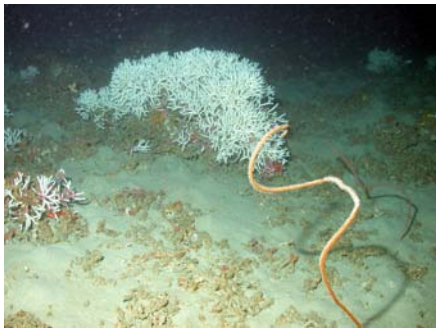
FINAL
Evaluation Plan
For the
Oculina Experimental Closed Area



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Summary

In April 2004, regulations were implemented through Amendment 13A to the South Atlantic Snapper Grouper Fishery Management Plan that extended the fishing restrictions for the designated 92-square mile *Oculina* Experimental Closed Area for an indefinite period. The amendment was developed by the South Atlantic Fishery Management Council to address the 10-year sunset provision for the closure of the area to snapper/grouper fishing. Located off the coast of Ft. Pierce, Florida, the area is part of the larger *Oculina* Habitat Area of Particular Concern (HAPC) designed to protect the *Oculina* coral found there. In addition to extending the closure, the amendment requires that the size and configuration of the Experimental Closed Area be reviewed within three years of the implementation date of Amendment 13A and that a 10-year re-evaluation be conducted for the area. The Council also stipulated that an Evaluation Plan be developed to address needed monitoring and research, outreach, and enforcement efforts within one year of implementation of the Amendment.

This Evaluation Plan contains only summary background information on the science and management relating to the *Oculina* Bank HAPC and Closed Area. For more information please refer to Amendment 13A to the Snapper Grouper Fishery Management Plan.

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1.1 Description of *Oculina* coral

Oculina varicosa (Figure 1) is known to exist from the West Indies to North Carolina and Bermuda, occurring as small, random coral heads. However, off central Florida, from Ft. Pierce to Cape Canaveral, and at shelf-edge depths of 180-400 ft, *Oculina* forms unique populations of dense coral growth on naturally occurring limestone ridges and pinnacles, as well as on artificial reefs and shipwrecks. This area has been designated the *Oculina* Habitat Area of Particular Concern, or HAPC. Within this discrete area, approximately 261square nautical miles (nm^2), *Oculina* colonies can grow in excess of 6 ft in diameter in a thicket-like habitat. These coral thickets are the foundation for a diverse marine ecosystem, supporting numerous invertebrates and finfish species. The southern portion of the *Oculina* Bank HAPC includes the *Oculina* Experimental Closed Area. Three percent of that 92-nm^2 area (2.76 nm^2) consists of high-relief pinnacle habitat (Scanlon et al. 1999).

Figure 1. *Oculina* coral heads (National Undersea Research Center).

Oculina varicosa is a stony coral that forms large bush-like colonies up to 5 ft tall and over 6 ft in diameter, with tree-like branches extending from the base. Two different growth forms of *Oculina varicosa* have been identified: (1) shallow water *Oculina* and (2) deep water *Oculina*.

Oculina thickets are very fragile. As an *Oculina* colony grows, newer branches prevent water flow to the center of the colony, which subsequently dies due to decreased food resources and oxygen. Burrowing animals infest the dead coral, hollowing out the center of the tree-like formations. This makes *Oculina* exceedingly fragile, and eventually the colony may collapse on itself, though the new branches continue to grow and the process continues, creating large, unconsolidated thickets.

Oculina coral supports very dense and diverse invertebrate communities (Reed et al. 1982; Reed and Mikkelsen 1987; Reed 2002). These studies report that 230 species of mollusks, 50 species of decapods, 47 species of amphipods, 21 species of echinoderms, 15 species of pycnogonids, 23 families of polychaetes, and numerous other invertebrate

taxa utilize or depend on *Oculina* coral for habitat. Additionally, healthy *Oculina* thickets support numerous finfish species. Roughtongue bass (*Pronotogrammus martinisensis*) and red barbier (*Hemanthias vivanus*) are commonly observed in association with *Oculina* coral. Other species that appear to be abundant in this habitat include gag (*Mycteroperca microlepis*), scamp (*M. phenax*), speckled hind (*Epinephelus drummondhayi*), and pelagics, such as the greater amberjack (*Seriola dumerili*) and almaco jack (*S. rivoliana*) (Koenig et al. (in press)).

Due to the nature and structure of *Oculina* coral thickets, they are extremely susceptible to damage. The coral can be damaged by extreme temperatures, excessive nutrient input, strong currents, disease, anchoring, and fishery-related impacts.

Fishery-related impacts resulting from trawl, bottom longline, and fish trap activities have been documented to negatively impact coral habitat (Barnette 2001). It has been theorized that calico scallop and rock shrimp trawling activities have caused the vast majority of damage to *Oculina*, as evidenced in recent trawl tracks and *Oculina* rubble within the HAPC (C. Koenig, Florida State University, personal observation). Vertical gear (e.g., hook and line, bandit gear) also has the potential to adversely impact coral. The use of sinkers to transport bait to the bottom, particularly the heavier weights (>8 oz) used in the high current environment, can impact and break off branches of *Oculina* coral. Additionally, due to the size and shape of *Oculina* thickets, fishing line is easily entangled amongst its branches, which can result in increased fragmentation of *Oculina* colonies.

Oculina coral fragments may continue to survive after an impact (Brooke 1998). However, the likelihood that impacted corals could be smothered by sediments, or sufficiently removed from the current's influence as to deprive them of nutrients, is greatly increased. Due to past fishery-related impacts, primarily from trawl gear, it is estimated that there is less than 10% of intact *Oculina* coral habitat remaining within the *Oculina* Experimental Closed Area (Koenig et al. in press).

1.2 Description of the *Oculina* Bank

The *Oculina* Bank is a 90-mile strip of coral reefs, located near the continental shelf edge off central eastern Florida that gets its name from the presence of banks, thickets, and rubble zones of *Oculina varicosa*. The depth of the western edge of the *Oculina* Bank is about 180 ft and the eastern boundary, located less than 3 miles east, is 400 ft. The bank narrows at the northern end, towards Cape Canaveral, to less than 2 miles wide.

The bank is mostly sandy, silty, and muddy sediments with limestone ridges and pinnacles known as "cones". The pinnacles vary in size and shape, but can rapidly rise as much as 60 ft or more from the seabed. The texture of the cones in the absence of *Oculina* coral is generally smooth and pockmarked. When colonized by *Oculina* coral, the habitat complexity and amount of surface area associated with the cones is greatly increased. *Oculina* rubble can be a major component of the sediment. Human caused and natural events can produce significant quantities of *Oculina* rubble (Figure 2).

Figure 2. *Oculina* rubble (National Undersea Research Center).

In some cases this rubble accumulates in piles more than 3 ft in depth. While this rubble does not support as diverse a group of species of invertebrates and fishes as healthy coral thickets do, it does provide habitat for a number of invertebrate species. However scientists have not done a detailed study describing the rubble and associated species.

Because it is close to the shelf edge, as well as the Gulf Stream, the *Oculina* Bank can experience very dynamic conditions. Typically, the Gulf Stream meanders inshore during the warmer summer months, bringing with it warm (e.g., 85º F) surface waters and a swift, northward-moving current. A "rip", as well as a distinct color change, indicating the delineation of the faster moving water body, usually marks the Gulf Stream current. This delineation may change daily or hourly. It is not uncommon for this boundary to be found west of the *Oculina* Bank (i.e., 80º W longitude). Gulf Stream surface currents as great as 4 knots (6.7 ft/sec) can be experienced.

The direction of the current typically is within a few degrees of due north. Bottom currents in the *Oculina* Bank generally are not as strong as the surface currents, and usually dissipate below the thermocline. On average, bottom currents of 1 to 1.5 knots (1.7 to 2.5 ft/sec) flow through the *Oculina* Bank (Scanlon et al. 1999; M. Barnette, NOAA Fisheries, personal observation; Koenig 2001).

An interesting oceanographic anomaly produced by the *Oculina* Bank is a surface disturbance produced by current deflection off the limestone pinnacles. Depending on the intensity of the current, the depth to which it extends, as well as the amount of relief offered by a series of pinnacles, dramatic boils are formed on the water's surface. On a calm day, these boils can reveal the pinnacles below to fishermen. This deflection may help transfer and distribute nutrients flowing in colder, slower-moving, bottom currents to the warmer, faster-moving, surface currents.

Periods of strong currents that cause this effect also may carry larvae farther north during their planktonic stage than would normally occur if retained in the slower-moving waters when the Gulf Stream is farther offshore. Recent work completed by Jon Hare (NOAA, National Ocean Service, Beaufort Laboratory) supports this effect. Researchers released satellite-tracked drifters from four sites in the *Oculina* Experimental Research Reserve. Of the 20 drifters released, 11 remained in the Gulf Stream and were transported north of Cape Hatteras where there is no appropriate juvenile habitat for snapper grouper species to settle out. Seven of the 20 drifters did move onto the shelf and were on the shelf for 35-50 days. Drifters moved onto the shelf during both late winter/early spring releases and summer releases. Release time coincided with the spawning seasons of gag, scamp, and several deepwater species (Memo from J.Hare to P. Thompson, 2003).

Frequently in the summer months, the central east coast of Florida can experience dramatic upwelling. Parcels of cold water move inshore from beyond the shelf edge, resulting in tremendous temperature fluctuations. Commonly, the bottom temperature on the *Oculina* Bank averages 61º F. However, when an upwelling event occurs in the summer months, bottom temperatures can fall to 45º F (Reed 1981). In June 2003, upwelling resulted in bottom temperatures of 48º F. Within the *Oculina* Bank, the thermocline began at a depth of 70 ft (M. Barnette, NOAA Fisheries, personal observation).

These upwellings can affect the behavior of some species. In many cases, fish species will temporarily vacate a location where water temperatures are unsuitably cold, and move inshore to warmer waters. Noticeable reductions in the abundance of dominant fish species, such as amberjack, scamp, red barbier, roughtongue bass, gag, and Warsaw grouper, has been witnessed at several sites between 240-300 ft depth, inside and just on the border of the *Oculina* Bank, at the onset of a cold-water upwelling (M. Barnette, NOAA Fisheries, personal observation). This behavior also has been observed by fishermen, who sometimes capture typical deep-water species, such as adult Warsaw grouper, in less than 100 ft of water.

1.3 Regulatory Action (Management)

The South Atlantic Fishery Management Council (Council) recognizes that the *Oculina* Bank is an area of special biological significance. In 1984, the Council designated a 92-nm^2 portion of the *Oculina* Bank as the *Oculina* Habitat Area of Particular Concern (HAPC) (Figure 3). Additionally, the Council prohibited the use of bottom trawls, bottom longlines, dredges, fish traps, and fish pots within the HAPC to mitigate the threat of fishing gear to *Oculina* coral. These actions were taken through the Fishery Management Plan (FMP)/Environmental Impact Statement for Coral and Coral Reefs, prepared jointly by the Gulf of Mexico and South Atlantic Councils (GMFMC and SAFMC 1982).

In Amendment 6/Environmental Assessment to the Snapper Grouper FMP (SAFMC 1993), implemented in 1994, the Council prohibited fishing for and retention of snapper grouper species within the HAPC and prohibited anchoring by vessels fishing for snapper grouper species. The area to which these prohibitions applied became known as the

Oculina Experimental Closed Area (Figure 4). The intent of these prohibitions was to "enhance stock stability and increase recruitment by providing an area where deep water species can grow and reproduce without being subjected to fishing mortality" (SAFMC 1993). As outlined in Amendment 6, without further action, these regulations would sunset in June 2004.

