribution back into the seascape. Furthermore, these fundamental relationships can be embedded in a spatial simulation model to assess the consequences of the Everglades restoration. **Figure 5** is an example of this kind of spatial simulation done to assess the short and longer-term efficacy of spatial management alternatives using 'research natural areas' for Dry Tortugas National Park (Figure 9 from Ault et al. 2000). A similar approach using data collected from this proposal could be used to predict and provide quantitative insights into the longer-term changes resulting from the

Everglades restoration. Development of similar predictive forecast models is essential for the restoration effort.

HYPOTHESIS TESTING: The following specific hypotheses will be tested for Goal 2, to evaluate trends in FKNMS, and Goal 3, to determine changes resulting from establishment of no-take zones:

- (a). Exploitation response. **Abundance of exploited populations will increase within reserves.**
- (b). Unexploited population response. **Abundance of unexploited species will remain the same or decrease in response to an increased abundance of exploited species.**
- (c). Quantitative exploitation response. **The greatest proportional population increases will be among the more heavily overfished reef fish species.**
- (d). Catchability. **Marine reserves will be more effective for species with higher catchabilities.**
- (e). Size structure. **Mean size and age will increase for species benefiting from reserves.**
- (f). Spawning potential. **Spawning potential of exploited populations will increase.**
- (g). Home range size. **Population increases in marine reserves will be greatest for species with sedentary adults.**
- (h). Species size. **Larger species will require larger reserves because of larger areas of activity.**
- (i). Dispersal distance. **Increased fishery landings due to postsettlement dispersal will be directly correlated with distance from reserve sites.**
- (j). Total area effect. **Total fishery landings for exploited species will increase with the amount of area under protection up to a point and then decrease.**
- (k). Edge effect. **Dispersal from reserves to surrounding areas will be proportional to the ratio of reserve boundary length to area enclosed.**
- (l). Local area effects. **Population responses in a reserve will be proportional to the protected area of that reserve.**
- (m). Threshold response. **Reserves must be of a minimum size to protect a sufficient population to be effective.**
- (n). Fecundity. **Reserves will improve regional recruitment on impacted species by increasing recruit abundance.**

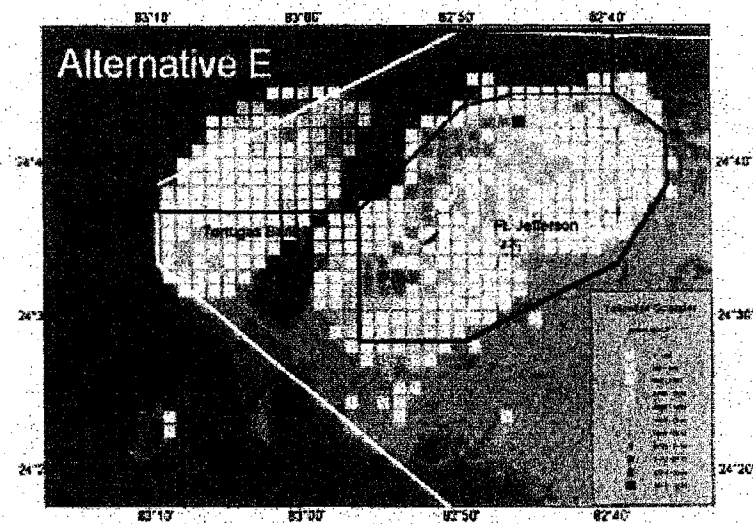
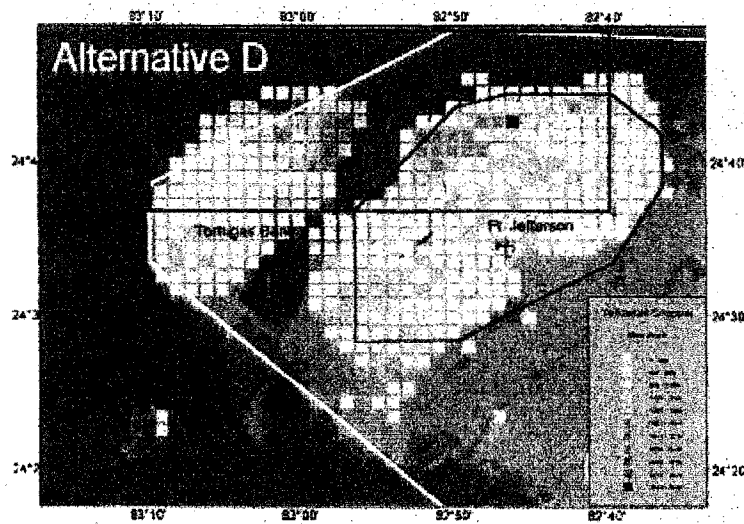
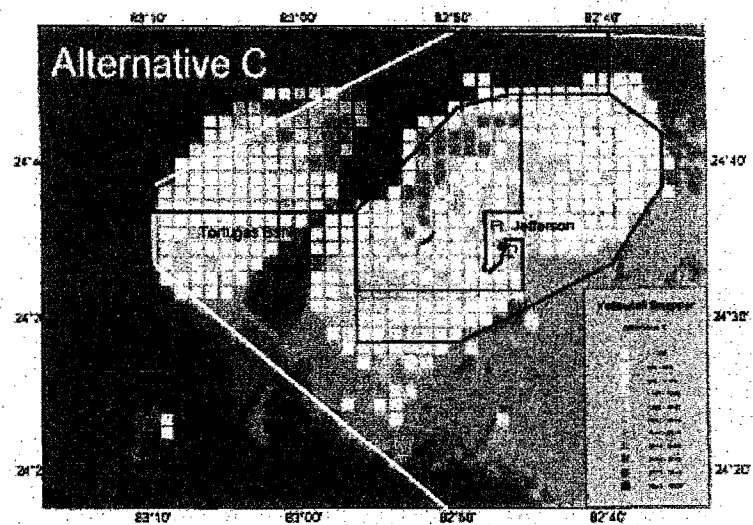
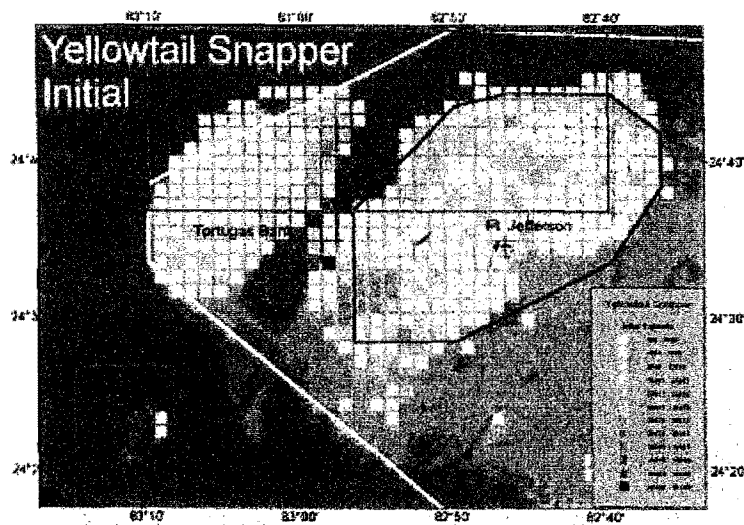


Figure 5 Example of spatially explicit population projections used to analyze different management alternatives in Dry Tortugas National Park (from Ault et al. 2000).

Relevance to goals of the SFERPM Program and its scientific priorities

The proposed research directly relates to question 5 of the Strategic Science Plan: **What is the relationship between environmental and habitat change and the recruitment, growth, and survivorship of animals in Florida Bay?** and to issues 4 and 5 identified by PMC and the Florida Bay Science Oversight Panel as priority research areas: **Ecosystem modeling studies of trophic relationships and recruitment pathways and higher trophic level monitoring and modeling.** Changes to Florida Bay involving habitat change, water quality, and trophic food web modifications will ultimately be reflected in the reef fish communities. The data collected are essential for assessing changes and for modeling effects of the restoration on Florida Bay and adjacent coral reef ecosystems. The degree and speed of community changes as the result of no-take zone protection offer some projection of how fast changes could be potentially anticipated as the result of the Everglades restoration. This research will assess changes for a variety of reef species that are ultimately dependent on Florida Bay through recruitment, growth and mortality as well as species less closely tied to Florida Bay. Other proposed projects that will develop higher trophic level models will benefit from 'real' data provided by this research.

Relevant Results from Prior Support

Prior SFERMP funding has led to numerous publications and scientific advancements. New and innovative ways to assess reef fish stocks were developed based on mean fish size and led to the first multispecies reef fish assessment for 35 species of economically important reef species in the Florida Keys (Ault et al. 1997, 1998). Procedures were developed to efficiently generate precise species-specific size distributions for juvenile and exploitable phased-stocks (Meester et al. 1999). A comprehensive baseline was developed to assess changes as the result of new zone protection for the FKNMS management plan (Bohnsack et al. 1999). Sampling coverage was optimized and expanded to cover other reef habitats besides fore reefs (Bohnsack et al. 1999a) and to other areas beyond the Florida Keys: including Broward County (R. Spieler, Nova U., pers. comm.) and the Tortugas (Ault et al. 2000). A comprehensive reef fish assessment was provided for Biscayne National Park using data collected from prior support (Ault et al. 2001a). Tortugas data were used to predict populations changes under various management alternatives for the National Park Service (Ault et al. 2000) and to provide a comprehensive reef fish stock assessment (Ault et al. 2001b). In summary, previous research support has provided important data and led to the development of new and effective tools for resource management, modeling, and decision making.

Most recently, the analytical approach outlined in this proposal has demonstrated a statistically significant response of adult yellowtail snapper (*Ocyurus crysurus*) after only 2 years following no-take zone protection in the FKNMS. Adult (exploitable phased) yellowtail were shown to be significantly more abundant in no-take zones in two offshore habitats in both the upper and lower Keys (**Figure 5**). Likewise, exploitable combined grouper showed significant abundance increases after 3 years. These results demonstrate the statistical power of the statistical sampling design to detect changes on a habitat and spatially explicit regional scale.

Yellowtail Snapper Adult CPUE 1999

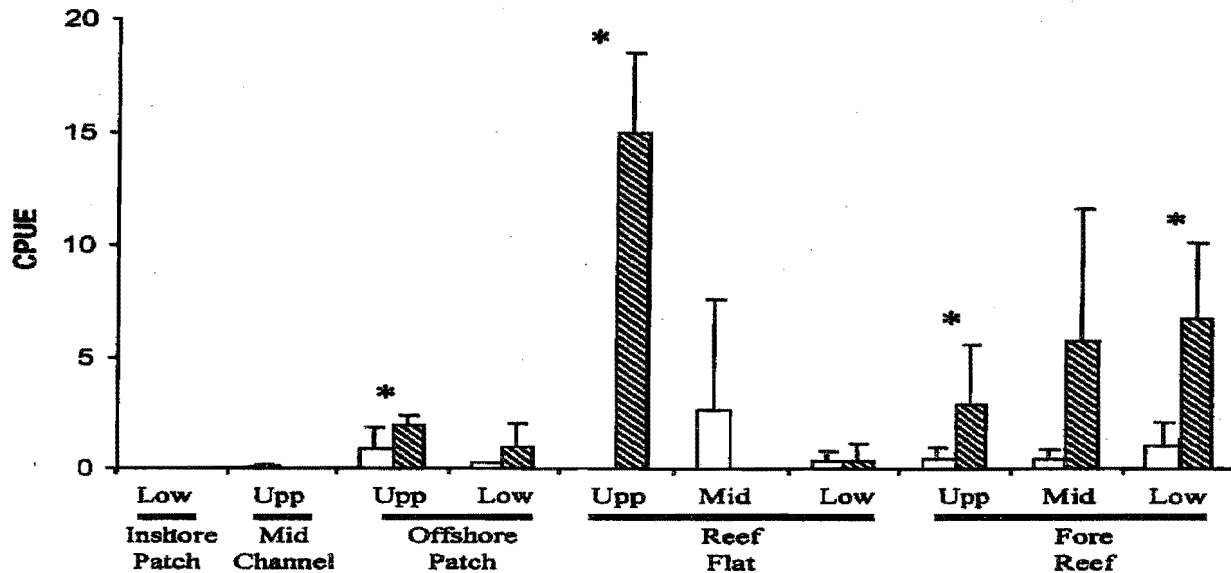


Figure 5. Mean density (+ 95% confidence intervals) of exploitable phased adult yellowtail snapper by habitat and region (upper, middle, and lower Keys) in no-take zones (hashed bars) and fished areas (blank bars). * indicate statistically significant differences.

Project Management The proposed research is a cooperative effort between investigators at the Southeast Fisheries Science Center (SEFSC, NOAA-Fisheries) under the direction of Dr. James Bohnsack and at the University of Miami under the direction of Dr. Jerry Ault. The investigators are uniquely qualified to conduct this research based on past research and experience in the study area. Dr. Ault will be largely responsible for all aspects of sampling survey design, statistics, modeling and data analyses, while Dr. Bohnsack will lead the field expedition and diver-training components, and provide support on data storage, syntheses, and analyses. The dive team will consist of Dr. Ault's research staff of research scientists including Dr. Steve Smith (statistical analyses and sampling survey design) and graduate students, as well as the SEFSC Reef Resources Team (NOAA Fisheries). The PI's agree to follow all federal laws and regulations.

a. Objectives and expected significance This research will provide necessary data for assessing the ultimate downstream impacts of Everglades restoration on the economically and ecologically important reef fish community. A primary first objective is to assess fishing impacts on reef fish communities by comparing no-take zones with fished areas. The experimental approach was designed to provide a 5 year evaluation report in 2002 and is on schedule. This project also will quantify the importance and contribution of specific habitat types and areas for individual reef species. This information will allow predictive models to be generated for these fishes on the effects of habitat loss, alteration or improvement resulting from the Everglades Restoration. With some additional support, we ultimately hope to develop predictive and processes models to describe the dynamics of fishes at higher trophic levels. We intend to continue to

conduct classical Level I fishery-independent fishery stock assessment of economically and ecologically important reef species under the newly proposed NMFS limit and target control rules (SEFSC 2000; Ault et al. 2001a, 2001b).