In January of 1996, regulations in Amendment 3 to the Coral FMP (SAFMC 1995) became effective, which prohibited all fishing vessels from anchoring within the HAPC. Also in 1996, to minimize the impacts of the rock shrimp fishery on essential fish habitat, including the fragile coral species existing in the *Oculina* Bank, the Council prohibited trawling for rock shrimp east of 80°W longitude, between 27°30'N and 28°30'N latitude, in depths less than 100 fathoms. This action was taken through Amendment 1 to the Shrimp FMP (SAFMC 1996). The area to which the prohibition applied became known as the rock shrimp closed area (Figure 5).

In 1998, the Council expanded the *Oculina* HAPC to include the rock shrimp closed area (Figure 6) and added two *Oculina* HAPC satellite areas. This action was accomplished through Amendment 4 to the Coral FMP included in the Council's Comprehensive Habitat Amendment (SAFMC 1998). Within the expanded HAPC, fishing with a bottom longline, bottom trawl, dredge, fish pot, or fish trap is prohibited, as is anchoring by a fishing vessel (SAFMC 1998). The prohibition on fishing for and retention of snapper grouper species remains in effect only within the smaller, *Oculina* Experimental Closed Area. This Evaluation Plan deals specifically with the *Oculina* Experimental Closed Area and the regulations relating to that area.

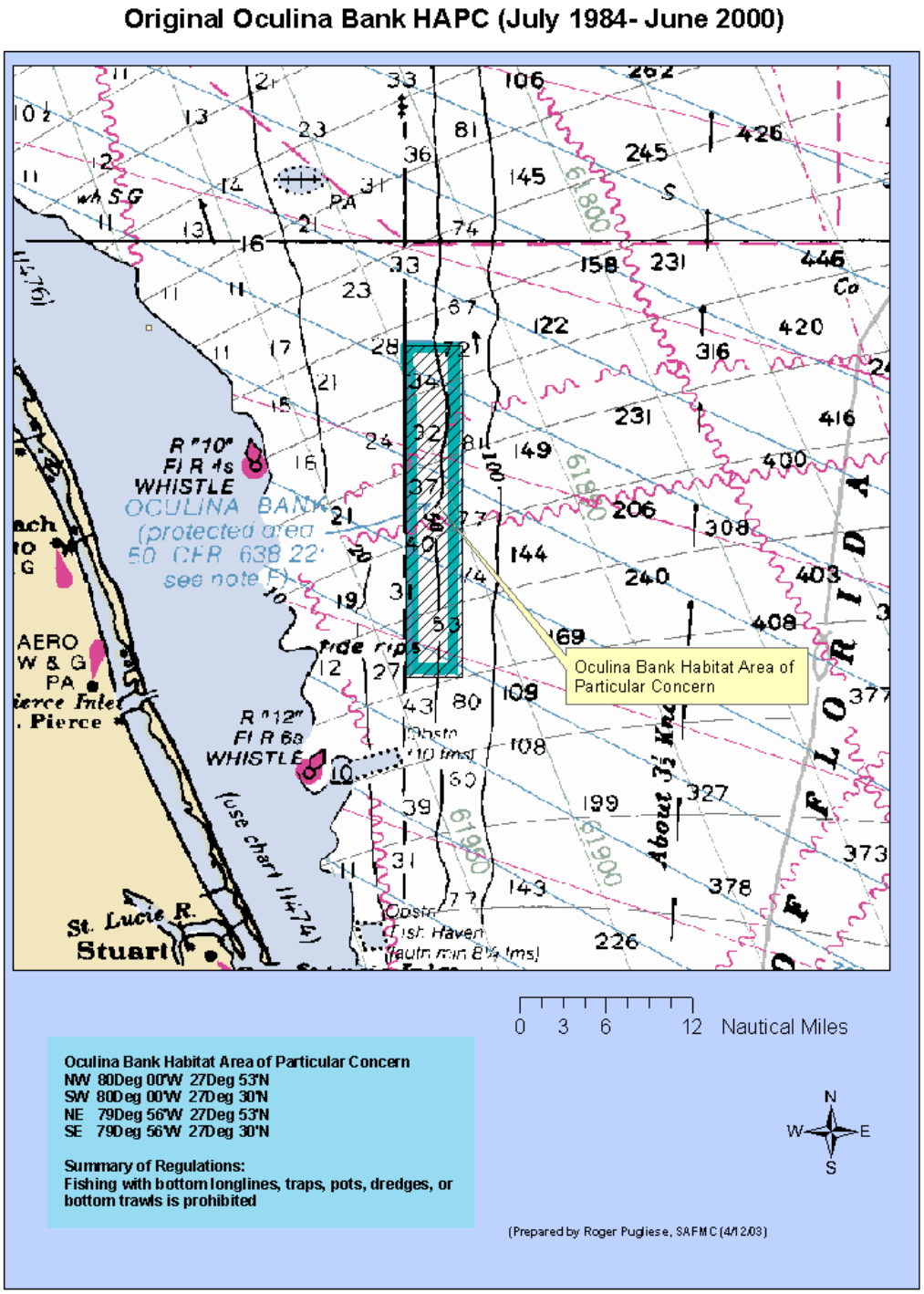

Figure 3. Original *Oculina* Bank HAPC (July 1984-July 2000).

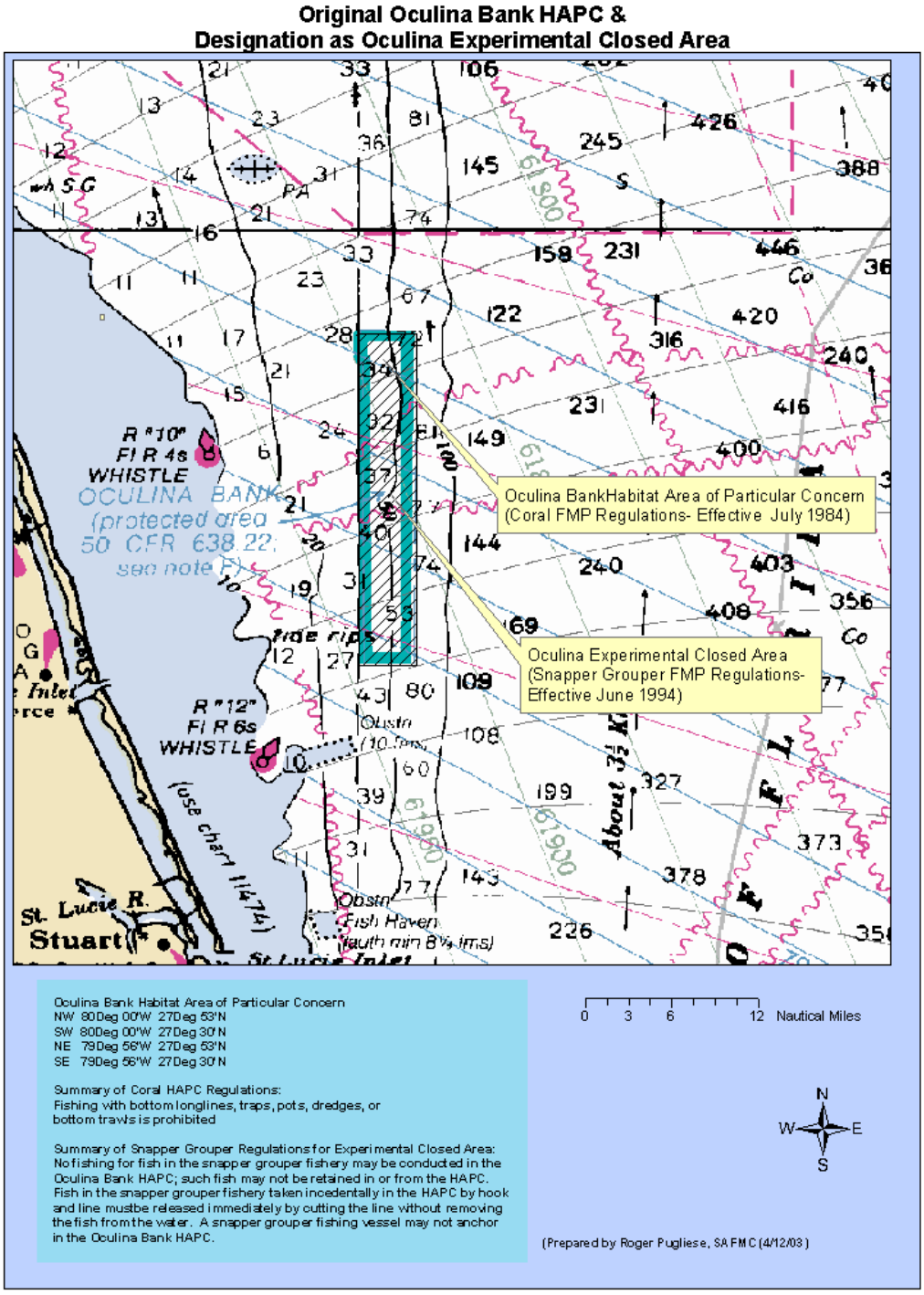

Figure 4. Original *Oculina* Bank HAPC and designations as *Oculina* Experimental Closed Area.

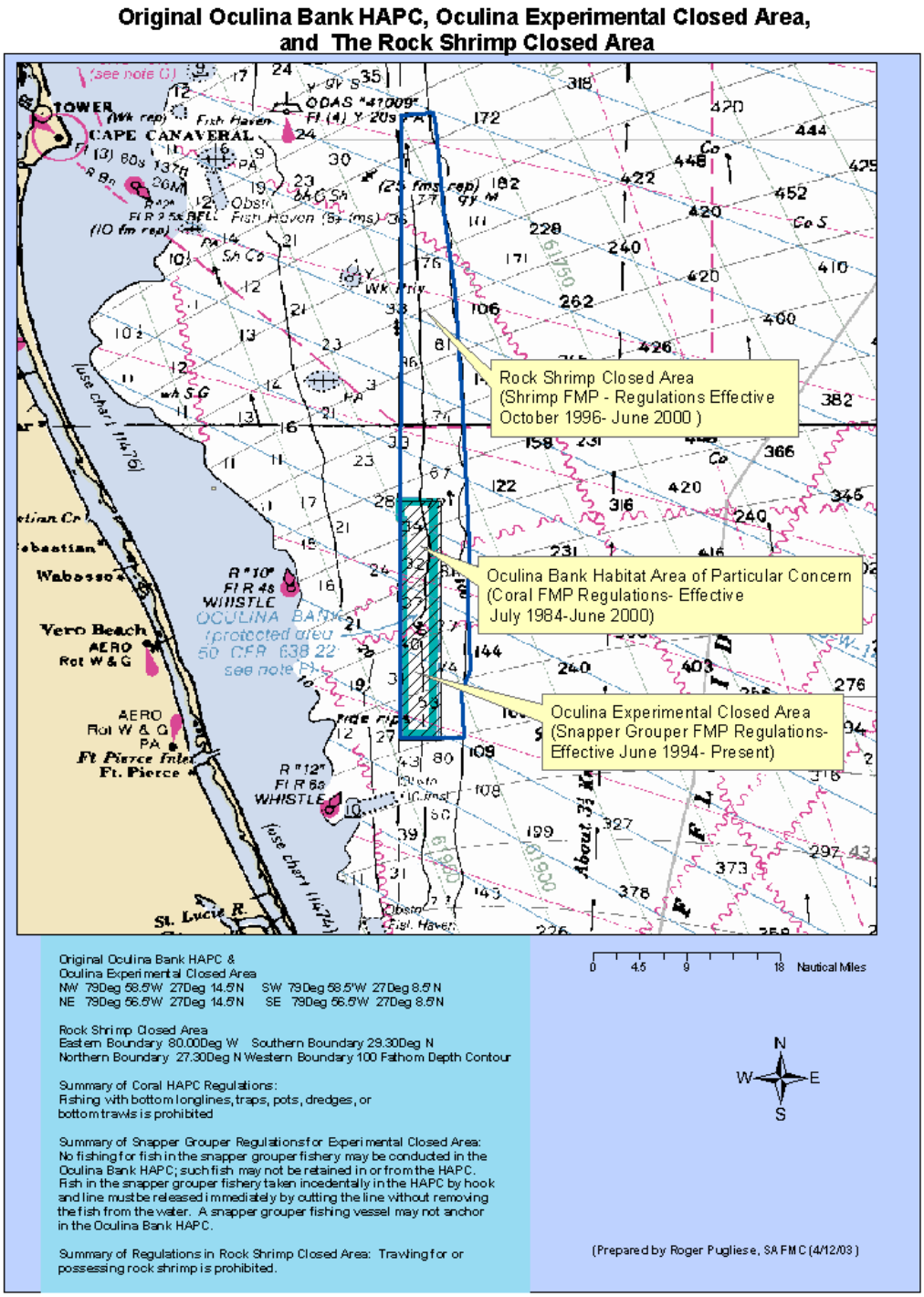

Figure 5. Original *Oculina* HAPC, *Oculina* Experimental Closed Area, and the Rock Shrimp Closed Area.