b. Relation to present state of knowledge in the field and relation to previous work and work in progress by PI's. This proposed research is a continuation of an integrated multi-year, multi-institutional and multi-disciplinary research effort to better understand and predict reef fish populations in relation to fishery extraction, physical factors and habitat quantity and quality. The research uses state-of-the-art statistical and computer visualization techniques in an experimental framework to test specific hypothesis. The experimental approach outlined in this proposal also has previously been tried and successfully used to model the dynamics of shrimp and fish populations in Biscayne Bay in relation to oceanographic processes, terrestrial fresh water flow, and benthic habitat distribution (Ault et al. 1999a,b). This proposal is the next step for developing similar models of Florida Bay and the Florida Keys' reef tract.

c. Value to program goals. The proposed research will address programs goals by directly addressing question 5 of the Strategic Science Plan involving higher trophic levels and the research priorities of the Florida Bay Science Oversight Board. The data to be collected are needed for monitoring changes and for developing descriptive and predictive models that describe the dynamics of coral reef fishes, habitat changes, and impacts of the Everglades restoration effort. The research will specifically address the importance and impact of human extractive uses on the resources, which could be the dominant influence on adult fish populations. By determining spatially explicit habitat use patterns by species, we will be able to predict consequences of habitat alterations (loss or degradation or expansion and improvement) resulting from the restoration effort. Impacts of fishing, and extreme environmental phenomena, such as hurricanes or el nino effects, can also be evaluated.

d. Potential Coordination with other investigators. Sampling will be conducted in cooperation with the Florida Keys National Marine Sanctuary, Biscayne National Park, John Pennnekamp Coral Reef State Park, and the Dry Tortugas National Park. Much of the sampling has been coordinated and conducted from the same sites used to collect detailed coral and benthic habitat data under the direction of Dr. Steven Miller (NURC, UNC - Wilmington). We will collect fish data simultaneously and at the same locations used by the NURC coral team who have adopted the site sampling strategy proposed here. Sampling is also coordinated with John Hunt (Florida FWCC) who is collaborating with spiny lobster co-sampling. He will provide access to FWCC data. Dr. Ault will collaborate with Dr. Tom Lee and John Wang (RSMAS, U of Miami) to model current and oceanographic processes with biological data collected by this research. Research on recruitment process by Dr. William Richards for fishes and invertebrates is complimentary to this effort. Finally, data collected here will help develop specific mechanistic hypothesis and will be needed to test hypothesis as they are developed about predicted changes caused by the Everglades restoration effort.

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(4) Milestone Chart

Task 2002 - 2003	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1. Pre-Survey analysis	XX	XX							XX	XX	XX	
2. Collect field data	XX	XX	XX	XX	XX					XX	XX	XX
3. Summary & optimization analysis					XX	XX	XX	XX	XX			

Task 2003 -2004	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1. Pre-Survey analysis									XX	XX	XX	
4. Collect field data	XX	XX	XX	XX	XX					XX	XX	XX
3. Annual Summary	XX						XX	XX	XX			
5. Trend Analysis										XX	XX	XX
6. Correlation Analysis										XX	XX	XX
7. Final Report												XX

Budget Pages

COP SUMMARY PROPOSAL BUDGET

ORGANIZATION SEFSC-NMFS-NOAA-DOC		FOR COP USE ONLY	
		PROPOSAL NO.	DURATION (MONTHS)
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James A. Bohnsack		AWARD NO.	
A. SENIOR PERSONNEL: PI/PI, Co-PIs, and Other Senior Associates (List each separately with title, A-7. Show number in brackets)	CAL ACAD JUMR	Funds Requested By Proposer	Funds Awarded by COP (if Different)
1. James A. Bohnsack	1.3	\$17,802	\$
2. David B. McClellan	2.4	15,013	
3. Douglas E. Harper	2.4	14,402	
4.			
5.			
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)			
7. () TOTAL SENIOR PERSONNEL (1-6)		0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)			
1. () POSTDOCTORAL ASSOCIATES			
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			
3. () GRADUATE STUDENTS			
4. () UNDERGRADUATE STUDENTS			
5. () SECRETARIAL - CLERICAL			
6. (X) OTHER DIVE HAZARD PAY and OVERTIME		17,000	
TOTAL SALARIES AND WAGES (A + B)		67,218	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)			
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)		67,218	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)			
TOTAL PERMANENT EQUIPMENT		11,500	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)		17,000	
2. FOREIGN		0	
F. PARTICIPANT SUPPORT COSTS			
1. STIPENDS \$			
2. TRAVEL			
3. SUBSISTENCE			
4. OTHER			
() TOTAL PARTICIPANT COSTS		0	
G. OTHER DIRECT COSTS			
1. MATERIALS AND SUPPLIES		21,082	
2. PUBLICATION/DOCUMENTATION/DISSEMINATION		3,000	
3. CONSULTANT SERVICES			
4. COMPUTER (ADPE) SERVICES			
5. SUBCONTRACTS Vehicle		5,300	
6. OTHER			
TOTAL OTHER DIRECT COSTS		0	
H. TOTAL DIRECT COSTS (A THROUGH G)		0	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)			
TOTAL INDIRECT COSTS (F&A)			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)		0	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS)			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)		\$125,100	\$
M. COST SHARING: PROPOSED LEVEL \$	AGREED LEVEL IF DIFFERENT: \$		
PI/PI TYPED NAME AND SIGNATURE James A. Bohnsack	DATE 11/26/01	FOR COP USE ONLY	
INST. REP. TYPED NAME & SIGNATURE Nancy B. Thompson	DATE 11/25/01	INDIRECT COST RATE VERIFICATION	
		Date Checked	Date of Rate Sheet
			Initials-ORG

COP SUMMARY PROPOSAL BUDGET

G/6/03 - 6/30/04

ORGANIZATION		FOR COP USE ONLY			
SEFSC-NMFS-NOAA-DOC		PROPOSAL NO.	DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James A. Bohnsack		AWARD NO.	Proposed	Awarded	
A. SENIOR PERSONNEL: PI/PI, Co-PIs, and Other Senior Associates (List each separately with title, A-7. Show number in brackets)		COP-Funded Person-mos.	Funds Requested By Proposer	Funds Awarded by COP (If Different)	
1. James A. Bohnsack	1.3	CAL ACAD SUMR	\$ 13,699	\$	
2. David B. McClellan	2.4		15,123		
3. Douglas E. Harper	2.4		19,764		
4.					
5.					
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. () TOTAL SENIOR PERSONNEL (1-6)			0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. () POSTDOCTORAL ASSOCIATES					
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. () GRADUATE STUDENTS					
4. () UNDERGRADUATE STUDENTS					
5. () SECRETARIAL - CLERICAL					
6. (X) OTHER DIVE HAZARD PAY and OVERTIME			17,850		
TOTAL SALARIES AND WAGES (A + B)			67,430		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)			67,430		
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)					
TOTAL PERMANENT EQUIPMENT			12,075		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)			17,850		
2. FOREIGN			0		
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS \$					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
() TOTAL PARTICIPANT COSTS			0		
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES			25,282		
2. PUBLICATION/DOCUMENTATION/DISSEMINATION			3,150		
3. CONSULTANT SERVICES					
4. COMPUTER (ADPE) SERVICES					
5. SUBCONTRACTS VEHICLE			3,565		
6. OTHER					
TOTAL OTHER DIRECT COSTS			0		
H. TOTAL DIRECT COSTS (A THROUGH G)			0		
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)			0		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)			\$131,352	\$	
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT: \$			
PI/PI TYPED NAME AND SIGNATURE James A. Bohnsack		DATE 11/26/01	FOR COP USE ONLY		
INST. REP. TYPED NAME & SIGNATURE Nancy B. Thompson		DATE 11/26/01	INDIRECT COST RATE VERIFICATION		
		Date Checked	Date of Rate Sheet	Initials-ORG	

COP SUMMARY PROPOSAL BUDGET

ORGANIZATION SEFSC-NMFS-NOAA-DOC		FOR COP USE ONLY			
		PROPOSAL NO.	DURATION (MONTHS) 24		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James A. Bohnsack		AWARD NO.	Proposed	Awarded	
A. SENIOR PERSONNEL: PI/PD, Co-PIs, and Other Senior Associates (List each separately with title, A-7. Show number in brackets)		COP-Funded Person-mos.	Funds Requested By Proposer	Funds Awarded by COP (If Different)	
1. James A. Bohnsack	3.6		\$36,495	\$	
2. David B. McClellan	4.8		29,525		
3. Douglas E. Harper	4.8		30,777		
4.					
5.					
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. () TOTAL SENIOR PERSONNEL (1-6)			0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. () POSTDOCTORAL ASSOCIATES					
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. () GRADUATE STUDENTS					
4. () UNDERGRADUATE STUDENTS					
5. () SECRETARIAL - CLERICAL					
6. (X) OTHER DIVE HAZARD PAY and OVERTIME			34,850		
TOTAL SALARIES AND WAGES (A + B)			131,647		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)			131,647		
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)					
TOTAL PERMANENT EQUIPMENT			23,525		
E. TRAVEL	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)		34,850		
	2. FOREIGN		0		
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS \$					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
() TOTAL PARTICIPANT COSTS			0		
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES			49,365		
2. PUBLICATION/DOCUMENTATION/DISSEMINATION			6,150		
3. CONSULTANT SERVICES					
4. COMPUTER (ADPE) SERVICES					
5. SUBCONTRACTS VEHICLE					
6. OTHER			10,965		
TOTAL OTHER DIRECT COSTS			0		
H. TOTAL DIRECT COSTS (A THROUGH G)			0		
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)			0		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)			\$256,452	\$	
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE James A. Bohnsack		DATE 11/26/01	FOR COP USE ONLY		
INST. REP. TYPED NAME & SIGNATURE Nancy B. Thompson		DATE 11/26/01	INDIRECT COST RATE VERIFICATION		
		Date Checked	Date of Rate Sheet	Initials-ORG	

SEP 2002 Budget Justification for Bohnsack / SEFSC NMFS NOAA

Title: Reef Fish Community Dynamics and Linkages with Florida Bay

Personnel - Partial salary support requested over two year period for Dr. James Bohnsack, Douglas Harper, and David McClellan who are primarily responsible for the project. Matching salary support will be provided by SEFSC for additional participants and additional time involved with the project.

Fringe Benefits - Salary figures include as 23.2 % fringe benefits.

Dive Hazard Pay - \$17,000 (@ \$50/day avg * 5 divers * 68 days each) = 340 man-days

Travel - \$17,000 requested for domestic travel expenses per year to cover trips to multiple research sites throughout the Florida Keys. We anticipate 15 overnight, three day trips involving 5-6 personnel per trip costing an estimated

\$ 1,035 mileage (@ \$0.345 /mi * 200 avg mi/trip * 15 trips)

\$ 4,050 housing (@ \$90 / day * 3 rooms * 15 trips * 3 nights/trip)

\$ 6,750 per diem (@ \$30 / day * 3 days * 5 people avg. * 15 trips)

\$ 600 FKNMS annual meeting (3 people)

\$ 2,400 National Scientific meeting for 2 people.

\$ 2,400 Florida Bay Meeting (@ \$ 800 * 3 people)

Year 2: Same as year 1 plus 5% inflation.

Publications - \$3000 are requested for costs involved in publishing and disseminating grant findings and outputs (e.g. reports, journal charges, reprints, illustrations, etc.)

Equipment - \$11,500

Year 1 we need to purchase 2 portable computers for infield navigation operations and data entry and printer and scanning equipment; 2 digital cameras and u/w housings.

Year 2 - we need to replace 1 computer and obtain one work station for analytical and GIS support, digital video camera and u/w housing, video editing equipment.

Contracts - \$5,300 to support leased vehicle to transport dive boat and crew to research sites.

Supplies & Materials - We request \$21,082 for supplies and materials as follows: ~\$10,000 for research vessel (R/V Aldo Leopold) annual maintenance and operations; \$7,000 for diving support (equipment replacement, air fills, dive physicals for 9 divers); \$2,000 for software; and \$2,082 for camera/video supplies, underwater paper, misc office supplies.

Year 2 calculations are based on 5% Inflation.

COP SUMMARY PROPOSAL BUDGET

		FOR COP USE ONLY			
ORGANIZATION		PROPOSAL NO.		DURATION (MONTHS)	
University of Miami/RSMAS - YEAR ONE (3/1/02 - 2/28/03)				Proposed	Awarded
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR		AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PIs, and Other Senior Associates (List each separately with title, A-7. Show number in brackets)		COP-Funded Person-mos.		Funds Requested By Proposer	Funds Awarded by COP (If Different)
1. Dr. Jerald Ault, PI		0.5		\$ 3,176	\$
2. Dr. Steven G. Smith		2.5		10,685	
3.					
4.					
5.					
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. (2) TOTAL SENIOR PERSONNEL (1-6)		3.0		13,861	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. () POSTDOCTORAL ASSOCIATES					
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (2) GRADUATE STUDENTS				24,320	
4. () UNDERGRADUATE STUDENTS					
5. () SECRETARIAL - CLERICAL					
6. () OTHER					
TOTAL SALARIES AND WAGES (A + B)				38,181	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				3,458	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				41,639	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) Computer = \$3,000					
TOTAL PERMANENT EQUIPMENT				3,000	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				10,000	
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS \$					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
() TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION/DOCUMENTATION/DISSEMINATION				2,000	
3. CONSULTANT SERVICES					
4. COMPUTER (ADPE) SERVICES					
5. SUBCONTRACTS					
6. OTHER				4,647	
TOTAL OTHER DIRECT COSTS				6,647	
H. TOTAL DIRECT COSTS (A THROUGH G)				61,286	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 40% of \$58,286 (MTDC)					
TOTAL INDIRECT COSTS (F&A)				23,314	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				84,600	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$ 84,600	\$
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE Dr. Jerald Ault		DATE 11-29-01		FOR COP USE ONLY INDIRECT COST RATE VERIFICATION	
INST. REP. TYPED NAME & SIGNATURE Dr. Otis B. Brown		DATE 11-27-01		Date Checked	Date of Rate Sheet
					Initials-ORG