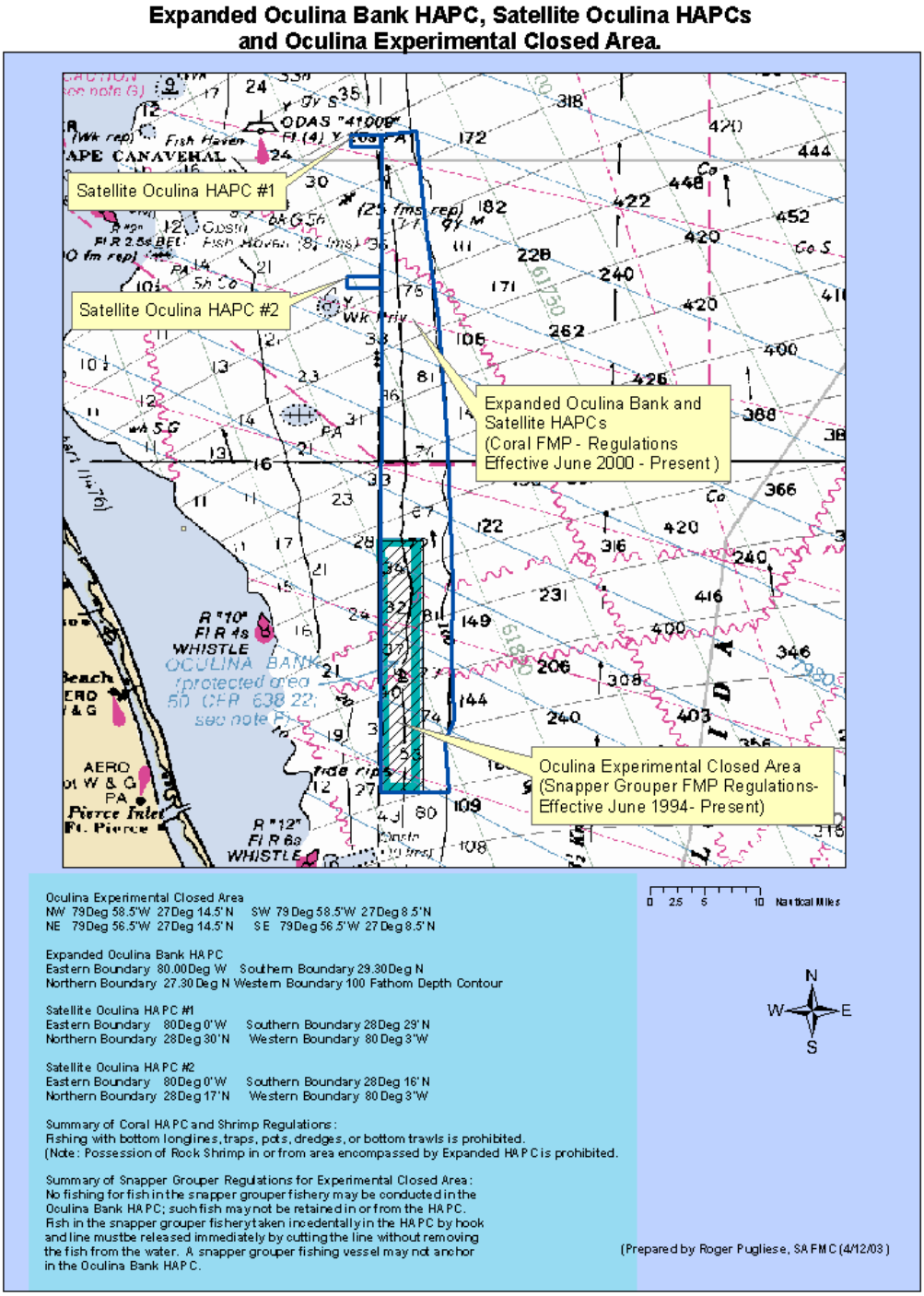

Figure 6. Expanded *Oculina* Bank HAPC, Satellite *Oculina* HAPCs, and the *Oculina* Experimental Closed Area.

2.0 Outreach Plan
2.1 Approach

When the *Oculina* Bank area was designated as a Habitat Area of Particular Concern (HAPC) in 1984 under the Council's Coral Fishery Management Plan, there was a substantial recreational and commercial fishery for groupers, snappers, and tilefishes. Closure of the 92-nm^2 area to snapper/grouper fishing as part of the *Oculina* Experimental Area in 1994 and subsequent anchoring prohibitions in 1996 for the HAPC (including the Experimental Closed Area) affected commercial hook and line fishermen, the recreational for-hire sector, and the private recreational sector. Expansion of the HAPC in 2000 from 92- nm^2 to 300- nm^2 included restrictions on trawling, bottom gear, and anchoring by fishing vessels, once again having impacts on fishing activities.

Early outreach efforts included the publication of an *Oculina* Bank brochure produced in-house by the Council in 1996 and the inclusion of information in the Council's quarterly newsletter, *The South Atlantic UpDate*. Currently, regulations for the HAPC and Experimental Closed Area and an area map are available through the Council's web site and the printed regulations brochure.

During the December 2003 meeting of the Council's Information and Education Committee, discussion regarding the *Oculina* Bank area acknowledged outreach needs to address concerns of the public's perception regarding the indefinite extension of the *Oculina* Experimental Closed Area. Testimony heard at public hearings expressed continued concerns over fishing restrictions, the use of the area for research and monitoring, lack of enforcement, and the need for increased public awareness. During Committee discussion, members expressed a need for a "fresh and innovative" approach to outreach for the area. A draft proposal for a comprehensive Outreach Plan for the *Oculina* HAPC and Deep Sea Corals, developed by several partners working on research and management in the *Oculina* Bank area, was submitted for committee consideration (Shepard et al. 2003).

Partnering with other agencies to achieve targeted goals cooperatively offers a fresh approach to outreach and additional leveraging opportunities not earlier available. With continued focus on the need to develop an outreach strategy specific to the *Oculina* Experimental Closed Area as directed by the Council following the approval of Snapper Grouper Amendment 13A, staff has worked cooperatively with National Oceanic and Atmospheric Administration (NOAA) partners, including Andy Shepard, NOAA Undersea Research Center at UNC-W and Jennifer Schull at NOAA Fisheries' Southeast Fisheries Science Center (SEFSC), in continued development of comprehensive outreach, research, and monitoring plans.

This approach included an opportunity to gather input from area constituents regarding community concerns and outreach needs for the *Oculina* Experimental Closed Area. Funding was provided through NOAA's Coral Reef Conservation Program (CRCP) for informal meetings and canvassing in the Ft. Pierce, FL and Port Canaveral,FL area in June of 2004 (Appendix A). These meetings provided valuable insight into community

concerns regarding the *Oculina* Bank HAPC and Experimental Closed Area and a tangible list of recommendations from stakeholders for area outreach efforts. They also provided a valuable network of contacts for future needs which will include the review and dissemination of new outreach materials. In addition, baseline data regarding community awareness of the area is currently being collected by survey through a partnership with Florida Sea Grant. These surveys, distributed to area fishermen and other stakeholders, will provide quantitative data for future evaluation of outreach program efforts.

2.2 *Oculina* Experimental Closed Area Outreach Plan

The *Oculina* Experimental Closed Area outreach plan represents a detailed and comprehensive approach to outreach activities, as directed by the Council, following implementation of Amendment 13A to the Snapper Grouper Fishery Management Plan. This outreach strategy format is similar to, and objectives overlap with the Outreach Plan for the *Oculina* HAPC and Deepwater Corals (Shepard et al. 2003) presented to the Information and Education Committee in December 2003. Since that time, the Coral Reef Conservation Program (CRCP) has awarded over $75,000 (FY 04 and 05) for initial outreach efforts, as described in the Outreach Plan for the *Oculina* Habitat Area of Particular Concern and Deep Sea Corals. A portion was used to support the local outreach constituent meetings in June 2004. A new *Oculina* Web site and new paper products (brochures, posters) are in the design phase as of December 2004. The Council will work with NOAA to prioritize the 2005 award for outreach ($45,000). The *Oculina* Banks will serve as a "poster child" for larger deep sea/cold water coral efforts.

Many of the suggestions received during the June 2004 constituent meetings specific to the *Oculina* Experimental Closed Area have been incorporated when possible. Because of the overlapping objectives and projects, it will be imperative that any outreach efforts related to regional deep sea corals work through partnerships when feasible to avoid duplication of effort. These partnerships will provide high quality products through adequate funding and close coordination with research and monitoring schedules and law enforcement activities for the *Oculina* Experimental Closed Area.

GOAL: Increase awareness and understanding of the Oculina Experimental Closed Area to the fishermen, citizens, and visitors of central eastern Florida and the U.S. public.

Using the comprehensive Outreach Plan for the *Oculina* HAPC and Deep Sea Corals (Shepard et al. 2003) as a model, objectives and subsequent projects have been identified specific to outreach activities for the *Oculina* Experimental Closed Area. Development of these projects also includes input received during the June 2004 *Oculina* outreach constituent meetings, the August 2004 joint meeting of the Council's Information and Education Committee and Advisory Panel and the November 2004 meeting of the Law Enforcement Committee and Advisory Panel. The projects were prioritized during the Information and Education Committee and AP meeting. The Committee and AP also outlined the projects the Council should initiate and those to be addressed through partnerships. The overlap of goals and projects contained in this outreach strategy for the

Oculina Experimental Closed Area allow for continued partnership through the larger, comprehensive Outreach Plan for the *Oculina* HAPC and Deepwater Corals. This plan is dynamic, intended to evolve and change as new findings and opportunities arise.

Objective 1: Assist in development of the *Oculina* Experimental Closed Area Evaluation Plan.

The following projects would be initiated by Council staff:

- Project 1: Develop an outreach strategy for the *Oculina* Bank area.
    - *Tasks:* Hold meetings with local constituents to help identify resource issues and receive stakeholder input towards the development of an outreach strategy for the *Oculina* Experimental Closed Area and HAPC. Develop draft document for review by the Information and Education Committee and Advisory Panel (AP) and the Law Enforcement Committee and AP.
    - *Justification:* Will fulfill the requirement as outlined in Snapper Grouper Amendment 13A to create an Evaluation Plan with an outreach component. These meetings will be a part of a larger outreach effort to raise public awareness, support, and conservation for deepwater corals found throughout the South Atlantic region.
    - *Deliverables:* The Outreach Component for the *Oculina* Evaluation Plan.
    - *Potential Partners/roles:* NOAA Fisheries, NOAA National Undersea Research Center at the University of North Carolina-Wilmington (NURC/UNCW), Harbor Branch Oceanographic Institution, and other partners.
    - *Schedule:* March 2005
    - *Budget:* Meeting costs and staff time.

Objective 2: Develop a focused campaign targeting recreational/commercial fishermen in the central-eastern Florida area.

The following projects would be initiated by Council staff:

- Project 1: Provide SAFMC regulation brochures to area fishermen.
    - *Tasks:* reprint updated federal regulation brochure and distribute to federal, state, and local law enforcement offices for distribution
    - *Justification:* the regulations brochure provides a summary of regulations and a map for the *Oculina* Experimental Closed Area and HAPC as well as identification chart for snapper/grouper species found in the area.
    - *Deliverables:* SAFMC regulation brochures
    - *Potential Partners/roles:* None
    - *Schedule:* Spring 2005 (update and reprint as needed)
    - *Budget:* Estimated cost: 40,000 copies at estimated cost of $14,000 (additional costs for reprints as needed).

- Project 2: Work with fishing chart manufacturers (both printed and electronic) and/or vendors to improve available information for the *Oculina* Experimental Closed Area

    - *Tasks:* identify products that provide inaccurate or incomplete information, contact manufacturers and coordinate methods to improve products
    - *Justification:* fishermen have identified electronic charts that do not accurately portray the fishing restrictions for the *Oculina* Experimental Closed Area and information on some privately produced printed charts distributed in the area is difficult to locate
    - *Deliverables:* updated information on electronic and printed charts, possible labels to apply to existing printed charts available at retail outlets
    - *Potential Partners/roles:* marine electronic manufacturers, map printing companies, U.S. Coast Guard
    - *Schedule:*Year 1, identify manufacturers and assess best method to modify information currently available. Year 2, work with cooperating manufacturers to modify electronic data for products. Due to publishing constrains, outcomes of this project may not be immediately evident but will have long-reaching effects.
    - *Budget:* dependent upon the number of printed fishing charts currently available (including those in storage), cost of creating and printing additional labels for existing printed charts, and willingness of electronics manufacturers to modify electronic products.

- Project 3(a): Work with Florida Fish and Wildlife Conservation Commission (FWC) to provide written information regarding the *Oculina* Experimental Closed Area in their publications targeting both recreational and commercial fishermen.

    - *Tasks:* contact FWC outreach representatives for methods to include information in specific publications – recreational and commercial newsletters, regulation brochures and other printed materials (e.g., "Fishing Lines" publication)
    - *Justification:* currently produced publications are widely distributed throughout the state and used by both sectors
    - *Deliverables:* an article highlighting *Oculina* Experimental Closed Area with regulations and map and/or a permanent location for *Oculina* Experimental Closed Area regulations in publications
    - *Potential Partners/roles:* FWC outreach coordinators: Kim Amendola, Recreational Coordinator and the Commercial Coordinator; also FWC "Fishing Lines" publication production coordinator
    - *Schedule*: Recreational brochures are printed in January and July of each year. Articles can be included as space allows. A commercial publication is also produced by FWC and articles will appear as space allows.
    - *Budget*: no cost (staff time)

- Project 3 (b): Work with FWC to include information regarding regulations for the *Oculina* Experimental Closed Area (and possibly all restricted fishing areas in the state) in mailings for fishing licenses and permits.

  Tasks: contact FL Fish and Wildlife Commission Permit & Licensing Office for possible inclusion of fact sheet in mailings
  - *Justification:* fact sheets would reach large number of fishermen issued licenses and permits by the state and provide basic information, regulations, and map(s)
  - *Deliverables:* single page flyer
  - *Potential Partners/roles:* FWC Permits Office
  - *Schedule:* Initiate contacts and agreements in 2005, flyers in 2006 mailings
  - *Budget:* printing costs for fact sheets dependent on number of mailings, (e.g., 13,000 commercial permit renewal reminders mailed annually @ .39 cents/copy = $5,070)

- Project 4: Develop and distribute news releases (coordinating with local contacts) to focus on law enforcement activities, research and monitoring projects, and the ecological importance of the area.

  - *Tasks:* work closely with law enforcement agencies (state and federal) to highlight law enforcement activities and cases; create science-based news releases relevant to ongoing research and monitoring activities with focus on habitat, snapper/grouper species (species highlight), and links to Indian River Lagoon and ecosystem-based management.
  - *Justification:* increase awareness of all activities in the area
    [Note: there is increased interest in the Indian River Lagoon, deep sea corals, and ecosystem-based management that provides additional opportunities to distribute information regarding the *Oculina* Experimental Closed Area; NOAA Fisheries is focusing on additional distribution of science-based media stories; input received during constituent meetings stressed need for highlighting law enforcement activities.]
  - *Deliverables:* news releases; outlets may include NOAA News, local/national media, and ENN. Coordinate releases with ongoing activities and strive to provide high resolution photos and graphics to media.
  - *Potential Partners/roles:* NOAA Undersea Research Center, Sea Grant; Harbor Branch Oceanographic Institution; NOAA Fisheries' Southeast Regional Office, NOAA Office for Law Enforcement, FL Fish and Wildlife Commission.
  - *Schedule:* Produce at least 1 feature news release/year; research cruises provide good opportunities for releases and events (e.g., port days, at-sea visits), following is tentative schedule for funded *Oculina* Experimental Closed Area research activities in 2005-2006:
    - *March 2005*- announce Coral Reef Conservation Program awards for OHAPC outreach, mapping, research and monitoring projects

    - *Jun*-Aug 2005—mapping cruise
    - *Sep 2005*—monitoring cruise
    - *Oct 2005*-- monitoring cruise
    - *May 2006*-- monitoring cruise
  - *Budget:* $400/each for printing. Will distribute electronically as well.

- Project 5: Develop Powerpoint presentation about *Oculina* Experimental Closed Area, distribute on CD, post at Web site, and present to fishing clubs, environmental groups, local governments, etc.

  - *Tasks:* design and create a Powerpoint presentation using existing photos, video, maps and other information to highlight *Oculina* Experimental Closed Area, history of management, research and monitoring activities, law enforcement, etc.
  - *Justification:* provides a quick method to distribute information for use by various audiences, can be readily updated
  - *Deliverables:* Powerpoint presentation on CD and Web site
  - *Potential Partners/roles:* Harbor Branch Oceanographic Institute, National Undersea Research Center, Southeast Fisheries Science Center, Fish and Wildlife Commission, Florida Sea Grant
  - *Schedule:* 2005
  - *Budget:* staff time

- Project 6: Develop and distribute posters and rack cards/brochures at area bait and tackle shops, marinas, fish houses, boating stores, fishing tournaments, boat shows, etc.

    - *Tasks:* contract design layout and printing for poster and complimentary rack cards and/or brochure, distribute to targeted businesses and fishing tournament directors
    - *Justification:* effectively designed poster and brochures and/or rack cards would draw attention to the area and provide quick access to information provided in brochure/card providing general information about habitat, fish species, map, regulations, law enforcement contacts
    - *Deliverables:* posters, rack cards and/or brochures
    - *Potential Partners/roles:* Harbor Branch Oceanographic Institute, National Undersea Research Center, U.S. Coast Guard, FL Fish and Wildlife Commission, NOAA Fisheries, FL Sea Grant
    - *Schedule*: Funding has been encumbered, printing to be completed in 2005.
    - *Budget:* Initial estimates for design and printing of 10,000 rack cards and 7,500 posters = approximately $5,000,

Objective 3: Coordinate a broader media campaign with partners to reach central Florida residents and visitors using newspaper, radio, TV, Internet, and existing environmental education network (e.g. environmental centers, schools, academia, area businesses).

The following projects will be initiated and accomplished through partnerships:

- Project 1: Develop an *Oculina* Web site or work within the existing site (e.g., www.safmc.net, www.uncw.edu/*Oculina*, or new NOAA site) to establish a comprehensive web-based outlet to include access to useful education and outreach products (e.g., regulations, live-link to *Oculina* data buoy system, research and monitoring information, law enforcement activities, news releases, high resolution video and photographs, maps, etc.). Publicize availability of information from new site by having links posted on other fishing/Non-Governmental Organizations/tourism related web sites (e.g., Florida Sportsman Magazine, Sportfishing Magazine, National Fisherman Magazine, Port Canaveral Tourism Assoc., fishing tournament sites, etc.)
    - *Tasks:* create new web site or enhance an existing site and integrate past materials from www.at-sea.org, oceanica.cofc.edu, www.oceanexplorer.noaa.gov., www.mpa.gov, and other sites. Publicize availability web-based information.
    - *Justification:* Web site is best media for maintaining comprehensive, dynamic content and imagery. The availability of this information can be easily publicized from other existing high-profile Web sites.
    - *Deliverables:* Web site and promotion
    - *Potential Partners/roles:* National Undersea Research Center; NOAA Fisheries' Southeast Fisheries Science Center (SEFSC), US Geological Service, NOAA Office for Law Enforcement, Florida Fish and Wildlife Commission, Florida Fish and Wildlife Research Institute (FWRI)/ (Note: Must identify possible hosting capabilities and/or provide information for Web site)
    - *Schedule:* Identify options and begin contracts in 2005; June 2005—identify host server and portal (e.g., SAFMC, UNCW, or NOAA); Dec. 2005—post beta Web site
    - *Budget:* Total dependent upon Web host and final design; 2004-2005 CRCP funds are available for development (at least $6,000)

- Project 2: Develop education products for teachers (K-12) and informal educators, post on Web site and develop packet for distribution to science teachers.
    - *Tasks:* Identify, develop, and produce education products
    - *Justification:* This was identified as a need at both constituent meetings and determined a priority item by the Information and Education Advisory Panel. Initial ground work will be needed to identify local education needs
    - *Deliverables:* education materials as identified

- *Potential Partners/roles:* Centers for Ocean Sciences Education Excellence (COSEE) in SC and FL, Florida Sea Grant, Project Oceanica, local school systems and teacher partners; identify and develop education materials for children
- *Schedule:* Identify interested partners in 2006 and develop schedule for product production; integrate existing products into education packet and new Web site
- *Budget:* Dependent upon products identified by educators; initial Web site page funded by 2004-5 CRCP; $5000 for local teacher workshop dedicated to product development

- Project 3: Create media packet targeting ecological importance of area; packet should include popular news items about *Oculina* Experimental Closed Area.

  - *Tasks:* develop a press kit for the *Oculina* Banks, including *Oculina* fact sheet, list of FAQs, and list of related publications (science and popular articles); paper and Web versions
  - *Justification:* TV, radio and newspapers need press kit for background information to supplement events and interviews
  - *Deliverables: Oculina* Press Kit (paper and on-line)
  - *Potential Partners/roles:* Harbor Branch Oceanographic Institute Public Relations, National Undersea Research Center, NOAA Fisheries Southeast Fisheries Science Center / produce paper and digital versions of materials
  - *Schedule:* Aug 2005 local workshop for media and researchers (dependent upon role of partner and staff time available), Early 2006 publish media packet (before major research/monitoring cruise)
  - *Budget:* $3000 for workshop including travel for invited participants; estimated production/printing costs: 50 high quality media packets @ $50.00 ea. = $5,000.