COP SUMMARY PROPOSAL BUDGET

ORGANIZATION University of Miami/RSMAS - YEAR TWO (3/1/03 - 2/28/04)		FOR COP USE ONLY		
		PROPOSAL NO.	DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR		AWARD NO.	Proposed	Awarded
A. SENIOR PERSONNEL: PI/PD, Co-PIs, and Other Senior Associates (List each separately with title, A-7. Show number in brackets)		COP-Funded Person-mos.	Funds Requested By Proposer	Funds Awarded by COP (If Different)
1. Dr. Jerald Ault, PI		0.5	\$ 3,335	\$
2. Dr. Steven G. Smith		2.5	11,219	
3.				
4.				
5.				
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)				
7. (2) TOTAL SENIOR PERSONNEL (1-6)		3.0	14,554	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)				
1. () POSTDOCTORAL ASSOCIATES				
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				
3. (2) GRADUATE STUDENTS			25,148	
4. () UNDERGRADUATE STUDENTS				
5. () SECRETARIAL - CLERICAL				
6. () OTHER				
TOTAL SALARIES AND WAGES (A + B)			39,702	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)			4,045	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)			43,747	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) Computer = \$3,000				
TOTAL PERMANENT EQUIPMENT			3,000	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)			10,000	
2. FOREIGN				
F. PARTICIPANT SUPPORT COSTS				
1. STIPENDS \$				
2. TRAVEL				
3. SUBSISTENCE				
4. OTHER				
() TOTAL PARTICIPANT COSTS			0	
G. OTHER DIRECT COSTS				
1. MATERIALS AND SUPPLIES				
2. PUBLICATION/DOCUMENTATION/DISSEMINATION			2,000	
3. CONSULTANT SERVICES				
4. COMPUTER (ADPE) SERVICES				
5. SUBCONTRACTS				
6. OTHER			4,647	
TOTAL OTHER DIRECT COSTS			6,647	
H. TOTAL DIRECT COSTS (A THROUGH G)			63,394	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 40% of \$60,394 (MTDC)				
TOTAL INDIRECT COSTS (F&A)			24,158	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)			87,552	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS)				
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)			\$ 87,552	\$
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT: \$		
PI/PD TYPED NAME AND SIGNATURE* Dr. Jerald Ault		DATE 11-27-01	FOR COP USE ONLY INDIRECT COST RATE VERIFICATION	
INST. REP. TYPED NAME & SIGNATURE* Dr. Otis B. Brown		DATE 11-27-01	Date Checked	Date of Rate Sheet
				Initials-ORG

COP SUMMARY PROPOSAL BUDGET

ORGANIZATION University of Miami/RSMAS - CUMULATIVE (3/1/02 - 2/28/04)		FOR COP USE ONLY	
		PROPOSAL NO.	DURATION (MONTHS) Proposed Awarded
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR		AWARD NO.	
A. SENIOR PERSONNEL: PI/PD, Co-PIs, and Other Senior Associates (List each separately with title, A-7. Show number in brackets)		COP-Funded Person-mos.	Funds Requested By Proposer
1. Dr. Jerald Ault, PI		1.0	\$ 6,511
2. Dr. Steven G. Smith		5.0	21,904
3.			
4.			
5.			
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)			
7. (2) TOTAL SENIOR PERSONNEL (1-6)		6.0	28,415
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)			
1. () POSTDOCTORAL ASSOCIATES			
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			
3. (2) GRADUATE STUDENTS			49,468
4. () UNDERGRADUATE STUDENTS			
5. () SECRETARIAL - CLERICAL			
6. () OTHER			
TOTAL SALARIES AND WAGES (A + B)			77,883
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)			7,503
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)			85,386
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) 2 Computers at \$3,000 each			
TOTAL PERMANENT EQUIPMENT			6,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)			20,000
2. FOREIGN			
F. PARTICIPANT SUPPORT COSTS			
1. STIPENDS \$			
2. TRAVEL			
3. SUBSISTENCE			
4. OTHER			
() TOTAL PARTICIPANT COSTS			0
G. OTHER DIRECT COSTS			
1. MATERIALS AND SUPPLIES			
2. PUBLICATION/DOCUMENTATION/DISSEMINATION			4,000
3. CONSULTANT SERVICES			
4. COMPUTER (ADPE) SERVICES			
5. SUBCONTRACTS			
6. OTHER			9,294
TOTAL OTHER DIRECT COSTS			13,294
H. TOTAL DIRECT COSTS (A THROUGH G)			124,680
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 40% of \$118,680 (MTDC)			
TOTAL INDIRECT COSTS (F&A)			47,472
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)			172,152
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS)			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)			\$ 172,152 \$
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT: \$	
PI/PD TYPED NAME AND SIGNATURE Dr. Jerald Ault		DATE 11-27-01	FOR COP USE ONLY INDIRECT COST RATE VERIFICATION
INST. REP. TYPED NAME & SIGNATURE Dr. Otis B. Brown		DATE 4-27-01	Date Checked Date of Rate Sheet Initials-ORG

SFP 2002 Budget Justification for Ault / University of Miami

Title: Reef Fish Community Dynamics and Linkages with Florida Bay

Personnel—Total salaries (two-year period) requested: Dr. Ault for 1 month, Dr. Smith for 5 months, a full-time graduate student for 24 months, and a second graduate student for 6 months (two summers). Current graduate assistant stipend is \$1581 per month.

Fringe Benefits—Fringe benefit rates by UM fiscal year (ending 31 May) are:

Faculty	21.0 % FY01	25.0% FY02
Staff	21.2 % FY01	26.5% FY02

Fringe benefits are not charged for graduate assistants.

Travel—\$10,000 for domestic travel expenses per year are requested to cover the following: trips to and from field study sites; to COP/FKNMS project meetings; to the Florida Bay annual science conference; and to a national science conference annually.

Year 1: One two-person trip to Florida Bay annual meeting (\$800 per person, includes transportation, lodging, and meals); one two-person trip to national science meeting (\$1,200 per person, includes roundtrip airfare, lodging, and meals); \$600 for travel to project meetings (transportation and meals); 54 person-days @ \$100/day for scuba field sampling trips (includes local mileage @ 0.34/mi, per diem \$30/day, tolls, parking, other travel-related field sampling costs).

Year 2: Same as year 1.

Software Licenses—Funds of \$4,647 are requested to maintain annual licenses (PC and/or Unix workstations) for the following computer software required for data management, spatial data analyses, scientific data visualizations, and statistical analyses: ArcInfo, ArcView, Interactive Data Language (IDL), SAS, S-Plus, Sigma Plot, Matlab.