- Project 4: Develop a traveling portable exhibit (include video presentation, posters, brochures, “goodie bag” promotional items) that can be displayed at fishing tournaments, tradeshows, seafood/maritime festivals, aquariums, science museums, libraries, government centers, etc.

  - *Tasks:* design and contract portable display and associated materials
  - *Justification:* provides easily transported informational display for promotional purposes and distribution of printed materials
  - *Deliverables:* portable display
  - *Potential Partners/roles:* Harbor Branch Oceanographic Institute, National Undersea Research Center, Southeast Fisheries Science Center, Florida Fish and Wildlife Commission, Florida Sea Grant
  - *Schedule:* 2006
  - *Budget:* $3,000 to $5,000 for table top display, design and graphics, table throw, and DVD player/monitor

- Project 5: Offer media excursions to the *Oculina* Experimental Closed Area and HAPC/ tours and interviews regarding enforcement activities onboard the *CT Randall* law enforcement vessel.

    - *Tasks:* host trips to *Oculina* Banks in conjunction with events (e.g., research cruises); work with new enforcement vessel *CT Randall* as shuttle vessel and focus of law enforcement activities
    - *Justification:* provide press with news event, photo opportunities, and chance to interview working scientists and law enforcement personnel; ROV operations are very effective as they are advanced technologies that allow press to "tour" the banks; also offers opportunity for media focus on law enforcement activities in the *Oculina* Experimental Closed Area and Habitat Area of Particular Concern and interviews with law enforcement personnel
    - *Deliverables:* resulting news coverage (TV, radio, newspaper, magazine)
    - *Potential Partners/roles:* M. Schrope, Harbor Branch Oceanographic Institution media contacts; A. Shepard and R. Pugliese, research cruises; Lt. Steve Thomas, Capt., *CT Randall* law enforcement vessel/ network using area media contacts provided by HBOI and SAFMC media list, coordinate event based on research schedule and availability of the CT *Randall* or other transport vessels
    - *Schedule:* annual when events occur; tentative Oct 2005 and May 2006 research/monitoring cruises
    - *Budget:* $1,000 (estimated fuel for two trips); develop memo of agreement with FFWC for use of *CT Randall*

- Project 6: Develop TV documentaries working with environmental TV outlets (e.g., Discovery Channel, Public TV, independent media contractors).

    - *Tasks:* produce documentaries for television that feature *Oculina* Experimental Closed Area and Habitat Area of Particular Concern; tie in with interest in Deep Sea Corals
    - *Justification:* TV is number one way to reach the public
    - *Deliverables:* TV production
    - *Potential Partners/roles:* Harbor Branch Oceanographic Institute, National Undersea Research Center (stock footage and researchers for interviews); TV producers (e.g., Ocean Vision)
    - *Schedule:* 2005 – 2006 Make contacts with media for interest in coordinating TV production with research activities; integrate media people into research cruises.
    - *Budget:* Staff time (production costs would be covered by media companies) and $1000 costs for inclusion in field programs (travel, supplies)

- Project 7: Work within existing program to deploy a real time data buoy in the *Oculina* Bank area to provide weather and sea-state information for boaters and fishermen and integrate information into web site.

    - *Tasks:* network with existing data buoy program to examine feasibility of deploying data buoy in the area; explore costs and implement; integrate existing buoy data into Web site; develop proposal for new observing system off Canaveral in OHAPC
    - *Justification:* would provide a service to fishermen and boaters, and draw additional users to site
    - *Deliverables:* data buoy for *Oculina* area; web page highlighting access to existing data products
    - *Potential Partners/roles:* NOAA/National Data Buoy Center, NOAA/ Center for Operational Oceanographic Products and Services (COOPS), Southeast Atlantic Coastal Ocean Observing System (SEACOOS), National Oceanographic Partnership Program(NOPP), Florida Space Authority, FWC
    - *Schedule:* Aug 2005—meeting at Canaveral to discuss real-time buoy in OHAPC in partnership with Kennedy Space Center, Florida Space authority, and FFWC; Dec 2005 integrate existing data into Web site; 2006 prepare NOPP proposal for OHAPC buoy with meteorological and oceanographic data down to seafloor
    - *Budget:* new buoy will cost at least $200,000 (buoy, sensors, data management and products)

- Project 8: Assist with the continued development of an interpretive *Oculina* coral display at the Smithsonian Marine Station in Ft. Pierce, Florida.

    - *Tasks:* coordinate with staff at the Marine Station to provide technical assistance and additional display/aquarium materials for an existing exhibit about the *Oculina* Bank.
    - *Justification:* the Marine Station currently has a basic exhibit with a limited interpretive area that includes photos and video of the *Oculina* Bank. The Station also has a very unique small aquarium display with live *Oculina* coral. Staff has requested assistance to develop of a more complete exhibit, including additional aquarium materials available only through partnership.
    - *Deliverables:* Digital photos and video from research cruises to be used in interpretive displays, aquarium specimens, and technical assistance.
    - *Potential Partners/roles:* Smithsonian Marine Station, Harbor Branch Oceanographic Institute, National Undersea Research Center, Southeast Fisheries Science Center.
    - *Schedule:* 2005 – Smithsonian submit plan for review by Council and NOAA partners in CRCP award.
    - *Budget:* Amount to be determined, co-funding available from Coral Reef Conservation Program 2005 award.

Objective 4: Evaluation.

- Project 1: Develop a survey tool to assess the effectiveness of the campaign and widely distribute before, during and after majority of activities underway.

    - *Tasks:* develop a written survey to assess public awareness (preliminary survey developed in 2004); refine survey for future distribution to follow up once outreach activities have been implemented
    - *Justification:* provides quantitative data to measure effectiveness of campaign
    - *Deliverables:* survey instrument and evaluation report
    - *Potential Partners/roles:* FL Sea Grant, FWC (port samplers and law enforcement agents), NOAA Law Enforcement, USCG Auxillary
    - *Schedule:* ongoing
    - *Budget:* staff time

- Project 2: Continue to receive input from local constituents (through the database established from the June 2004 outreach meetings) regarding the development of materials and level of community awareness.

    - *Tasks:* distribute prototypes of outreach materials for review by those involved in initial meetings, follow up with additional visits to area to increase database, conduct in-person interviews
    - *Justification:* provides additional review of materials and projects at the local level, maintains continued contact with constituents for distribution and evaluation of materials, allows for qualitative data collection
    - *Deliverables:* input regarding outreach materials; qualitative data
    - *Potential Partners/roles:* area constituents/ provide additional input for material review and evaluation
    - *Schedule:* ongoing
    - *Budget:* $1200/year staff travel for follow up meetings and interviews

Table 1. Information and Education Planning Table (**The years listed in the following table begin in April**)

	Cost	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014
Objective 1: Assist in development of the *Oculina* Experimental Closed Area Evaluation Plan.											
Project 1: Develop an outreach strategy for the *Oculina* Bank area.	Staff time	**X**									
Objective 2. Develop a focused campaign targeting recreational/commercial fishermen in the central-eastern Florida area. (COUNCIL INITIATED PROJECTS)											
Project 1. Provide SAFMC regulation brochures to area fishermen (40,000 copies)	$14,000	**X**	------	------	------	------	------	------	------	------	**X**
Project 2. Work with fishing chart manufacturers and or vendors to improve available information for the *Oculina* Experimental Closed Area.	TBD				**X**						
Project 3. Work with Florida FWC to provide written information regarding the *Oculina* Experimental Closed Area in (a) their publications targeting both recreational and commercial fishermen and in (b) mailings for fishing licenses and permits.	(a) Staff time (b) $5,000		**X** (a)	**X** (b)							
Project 4. Develop and distribute news releases to focus on law enforcement activities, research and monitoring projects, and the ecological importance of the area.	$400/yr.		**X**	------	------	------	------	------	------	------	**X**

Table 2. Information and Education Planning Table (cont.)

	Cost	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014
Project 5. Develop a Powerpoint presentation about the *Oculina* Experimental Closed Area, distribute on CD, post at Web site, and present to fishing clubs, environmental groups, local governments etc.	Staff Time		**X**								
Project 6. Develop and distribute posters and rack cards/brochures at area bait and tackles shops, marinas, fish houses, boating stores, fishing tournaments, boat shows, etc.	$5,000		**X---**	**X**							
Objective 3: Coordinate a broader media campaign with partners to reach central Florida residents and visitors using newspaper, radio, TV, Internet, and existing environmental education network (e.g. environmental centers, schools, academia, area businesses). (PARTNERSHIP PROJECTS)											
Project 1: Develop an *Oculina* Web site or work within the existing site to establish a comprehensive web-based outlet to include access to useful education and outreach products. Publicize availability of information from new site by having links posted on other fishing/Non-Governmental Organizations/tourism related web sites	Initial '04 -'05 funds available $6,000		**X**								
Project 2: Develop education products for teachers (K-12) and informal educators, post on Web site and develop packet for distribution to science teachers.	$5,000 for material developing workshop		**X**								
Project 3: Create media packet targeting ecological importance of area; packet should include popular news items about *Oculina* Experimental Closed Area.	$3,000 media workshop $5,000 media packets		**X**								

Table 2. Information and Education Planning Table (cont.)

	Cost	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014
Project 4: Develop a traveling portable exhibit that can be displayed at fishing tournaments, tradeshows, seafood/maritime festivals, aquariums, science museums, libraries, government centers, etc.	$3,000 to $5,000			**X**							
Project 5: Offer media excursions to the *Oculina* Experimental Closed Area and HAPC/ tours and interviews regarding enforcement activities onboard the *CT Randall* law enforcement vessel.	$2,000 (fuel for 2 trips)		**X**	**X**							
Project 6: Develop TV documentaries working with environmental TVoutlets (e.g., Discovery Channel, Public TV.	$1,000		**X**								
Project 7: Work within existing program to deploy a real time data buoy in the *Oculina* Bank area to provide weather and sea-state information for boaters and fishermen and integrate information into web site.	$200 K		**X**								
Project 8: Assist with the continued development of an interpretive *Oculina* coral display at the Smithsonian Marine Station in Ft. Pierce, Florida.	TBD		**X**								

Table 2. Information and Education Planning Table (cont.)

	Cost	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014
Objective 4: Evaluation.											
Project 1: Develop a survey tool to assess the effectiveness of the campaign and widely distribute before, during and after majority of activities underway.	Staff Time	**X**	**X**			**X**			**X**		
Project 2: Continue to receive input from local constituents (through the database established from the June 2004 outreach meetings) regarding the development of materials and level of community awareness.	$1,200 per yr.		**X**	-------	--------	--------	-------	--------	--------	-------	

3.0 Law Enforcement

3.1 Background

At their March 3-6, 2003 meeting, the Council had an in-depth discussion about the issue of law enforcement in the Experimental Closed Area and made the following motion: (1) It is the Council's position/policy that enforcement of the *Oculina* Closure is an utmost priority, (2) violation of the *Oculina* Experimental Closed Area is egregious and of a high and aggravated nature, and (3) that we request NOAA General Counsel revise the penalty schedule to be commensurate with the above classification. In response NOAA Fisheries has assigned a special agent to the area which should improve enforcement.

At its June 2003 meeting, the Council also approved a motion to develop an updated enforcement plan within one year of the implementation of Snapper Grouper Amendment 13 A.