Publications—Funds of \$2000 per year are requested for costs involved in publishing and disseminating grant findings and outputs, e.g., reports, journal costs, reprints, illustrations, etc.

Computer Equipment—A total amount (two-year period) of \$6,000 is requested to purchase a laptop computer for field data entry, database management, and GIS-based on-site selection of sampling locations; and to upgrade the CPU hardware of a Unix workstation to facilitate data processing, scientific data visualizations, and statistical analyses.

Indirect Costs—The indirect cost rate for federally-funded projects at the University of Miami RSMAS through CIMAS (Cooperative Institute for Marine and Atmospheric Studies) is 40% of modified total direct costs, which in this proposal equals total direct costs minus computer equipment.

(6) Biographical Sketch: JAMES ANTHONY BOHNSACK
Abbreviated Curriculum Vitae

Research Fishery Biologist, Southeast Fisheries Center, National Marine Fisheries Service, NOAA,
75 Virginia Beach Drive, Miami, Florida 33149. (305) 361-4252 FAX: (305) 361-4499
Jim.Bohnsack@noaa.gov

Education

1979 Ph.D. (Biology) UNIVERSITY OF MIAMI, Miami, FL
1976 M.S. (Biology) UNIVERSITY OF MIAMI, Miami, FL
1969 B.S. (Biology) TULANE UNIVERSITY, New Orleans, LA

Recent Positions Held

Research Fishery Biologist, Southeast Fisheries Science Center, National Marine Fisheries Service, NOAA, 75 Virginia Beach Drive, Miami, FL 33149. (1984-Present)
Adjunct Professor, Department of Marine Biology and Fisheries, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway Miami, FL 33149. (1984-Present).
Board of Directors, Reef Environmental Education Foundation (REEF). (1995-Present)

Selected Recent Publications

- Roberts, C.M., J.A. Bohnsack, F.Gell, J.P. Hawkins, R. Goodridge. *In press*. Marine Reserves enhance adjacent fisheries. *Science* 000.
- Bohnsack, J.A., B. Causey, M.P. Crosby, R.G. Griffis, M.A. Hixon, T.F. Hourigan, K.H. Koltes, J.E. Maragos, A. Simons, and J.T. Tilmant (*in press*). A rationale for minimum 20-30% no-take reef protection. *Proceedings 9th International Coral Reef Conference, Bali*.
- Harper, D.E., J.A. Bohnsack and B. Lockwood. 2000. Recreational Fisheries in Biscayne National Park, Florida, 1976-1991. *Mar. Fish. Rev.* 62: 8-26.
- Fogarty, M.J., J.A. Bohnsack, and P.K. Dayton. 2000. Marine reserves and resource management. Chapter 134. *Pages 283-300 in C. Sheppard (ed.). Seas at the Millinnium: An environmental evaluation*. Pergamon, Elsevier Science., N.Y.
- Bohnsack, J.A. 2000. A comparison of the short term impacts of no-take marine reserves and minimum size limits. *Bull. Mar. Sci.* 66: 615-650.
- Johnson, D.R., N.A. Funicelli, and J.A. Bohnsack. 1999. The effectiveness of an existing estuarine no-take fish sanctuary within the Kennedy Space Center, Florida. *North American Journal of Fisheries Management* 19(2): 436-453.
- Bohnsack, J.A., D.B. McClellan, D.E. Harper, G.S. Davenport, G.J. Konoval, A.M. Eklund, J.P. Contillo, S.K. Bolden, P.C. Fischel, G.S. Sandorf, J.C. Javech, M.W. White, M.H. Pickett, M.W. Hulsbeck, J.L. Tobias, J.S. Ault, G.A. Meester, S.G. Smith, and J. Luo. 1999. Baseline Data for Evaluating Reef Fish Populations in the Florida Keys. NOAA Tech. Mem. NMFS-SEFSC-427. 61 p.
- Bohnsack, J.A. 1999. Incorporating no-take marine reserves into precautionary management and stock assessment. Pages 8-16 in V.R. Restrepo, ed. *Providing scientific advice to implement the precautionary approach under the Magnuson-Stevens Fishery Conservation and Management Act*. NOAA Tech. Memo NMFS-F/SPO-40.

- Murray, S.N., R.F. Ambrose, J.A. Bohnsack, L.W. Botsford, M.H. Carr, G.E. Davis, P.K. Dayton, D. Gotshall, D.R. Gunderson, M.A. Hixon, J. Lubchenco, M. Mangel, A. MacCall, D.A. McArdle, J.C. Ogden, J. Roughgarden, R.M. Starr, M.J. Tegner, and M.M. Yoklavich. 1999. No-take reserve networks: protection for fishery populations and marine ecosystems. *Fisheries* 24(11):11-25.
- Ault, J.S., J.A. Bohnsack, and G. Meester. 1998. A retrospective (1979-1995) multispecies assessment of coral reef fish stocks in the Florida Keys. *Fishery Bulletin* 96: 395-414.
- Bohnsack, J.A. 1998. Application of marine reserves to reef fisheries management. *Aust. J. Sci.* 23:298-304.
- Bohnsack, J.A. 1997. Consensus development and the use of marine reserves in the Florida keys, U.S.A. *Proceedings of the 8th International Coral Reef Symposium* 2: 1922-1930.
- Ault, J.S., J.A. Bohnsack, and G.A. Meester. 1997. Florida Keys National Marine Sanctuary: Retro-spective (1979-1995) reef fish assessment and a case for protected marine areas. *In: Developing and sustaining World Fisheries Resources: The State of Science and Management*, D.A. Hancock, D.C. Smith, A. Grant and J.P. Beumer (eds.). *World Fisheries Congress* 2: 415-425.
- Bohnsack, J.A. 1996. Marine reserves, zoning, and the future of fishery management. *Fisheries* 21(9): 14-16.
- Bohnsack, J.A. 1996. Maintenance and recovery of fishery productivity. Chapter 11 *in Tropical Reef Fisheries*. N.V.C. Polunin and C.M. Roberts (eds). Chapman & Hall.
- Bohnsack, J.A. and J.S. Ault. 1996. Management strategies to conserve marine biodiversity. *Oceanography* 9: 73-82.
- Bohnsack, J.A., D.E. Harper and D.B. McClellan. 1994. Fisheries trends from Monroe County, Florida. *Bull. Mar. Sci.* 54:982-1018.
- Bohnsack, J.A., D.E. Harper, D.B. McClellan, and M. Hulsbeck. 1994. Effects of reef size on colonization and assemblage structure of fishes at artificial reefs off southeastern Florida, U.S.A. *Bull. Mar. Sci.* 55: 796-823.
- Bohnsack, J.A. 1994. How marine fishery reserves can improve reef fisheries. *Proceedings of the Gulf and Caribbean Fisheries Institute* 43: 217-241.
- Bohnsack, J.A. 1993. Marine reserves: They enhance fisheries, reduce conflicts, and protect resources. *Oceanus* 36(3): 63-71.
- Bohnsack, J.A. 1992. Reef resource habitat protection: The forgotten factor. *in R.H. Stroud (ed). Stemming the tide of coastal fish habitat loss. Mar. Rec. Fish.* 14: 117-129.
- Bohnsack, J.A., D.L. Johnson and R.F. Ambrose. 1991. The ecology of artificial reef habitats and fishes. Ch 3, pages 61-107 *in Seaman, W., Jr. and L.M. Sprague (eds). Artificial Habitats for Marine and Freshwater Fisheries*. Academic Press, Inc. 285p
- Bohnsack, J.A. 1991. Habitat structure and the design of artificial reefs. Chapter 20. Pages 412-426 *in: S.S. Bell, E.D. McCoy, and H.R. Mushinsky (eds.). Habitat Structure: The Physical Arrangement of Objects in Space*. Chapman and Hall Ltd., London. 438 p.
- Bohnsack, J.A.. 1990. The potential of marine fishery reserves for reef fish management in the U.S. southern Atlantic. Snapper-Grouper Plan Development Team Report for the South Atlantic Fishery Management Council. NOAA Tech. Memo. NMFS-SEFC-261 45 p.
- Bohnsack, J.A. and S.P. Bannerot. 1986. A stationary visual census technique for quantitatively assessing community structure of coral reef fishes. NOAA Tech. Report NMFS 41:1-15.

JERALD STEPHEN AULT
Abbreviated Curriculum Vitae

Current Position.- Associate Professor of Marine Biology and Fisheries (Tenured), University of Miami, Rosenstiel School of Marine and Atmospheric Science, 4600 Rickenbacker Causeway, Miami, Florida 33149, (305)361-4884 ph; (305)361-4791 fax; ault@shark.rsmas.miami.edu

Education

Postdoctoral (1990), Population dynamics, University of Maryland

Ph.D. (1988) Fishery Management Science & Applied Statistics, University of Miami RSMAS

*** (1983) Biological Oceanography, Scripps Institution of Oceanography, University of California at San Diego. ***Completed 1-year of post-M.S. coursework.

M.S. (1982) Natural Resources (Fisheries), Humboldt State University

B.S. (1979) Fisheries, Humboldt State University

A.A. (1977) Mathematics/Life Sciences, San Diego Mesa College

Research Interests.- Dr. Ault's interests include theory and application of quantitative methods for investigating the response of marine populations to exploitation, biological-physical coupling, and recruitment processes.

Professional.- Dr. Ault is a Fellow of the American Institute of Fisheries Research Biologists and a Certified Fisheries Professional by the American Fisheries Society. He is also a member of the Scientific and Statistical Committee of the South Atlantic Fishery Management Council, the Statistical Advisory Panel - Florida Fish and Wildlife Commission, Bering Sea Ecosystem Science Advisory Committee, and the EPA Florida Keys Technical Advisory Committee.

Five Publications Most Closely Related to Proposed Research

Ault, J.S., Bohnsack, J.A. and G.A. Meester. (1998). A retrospective (1976-1996) multispecies assessment of coral reef fish stocks in the Florida Keys. *Fishery Bulletin* **96**(3):395-414.

Ault, J.S., Smith, S.G., Luo, J., Meester, G.A., Bohnsack, J.A., and S.L. Miller. (2001). Baseline multispecies coral reef fish stock assessments for the Dry Tortugas. National Park Service and FKNMS Final Report. 123 p.

Bohnsack, J.A. and J.S. Ault. (1996). Management strategies to conserve marine biodiversity. *Oceanography* **9**(1):1-10.

Ault, J.S., Diaz, G.A., Smith, S.G., Luo, J. and J.E. Serafy. (1999). An efficient sampling survey design to estimate pink shrimp population abundance in Biscayne Bay, Florida. *North American Journal of Fisheries Management* **19**(3):696-712.

Ault, J.S., Luo, J., Smith, S.G., Serafy, J.E., Wang, J.D., Diaz, G.A., and R. Humston. (1999). A spatial dynamic multistock production model. *Canadian Journal of Fisheries and Aquatic Sciences* **56** (S1):4-45.

Rubec, P.J., Smith, S.G., Coyne, M.S., White, M., Wilder, D., Sullivan, A., Ruiz-Cruz, R., MacDonald, T., McMichael, R.H., Henderson, G.E., Monaco, M.E., and J.S. Ault. (2001). Spatial modeling of fish habitat in Florida. Pages 1-18 in Spatial Processes and Management of Fish Populations. University of Alaska Sea Grant. AK-SG-01-02, Fairbanks.

Ault, J.S. and D.B. Olson. (1996). A multicohort stock production model. *Transactions of the American Fisheries Society* **125**(3):343-363. **Best Paper Award in TAFS 125(1996)**

Other Related Publications

Ault, J.S., Bohnsack, J.A., and Meester, G.A. (1997). Florida Keys National Marine Sanctuary: retrospective (1979-1995) assessment of reef fish and the case for protected marine areas. Pages 415-425 in Developing and Sustaining World Fisheries Resources: The State of Science and Management, Hancock, D.A., Smith, D.C., Grant, A., and Beumer, J.P. (eds.). 2nd World Fisheries Congress, Brisbane, Australia, 797 p.

Diaz, G.A., Smith, S.G., Serafy, J.E. and J.S. **Ault** (2001). Allometry of the growth of pink shrimp *Farfantepenaeus duorarum* in a subtropical bay. Transactions of the American Fisheries Society **130**(2):328-335.

Ault, J.S., Smith, S.G., Meester, G.A., Luo, J., and J.A. Bohnsack. 2001. Site Characterization for Biscayne National Park: assessment of fisheries and habitats. National Park Service Report. 86 p.

Lindeman, K.C., Pugliese, R., Waugh, G.T. and J.S. **Ault**. (2000). Developmental pathways within a multispecies reef fishery: management applications for essential habitats and marine reserves. Bulletin of Marine Science **66**(3):929-956.

Glynn, P.W. and J.S. **Ault**. (2000). A biogeographic analysis and review of the far eastern Pacific coral reef region. Coral Reefs **19**(1):1-19.

Ault, J.S., Crosby, M.P., Davis, G., and E. Reese. (2000). Ecological assessments. Chapter 4, Pages 45-48 in Alternative Access Management Strategies for Marine and Coastal Protected Areas. U.S. Man and the Biosphere Program, Washington, DC. 168 p.

Chiappone, M., Miller, S.L., Swanson, D.W., **Ault, J.S.**, and S.G. Smith. (2001). Comparatively high densities of long-spined sea urchins in the Dry Tortugas, Florida. Coral Reefs **20**(2):137-138.

Rothschild, B.J., **Ault, J.S.**, Gouletquer, P. and M. Heral. (1994). The decline of the Chesapeake Bay oyster population: a century of habitat destruction and overfishing. Marine Ecology Progress Series **111**(2&3):29-39.

Cosner, G.C., DeAngelis, D.L., **Ault, J.S.** and D.B. Olson. (1999). Effects of spatial grouping on the functional response of predators. Theoretical Population Biology **56**:56-65.

Humston, R., **Ault, J.S.**, Lutcavage, M., and D.B. Olson. 2000. Schooling and migration of large pelagic fishes relative to environmental cues. Fisheries Oceanography **9**(2):136-146.