A revision of the Southeast Region Magnuson-Stevens Act penalty schedule was published in June 2003. The schedule provides ranges for civil administrative monetary penalty amounts and permit sanctions for violations such as illegally fishing or possessing fish within the *Oculina* Habitat Area of Particular Concern or *Oculina* Experimental Closed Area as follows: First violation - $500 to $50,000, and a permit sanction up to 45 days; Second violation - $2,500 to $90,000, and a permit sanction of 30 – 90 days; and Third violation - $5,000 – statutory maximum, and a permit sanction of 60 days to revocation. Aggravating or mitigating circumstances may be considered in determining the proper penalty level within, above, or below the penalty ranges.

At their November 22 – 23, 2004 meeting, the Council's Joint Law Enforcement Advisory Panel and Law Enforcement Committee established five enforcement principles for the *Oculina* Bank: (1) use of the Vessel Monitoring System (VMS) in certain fisheries (e.g., Rock Shrimp) or all fisheries, regardless of sector (commercial and recreational); (2) enforcement of the boundaries of the Bank is not a single agency event, but rather a cooperative effort between the Coast Guard, the Florida Fish and Wildlife Conservation Commission, and NOAA Fisheries; (3) increase enforcement presence at the Bank; (4) a report documenting fisheries violations should be given at every Council meeting and possibly posted on the Council's website; and (5) all concurred that outreach is less costly in the long run than enforcement efforts, and that better knowledge leads to better compliance.

On December 13, 2004, an *Oculina* Bank Enforcement Meeting was held, bringing together enforcement partners from the Coast Guard (USCG), Florida Fish and Wildlife Conservation Commission, and NOAA Fisheries Office for Law Enforcement. The previously mentioned enforcement principles were discussed and an enforcement strategy was created for the *Oculina* Bank Habitat Area of Particular Concern and the Closed Area.

3.2 Strategy

This document is for information purposes only; nothing here commits agencies to supply any specific resources or creates any financial obligations. This does not change any statutory authority or create any new responsibilities.

Enforcement Principle 1 – VMS

Currently, VMS is required on shrimp trawlers holding a rock shrimp endorsement while on a trip in the South Atlantic. The real-time VMS display is monitored by an OLE enforcement technician in St. Petersburg, Florida and, by USCG District 7 Command Center in Miami, Florida and by USCG Group Mayport (Sector Jacksonville) Operations Center. Alerts are sent electronically to the OLE *Oculina* Bank special agent, USCG Group Mayport Operations Center, Group (Sector) Miami Operations Center, and Station Fort Pierce.

The USCG is working towards near real-time access to VMS by patrol boats and utilizing VMS for incident/incursion responses coordinated through USCG Group (Mayport (Sector Jacksonville). At this time, the Florida FWC does not have direct access to VMS however, information is provided to Florida FWC units for the purposes of Federal fisheries enforcement.

Enforcement Principle 2 – Cooperative Enforcement

Enforcement of the *Oculina* Habitat Area of Particular Concern/*Oculina* Experimental Closed Area is a cooperative effort of the USCG, FWC, and OLE subject to the availability of resources. Each agency has primary, and overlapping jurisdiction, and supportive roles towards *Oculina* HAPC/*Oculina* Experimental Closed Area enforcement. Patrol of the *Oculina* HAPC is the primary role of the USCG and FWC and their vessels and aircraft. Investigation of suspected violations is the primary role of OLE. Each partner supports the other through intelligence and asset sharing as well as training. Additionally, the enforcement partners will maintain a high level of cooperation and coordination through periodic enforcement meetings to discuss enforcement efforts.

Enforcement Principle 3 – Increase Enforcement Presence

As the Council identified, the enforcement partners cannot provide a continuous law enforcement presence due to the limited resources of OLE and the priority tasking of the USCG (Snapper Grouper Amendment 13A). The enforcement partners can provide a deterrent presence through patrol and surge operations.

If available, the following assets will be utilized for *Oculina* HAPC/*Oculina* Experimental Closed Area patrols:

USCG
87' Coastal Patrol Boats (CPB)
47' Motor Lifeboats (MLB)
Helicopters (HH-65)
Coast Guard Auxiliary aircraft
Medium Endurance Cutters (MEC)
High Endurance Cutters (HEC)

FWC
65' Offshore Patrol Vessel (P/V)
Aircraft

OLE does not have a dedicated patrol asset, but can provide a 24' Rigid Hull Inflatable Boat (RHIB) for surge operations.

The primary patrol assets for the OHAPC are the USCG 87' CPBs and FWC 65' P/V. In addition, FWC has dedicated aircraft flight hours for OHAPC patrols through the 2005 Joint Enforcement Agreement. Due to their low on-scene endurance, USCG 47' MLBs will be utilized to respond to specific incidents or incursions. Cooperative surge operations will be conducted periodically throughout the year to address increased activity by commercial or recreational vessels in the vicinity of the OHAPC or OECA. USCG and OLE will conduct training sessions prior to surge operations. The USCG will also utilize officers from the Southeast Regional Fisheries Training Center for training and additional surge operations support.

Enforcement Principle 4 – OHAPC Enforcement Reports
Currently, each enforcement partner prepares a monthly activity report. This report will be synthesized into one document and reported to the Council quarterly, prior to the briefing book deadline for each Council meeting. The following statistics will be collected for the quarterly report:

1. Number of hours in the OHAPC,
2. Average number of hours underway/in transit to patrol areas,
3. Number of sorties/patrols,
4. Number of vessels sighted (Commercial and Recreational),
5. Number of vessels boarded (Commercial and Recreational),
6. Enforcement actions,
7. Combined operations with aircraft or other enforcement partner, and
8. Significant violations summary

The OLE OHAPC special agent will be the collection point for monthly reports and will draft the quarterly report to be presented to the Council.

Enforcement Principle 5 – Outreach and Education

An outreach plan was required by Amendment 13A to the Snapper Grouper Fishery Management Plan. This outreach plan is the primary responsibility of the Council's Information and Education Committee and Advisory Panel. The enforcement partners are important supporters of this plan. The enforcement partners can support Objective 1, Project 4 (distribution of OHAPC brochures) and Project 6 (distribution of SAFMC regulations) during law enforcement activities (boardings, dockside inspections) and scheduled outreach activities (fishing tournaments, fishing association meetings, boat shows). Project 7 (news releases) is also a vital component to the goal of increasing compliance with OHAPC regulations Enforcement news releases regarding activities and cases will be issued periodically. The enforcement partners, through the OLE OHAPC special agent, will liaison with the Council staff on all outreach and education activities.

4.0 Research and Monitoring

4.1 Background

In April 2004, regulations were implemented through Amendment 13A to the South Atlantic Snapper Grouper Fishery Management Plan that extended the fishing restrictions for the designated 92-square mile *Oculina* Experimental Closed Area for an indefinite period. The amendment was developed by the South Atlantic Fishery Management Council to address the 10-year sunset provision for the closure of the area to snapper/grouper fishing. Located off the coast of Ft. Pierce, Florida, the area is part of the larger *Oculina* Habitat Area of Particular Concern designed to protect the *Oculina* coral found there. In addition to extending the closure, the amendment requires that the size and configuration of the Experimental Closed Area be reviewed within three years of the implementation date of Amendment 13A and that a 10-year re-evaluation be conducted for the area. The Council also stipulated that an evaluation plan be developed for the area to address needed monitoring and research, outreach, and enforcement efforts within one year of implementation of the Amendment.

Oculina coral *(Oculina varicosa*) or ivory tree coral is distributed along the South Atlantic shelf with concentrations occurring off the central East Coast of Florida. Unique among coral reefs, the *Oculina* Banks are composed of a single species of delicately branched coral that grows on ancient limestone ridges and pinnacles distributed throughout the area. The *Oculina* coral provides habitat for an incredible diversity of fish and associated invertebrates including 70 species of fish, 230 species of mollusks and 50 species of decapod crustaceans (crabs and shrimp). Because of this diversity, the deepwater coral areas have been subjected to intense fishing pressure since the early 1960s and fishing gear, including bottom trawls, has had a devastating effect on the fragile coral.

Beginning in the early 1980's, studies conducted in the area showed a relatively high abundance of reef fish such as snappers, groupers, and amberjack. In addition, the habitat provided by the *Oculina* coral supported spawning aggregations of grouper. Due to the unique and fragile nature of the coral formations and because it provides valuable habitat for economically important commercial and recreational species, the South Atlantic Council recognized it was imperative to afford this area extra protection. In 1984, to protect this fragile and limited habitat, a 92-square mile *Oculina Bank Habitat Area of Particular Concern* was established.

Unfortunately, by the late 1980s the fish populations in the area had been severely decimated from overfishing. In 1994, after learning from researchers that the *Oculina* Bank Habitat Area of Particular Concern had been found to contain species in the deepwater snapper grouper complex, the area was designated as the *Oculina Experimental Closed Area* (herein referred to as the *Oculina* Experimental Closed Area). Designated through Amendment 6 to the Snapper Grouper Fishery Management Plan, the *Oculina* Experimental Closed Area (*Oculina* Experimental Closed Area) restricted fishing for species in the snapper/grouper complex for a period of 10 years. Anchoring was also prohibited. The Council determined that added protection on this area would

enhance stock stability and increase recruitment by providing an area where deepwater species can grow and reproduce without being subject to fishing mortality.

Through the Council's Comprehensive Amendment Addressing Essential Fish Habitat, in 2000, the *Oculina* Bank Habitat Area of Particular Concern was expanded to encompass areas that had earlier only been restricted to rock shrimp vessels. The Habitat Area of Particular Concern expansion eliminated the use of all trawling gear in the area. Bottom gear restrictions, including anchoring, were also included in the expansion. The expanded area is 60 nautical miles long by approximately 5 nautical miles wide.

Information on the *Oculina* Experimental Closed Area, including regulations, can be accessed through the Council's Ecosystem Homepage and Internet Mapping System (http://www.safmc.net/habitat/fmpro?-db=content&-format=default.html&-view). The Council's Ecosystem Homepage presents a thorough overview of how the Council is adopting an ecosystem-based management approach in the South Atlantic including documents related to research and management of the Closed Area and imagery files of representative habitats within the *Oculina* Experimental Closed Area and the larger *Oculina* Bank Habitat Area of Particular Concern.

4.2 Research and Monitoring Components

The First research and monitoring task included the development of this *Oculina* Evaluation Plan which occurred in beginning in April of 2004 and finished in March of 2005.

The following objectives and projects represent a comprehensive approach for addressing each goal. Projects are listed in general priority order based on input from researchers at the Deepwater Coral Research and Monitoring Workshop held in Cape Canaveral, Florida in August 2004.

I. Will *Oculina* thicket habitat recover throughout the *Oculina* Experimental Closed Area without human intervention? What time frame will be needed for significant recovery (years, decades, centuries)? Will it be necessary to introduce artificial substrate to serve as an initial settlement surface?

The *Oculina* banks have been damaged to such an extent that intact *Oculina* thickets can only be found in a small (4 ha) area known as Jeff's Reef, and a larger area just to the north called Chapman's Reef. Some of the damaged areas were observed in the early 1980s, and although some level of recovery would be expected after more than 2 decades, there are still large, denuded areas in several locations. This failure of ecosystem recovery may be attributable to a combination of several factors: (1) low levels of larval delivery, (2) lack of suitable substrate for coral settlement and survival, (3) physical factors that have caused some locations to become unsuitable for coral survival and (4) repeated impact from illegal fishing gear, which would destroy new coral colonies.

The question of *Oculina* habitat recovery is of the highest priority because much of the coral pinnacle habitat is damaged (Koenig et al. in press), and habitat provides the foundation of biodiversity and production. Recovery primarily involves three conditions: (1) a supply of coral larvae, (2) suitable substrate for larval settlement, and (3) environmental conditions suitable for coral survival and growth. All three of these conditions can be evaluated simultaneously by taking advantage of artificial structures already present within the *Oculina* Experimental Closed Area.