Graduate Students and Post-Doctoral Scholars Advised

S.G. Smith, K.C. Lindeman, G.A. Meester, R. Humston, G.A. Diaz, J.E. Serafy, R.M. Orhun, S.M. Smith, C. Legault, J.T. Post, C. Yeung, J. Martinez, M. Koch, S. Aman, A. Holmes, C. Pike, A.L. Chai, S. Endo, C. Schmitz, H. Molina, S. Luthy, M. Feeley, E. Maddox, E. Franklin, D.W. Swanson, M. Almeida, N. Farmer, A. McCrea

Collaborators (last 48 months)

E. Baker, J. Bexley, J.A. Bohnsack, S. Cantrell, T.R. Capo, E.P. Chassignet, M. Chiappone, R. Clark, D.G. Clarke, C.G. Cosner, M. Coyne, M.P. Crosby, D.L. DeAngelis, N.M. Ehrhardt, J. Gentile, R.N. Ginsburg, P.W. Glynn, M.A. Harwell, T. Lee, B. Luckhurst, M. Lutcavage, J. Luo, A. Mehrotra, B.A. Megrey, S.L. Miller, M.E. Monaco, H. Norris, D.B. Olson, E. Prince, E. Reese, B.J. Rothschild, P.J. Rubec, T.W. Schmidt, J.E. Serafy, S.G. Smith, J.D. Wang, C.I. Zhang

STEVEN G. SMITH
Abbreviated Curriculum Vitae

University of Miami
Rosenstiel School of Marine and Atmospheric Science
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Telephone: (305) 361-4783 Fax: (305) 361-4600
Email: sgsmith@rsmas.miami.edu

Education:

1998 Postdoctoral, University of Miami, Fish Population Dynamics/Biostatistics
1997 Ph.D., University of Maryland, College Park, Marine Estuarine Environmental Science
1984 B.A., Occidental College, Los Angeles, California, Biology (Honors), Marine Emphasis

Professional Experience:

Dates	Organization	Position
1998-present	University of Miami RSMAS	Assistant Research Scientist
1997-1998	University of Miami RSMAS	Postdoctoral Fellow
1993-97	Univ. of Maryland Chesapeake Biological Lab.	Graduate Research Assistant
1993	Univ. of Md., College Park, Biometrics Program	Graduate Teaching Assistant
1991-92	The Rothschild Ault Group, Inc.	Director of Research
1987-91	Univ. of Md., Chesapeake Biological Lab.	Graduate Research Assistant
1985-87	Occidental College Redondo Beach Marine Lab.	Project Manager
1984	Occidental College Redondo Beach Marine Lab.	Marine Aquarist

Selected Publications:

- Meester, G.A., J.S. Ault, S.G. Smith and A. Mehrotra. In Press. Integration of simulation and operations research into spatial fishery management decision making. *Sarsia*.
- Miller, S.L., D.W. Swanson, M. Chiappone, J.S. Ault, S.G. Smith, G.A. Meester, J. Luo, E.C. Franklin, J.A. Bohnsack, D.E. Harper and D.B. McClellan. In Press. An extensive deep reef terrace on the Tortugas Bank, Florida Keys National Marine Sanctuary. *Coral Reefs*.
- Smith, S.G. and E.S. Chang. In Review. Molting and growth. Chapter 3 in V.E. Kennedy and L.G. Cronin, editors. The blue crab, *Callinectes sapidus*. Maryland Sea Grant College, College Park, Maryland.
- Chiappone, M., S.L. Miller, D.W. Swanson, J.S. Ault and S.G. Smith. 2001. Comparatively high densities of the long-spined sea urchin in the Dry Tortugas, Florida. *Coral Reefs* 20:137-138.
- Diaz, G.A., S.G. Smith, J.E. Serafy and J.S. Ault. 2001. Allometric models of pink shrimp growth in a subtropical bay. *Transactions of the American Fisheries Society* 130:328-335.

- Rubec, P.J., S.G. Smith, M.S. Coyne, M. White, A. Sullivan, T. MacDonald, R.H. McMichael, Jr., M.E. Monaco and J.S. Ault. 2001. Spatial modeling of fish habitat suitability. Pages 1-18 *In* Spatial Processes and Management of Marine Fish Populations. University of Alaska Sea Grant, Fairbanks. AK-SG-01-02.
- Ault, J.S., S.G. Smith, J. Luo, G.A. Meester, J.A. Bohnsack, and S.L. Miller. 2001. Baseline multispecies coral reef fish stock assessments for the Dry Tortugas. National Park Service and FKNMS Final Report. 123p.
- Ault, J.S., S.G. Smith, G.A. Meester, J. Luo and J.A. Bohnsack. 2001. Site characterization for Biscayne National Park: assessment of fisheries and habitats. National Park Service Final Report. 86 p.
- Ault, J.S. and S.G. Smith. 2000. Extensions to gear inter-calibration methods for fishery-independent catch-per-unit-effort data. Florida Marine Research Institute Technical Report, FFWCC Contract #99020. 67p.
- Ault, J.S., G.A. Diaz, S.G. Smith, J. Luo and J.E. Serafy. 1999. An efficient sampling survey design to estimate pink shrimp population abundance in Biscayne Bay, Florida. *North American Journal of Fisheries Management* 19:696-712.
- Ault, J.S., J. Luo, S.G. Smith, J.E. Serafy, J.D. Wang, G. Diaz and R. Humston. 1999. A spatial dynamic multistock production model. *Canadian Journal of Fisheries and Aquatic Sciences* 56(Suppl. 1):4-25.
- Bohnsack, J.A., D.B. McClellan, D.E. Harper, G.S. Davenport, G.J. Konoval, A.M. Eklund, J.P. Contillo, S.K. Bolden, P.C. Fischel, G.S. Sandorf, J.C. Javech, M.W. White, M.H. Pickett, M.W. Hulsbeck, J.L. Tobias, J.S. Ault, G.A. Meester, S.G. Smith, and J. Luo. 1999. Baseline data for evaluating reef fish populations in the Florida Keys. NOAA Technical Memorandum NMFS-SEFSC-427. 61 p.
- Rubec, P.J., J.C.W. Bexley, H. Norris, M.S. Coyne, M. Monaco, S.G. Smith and J.S. Ault. 1999. Suitability modeling to delineate habitat essential to sustainable fisheries. *American Fisheries Society Symposium* 22:108-133.
- Rothschild, B.J., J.S. Ault and S.G. Smith. 1996. A systems science approach to fisheries stock assessment and management. Pages 473-492 *in* V.F. Gallucci, S.R. Saila, D.J. Gustafson and B.J. Rothschild, eds. *Stock assessment: quantitative methods and applications for small-scale fisheries*. Lewis Publishers (Division of CRC Press), Chelsea, Michigan.
- Smith, S.G., and J.S. Ault. 1993. Statistical sampling design analysis of the 1991-1992 Puerto Rico shallow-water reef fish monitoring survey. NOAA Tech. Memo. NMFS-SEFSC-331:1-36.