Oculina varicosa is a highly fecund, broadcast spawning species, with a larval stage that spends 2-3 weeks in the plankton. The reproductive biology of this species therefore has the elements necessary for colonization of areas that may be several miles from the adult colonies. It is possible however, that cohorts of larvae are frequently lost in the complex hydrodynamics of the Florida shelf. Since very little intact reef remains, larval loss through vicarious natural events has a relatively larger impact on recovery potential than if the larval pool was supplied by large areas of intact reef. For example, the fewer larvae there are, the less we can afford to lose. The prevailing current is northerly and the intact areas are at the southern end of the reef, therefore larvae are potentially transported north to re-colonize the damaged area. However, the hydrodynamics of the Florida shelf are very complex and variable. A three-dimensional model that integrates physical and biological data is needed to generate probability density patterns for dispersal of invertebrate and fish larvae, and predict reef recovery potential.

Water quality data will help identify conditions that may be unsuitable for coral survival. For example, the Florida bedrock is composed of porous limestone, which may permit freshwater to seep through from the subterranean aquifer into the marine environment, locally reducing the salinity or potentially transporting pollutants.

Dead coral rubble is the major substrate component in many damaged reef areas. This may not be suitable for *Oculina varicosa* larval settlement since it is a low relief substrate and may be easily covered with sediment. Small pieces of rubble may also tumble in high current, sloughing off any new recruits. Previous studies have shown growth rates for *Oculina varicosa* coral in shallow and deep water and relationships to environmental factors (Reed 1981). Numerous surveys over rubble bottom by National Marine Fisheries Service and Florida State University researchers during the late 1990s suggest that successful recruitment to rubble is rare, but bottom disruption by illegal trawling, which continued in recent times, cannot be ruled out as an impediment to successful rubble recruitment. Recent Remote Observing Vehicle observations (2003) of an artificial structure (reefblock) deployed in 1998 shows numerous coral recruits covering the surface. So we know that recruitment occurs within the *Oculina* Experimental Closed Area.

Objective 1: Identify coral/fish recruitment pathways and compare settlement, growth, and survival rates on artificial substrate relative to settlement, growth, and survival rates on nearby unconsolidated coral rubble.

- Proposed Methodology: Coral larvae are extremely small (approximately 130 microns) and growth rate of deepwater *Oculina varicosa* is slow (approximately16 millimeters /year [Reed 1981]). Recruitment, therefore, cannot be evaluated immediately following deployment of artificial substrate since new coral colonies would not be detected using a Remote Observing Vehicle or submersible cameras. Between 1996 and 2001, a total of 276 large concrete structures were deployed in the *Oculina* Experimental Closed Area and new coral colonies have been observed on some of the older structures (Brooke et al. in review). Comparisons of colonization on artificial and natural (rubble) substrate would determine whether artificial structures enhance reef recovery. In the past we have had no way of knowing the extent of trawling impact on coral colonization. The introduction of a mandatory Vessel Monitoring System on licensed rock shrimp fishing vessels should prevent destruction of new coral colonies by illegal trawling. However, if trawling does occur in the experimental reefball area, the impact would be visible since both natural and artificial substrate would be affected. The following methods would be used to determine whether human intervention is necessary to initiate habitat recovery:

A. Compare coral colonization and growth on natural (rubble) vs. artificial substrate at Sebastian Pinnacles: In 2000 and 2001, 225 reefballs were deployed in various experimental configurations in the badly damaged Sebastian Pinnacles area. If corals are successfully recruiting to the reefballs, the older colonies should be easily visible. The reefballs would be quantitatively surveyed for coral colonization and growth rate using manned submersibles, Remote Observing Vehicles, and/or Tech Divers. If the coral recruits to the artificial surfaces and not to the rubble, this experiment would provide unequivocal evidence that artificial surfaces are necessary for the successful short-term (less than 50 years) recovery of the coral habitat.

B. Compare coral colonization and growth on natural (rubble) vs. artificial substrate from multiple high relief areas throughout the *Oculina* Experimental Closed Area: Variability in physical and biological factors along the shelf may lead to differences in colonization rates in the *Oculina* habitat. Results from experiments in the Sebastian area cannot necessarily be extrapolated to other pinnacle areas within the *Oculina* Experimental Closed Area. Therefore, insights into regional differences can be obtained by surveying the previously deployed 56 one-cubic-meter reefblocks on high-relief features throughout the *Oculina* Experimental Closed Area from 1996 – 1999 (Koenig 2001). If some factors necessary for successful coral recruitment (e.g., larval supply) are not present in some areas of the *Oculina* Experimental Closed Area, then deployment of artificial substrate in those areas would do little to facilitate habitat recovery. Comparison of recruitment rates to reefblock surfaces throughout the *Oculina* Experimental Closed Area would provide a basis with which to judge spatial recovery potential.

C. Assess the influence of geomorphology and orientation on habitat recovery: Most of the coral thicket habitat in the *Oculina* Experimental Closed Area is restricted to high relief areas; it is likely, therefore, that successful coral colonization (and thus that habitat recovery) is influenced by regional geomorphology. Habitat recovery requires larval delivery and successful post settlement survival and growth. These two components can be investigated simultaneously by attaching live coral transplants to artificial substrates and deploying replicate experiments at various high and low relief sites. The experiments would be surveyed for new coral colonies as well as transplant survival and growth. This work would define potential target sites for large scale restoration if the introduction of artificial substrate is necessary.

- Deliverables and timing: Results from these experiments will provide the necessary experimental basis for proceeding with habitat recovery plans. We either do nothing if recruitment to natural rubble substrate is strong relative to artificial substrate, or we introduce clusters of artificial structures if coral recruitment to rubble is weak. Timing is from 2 to 4 years. Since both types of substrate have now been deployed for several years, information on coral colonization/growth and survival/growth of transplants could be available shortly after completion of surveys. Results of new deployments: 3-5 years for coral colonization/growth and 1+ years for transplant survival/growth.
- Opportunities: Because artificial structures (reef blocks, reef balls, and reef disks) have been deployed in the *Oculina* Experimental Closed Area starting 9 years ago (1996 to 2001), evaluation of these experiments could begin immediately. In addition, the Florida Fish and Wildlife Commission's Artificial Reef Program is interested in collaborating to support deployment of experimental structures in the *Oculina* Habitat Area of Particular Concern adjacent to living reef. The Council could work with aerospace industry, Port Canaveral and the State of Florida /Florida Fish and Wildlife Commission as well as NOAA to place considerably larger settlement structures meeting high substrate quality parameters for placement at previously destroyed *Oculina* reef sites in the vicinity of Cape Canaveral. Avenues to enlist the cooperation of the fishing industry should be investigated; especially in light of the fact that damage to the *Oculina* reef off Cape Canaveral was caused by trawlers (discovered in the 2001 Ocean Exploration mission by John Reed). This would also enhance rock shrimp production by producing additional habitat.
- Funding sources: (competitive) National Undersea Research Center, Marine Fisheries Initiative, National Science Foundation (Ocean Research Interactive Observatory Networks), National Oceanic and Atmospheric Administration Coral Reef Initiative, Sea Grant; (non-competitive) South Atlantic Fishery Management Council, Southeast Area Monitoring and Assessment Program, State of Florida.

Objective 2: Model coupled biological and physical properties as well as relevant chemical/nutrient and physiological characteristics. Previous studies have shown the benthic environment of the *Oculina* reefs to be very dynamic and widely fluctuating due to upwelling events and meandering of the Florida Current (Reed 1983).

- Proposed Methodology:
    A. Characterize the physical and biological properties of the water column in 3D using combined hydrodynamic modeling and observational approaches (via current meter arrays, ADCPs, Autonomous Underwater Vehicles, etc) and examine essential chemical and physiological parameters (pH, temperature, sediment, salinity). This would require long-term data from current meters and sensor arrays deployed at several sites along the shelf. Some of this information may become available through large scale programs presently being defined such as the National Science Foundation Ocean Research Interactive Observatory Networks, the sustained measurements from the Integrated Ocean Observing System, as well as from National Oceanic and Atmospheric Administration buoys. Three-dimensional hydrodynamic models would incorporate physical and biological data to create probability density maps to investigate transport of coral and fish larvae.

    B. Must deploy Ocean Observing System in the *Oculina* Experimental Closed Area at critical locations that represent overall circulation and water masses; physical water/weather parameters to measure include winds, waves, currents, temperature, and optical properties; chemical and geological parameters to measure include pH, turbidity, substrate states, and salinity; biological properties to measure include fluorescence, plankton concentration and components, including Harmful Algal Blooms and larvae; modeling expertise must be brought on-board prior to development of Ocean Observing System; models to predict future recruitment success of corals and key fish stocks. Examples are presented in Figures 7, 8, and 9.
- Deliverables and timing: Physical models – 3 yrs, chemical and biological models – 5-10 years
- Opportunities: Utilize existing hydrodynamic models (e.g. used by Southeast Atlantic Coastal Ocean Observing System (Seim et al. 2003) and National Oceanic and Atmospheric Administration/National Data Buoy Center C-Man buoys. Hydrodynamic models for this area have been produced by a researcher at the Rosenstiel School of Marine Science under Dr. Chris Moore (G. Gilmore, personal communication). Another study (Frias-Torres, in prep.) produced a general account of cross shelf transport of east central Florida (G. Gilmore, personal communication). The Council should encourage oceanographic model development for east central Florida south of Cape Canaveral as this has great implications for larval transport from *Oculina*, grouper, snapper and porgy spawning activities as well as overall coral health.

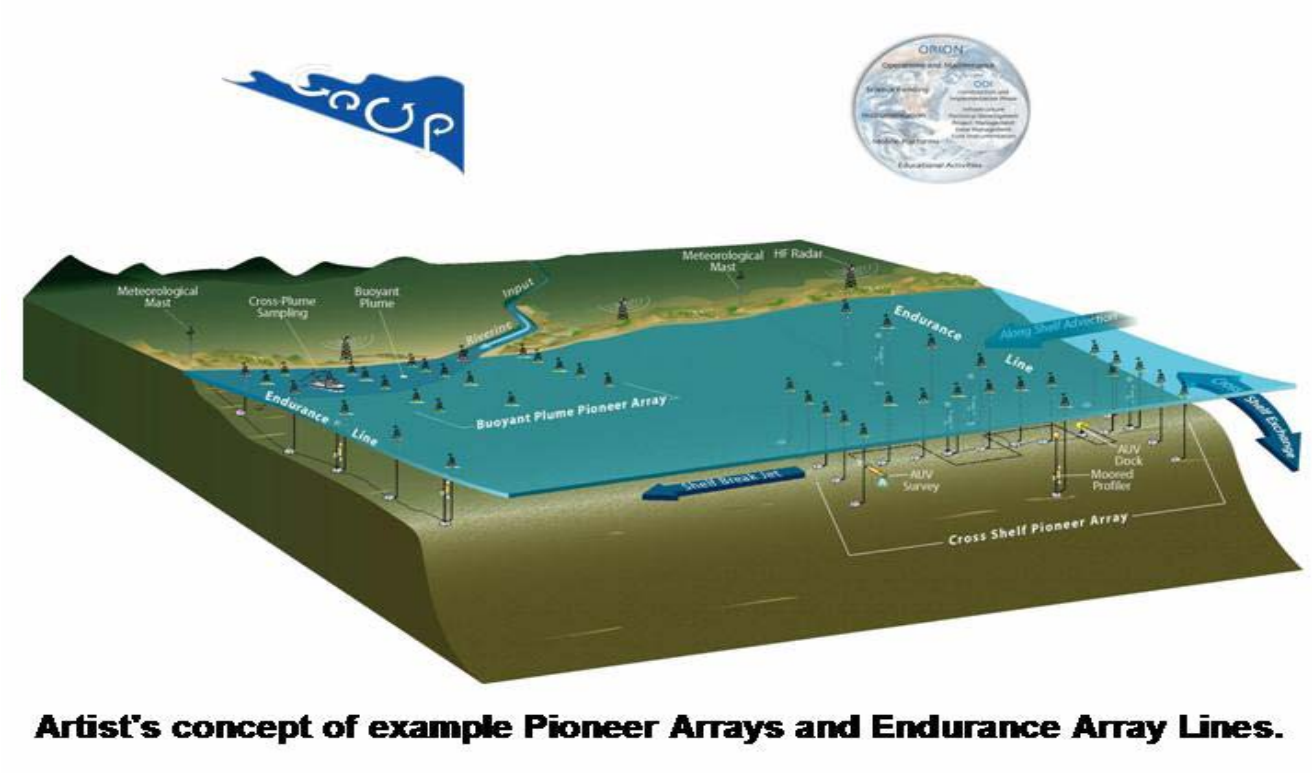

Figure 7. Example Pioneer Arrays and Endurance Array Lines (Source: Figure supplied by Cisco Werner, SEACOOS Program, January 2005. Original in Skidaway Institute of Oceanography Technical Report TR-03-01. 2003.)

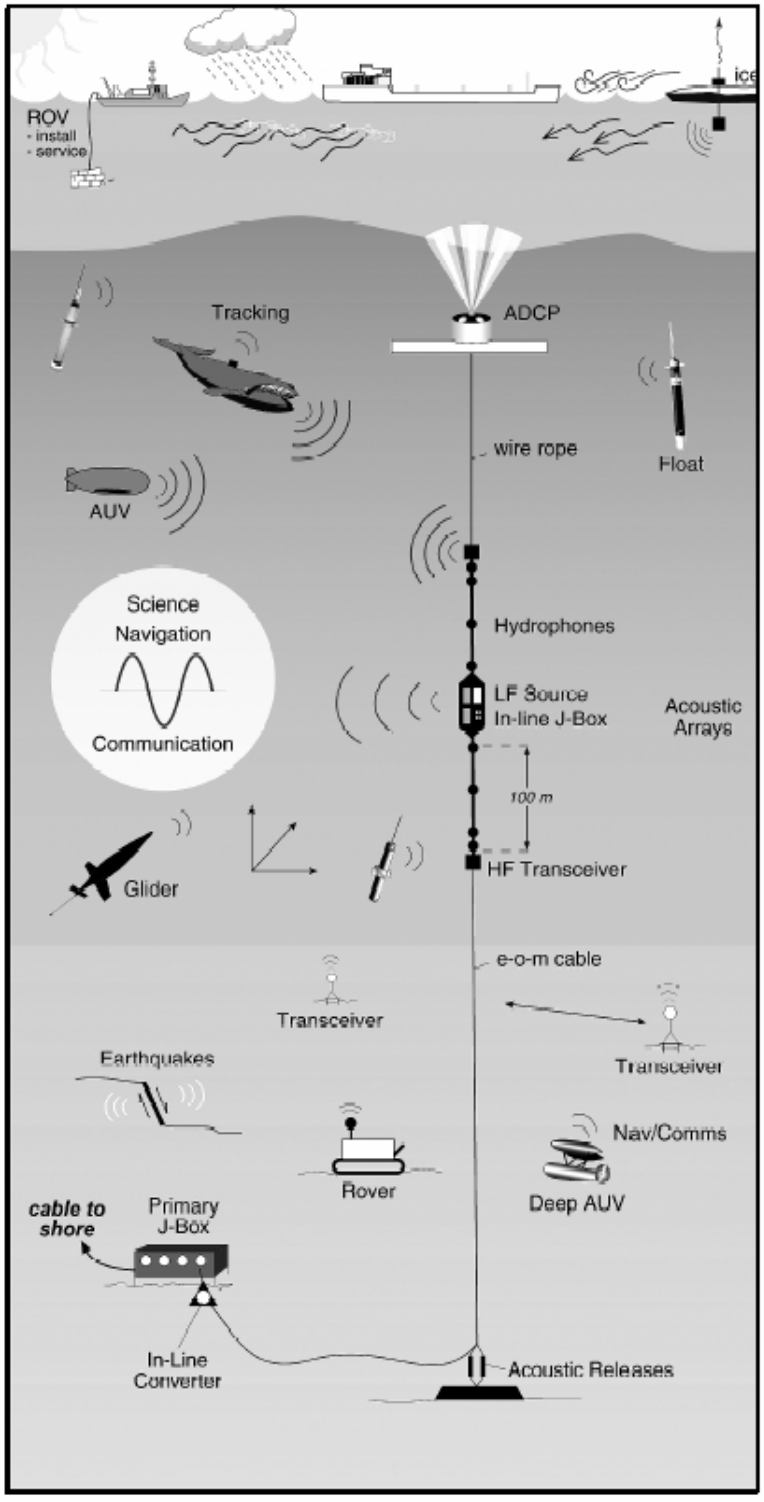

Figure 8. Examples of acoustic systems integrated for ocean observatories, directly making science measurements while at the same time providing navigation and communications as part of the sensor network infrastructure (Source: National Science Foundation Ocean Research Interactive Observatory Networks, Winter 2005 Newsletter)

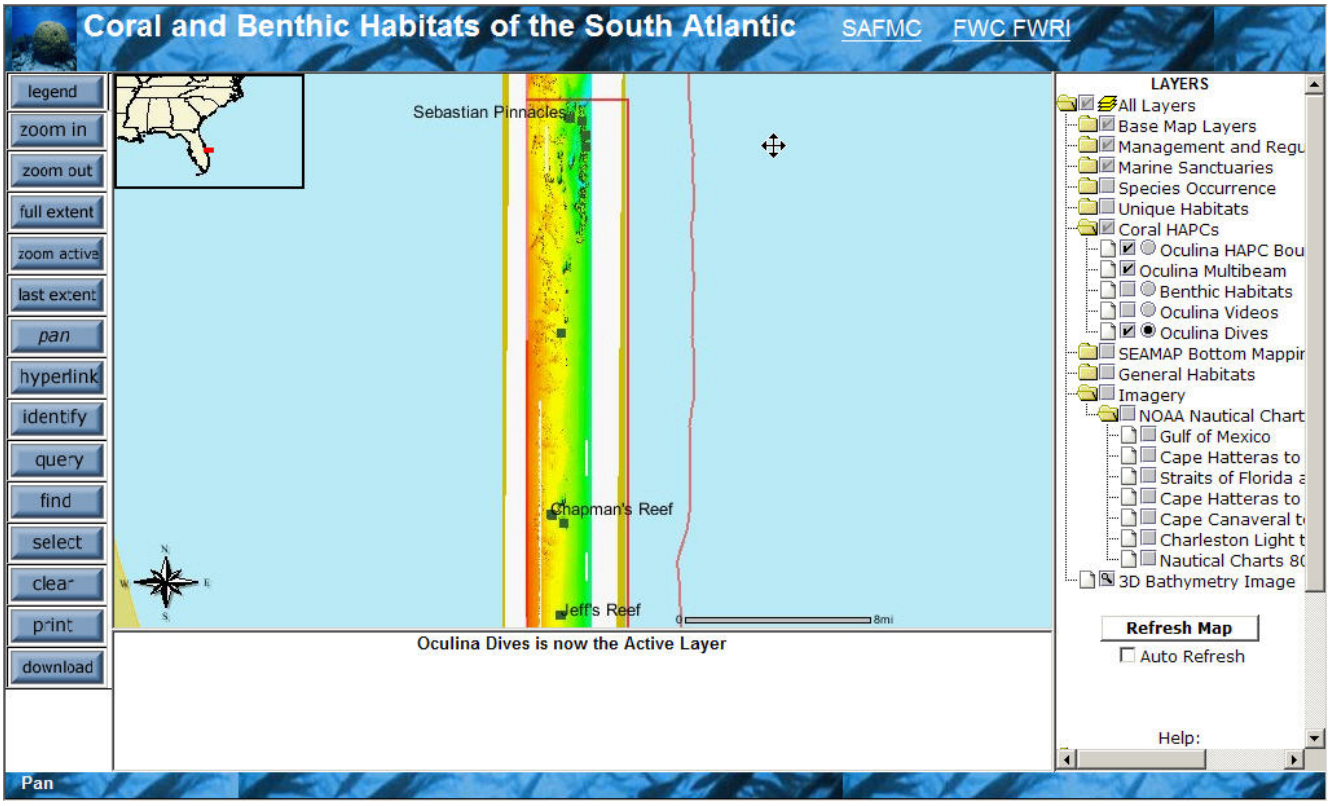

Figure 9. Candidate sites for oceanographic moorings to facilitate remote research and monitoring in the *Oculina* Experimental Closed Area (Source: SAFMC Online Internet Mapping System, Prepared by Tina Udouj, FWRI January, 2005)

II. Determine and monitor the effect of the *Oculina* Experimental Closed Area on fish distribution and status

Spawning aggregations of gag and scamp groupers were associated with the high-relief *Oculina* pinnacles in the 1970s (Gilmore and Jones 1992). It is well known that shelf-edge reefs, such as *Oculina* reefs are important habitat for grouper spawning, but intensive fishing since the 1970s has all but eliminated these aggregations (Koenig et al. 2000). Since the ban on bottom fishing began in 1994, a primary research objective is to determine the extent of recovery of fish populations, if any. This requires quantitative evaluation of the significant aggregation sites during the months of February, March, or early April, the dominant months of spawning for these two species. We already know that gag and scamp spawn within the *Oculina* Experimental Closed Area, but we don't know if other species such as Warsaw grouper, speckled hind, black sea bass, snowy grouper, red porgy, red snapper, etc. spawn in this area as well.

The most significant benefit of marine protected areas is to significantly enhance fisheries through recovery of populations and spillover into remaining fishing grounds. A variety of approaches are needed to assess fish populations synoptically in and outside the

Oculina Experimental Closed Area. This work may also finally address the potential for significant fisheries impacts external to the *Oculina* Experimental Closed Area to influence fish numbers within the *Oculina* Experimental Closed Area. To evaluate spillover fish must be tagged inside the *Oculina* Experimental Closed Area. Capture of fish and reporting of tags from outside of the Closed Area indicates that spillover does exist. However, until the *Oculina* Experimental Closed Area recovers there is little point in quantitatively evaluating the rate of spillover.

A major objective of the *Oculina* Experimental Closed Area is to provide areas where fish population demographics can recover to historical levels and thereby provide a reproductive haven. Recent studies (e.g., Berkeley et al. 2004) show that large old fish not only produce greater numbers of eggs, they also produce higher quality eggs with a greater survival potential. The oceanographic models used for modeling larval coral recruitment might also be useful for modeling transport of fish larvae from the *Oculina* Banks throughout the South Atlantic Bight. These models will need to be able to nest resolution at various scales as the importance of larval/propagule retention at small scales versus dispersal at larger scales needs to be addressed.

Objective 1: Assess spawning aggregations of fishery species.

- Proposed Methodology: A variety of tools could be adapted to this work including manned submersibles, Remote Observing Vehicles, and video cameras. The goal of the research would be to first see if spawning aggregations of gag and scamp groupers are recovering; then to determine where they are compared to historical levels and demographics observed by Gilmore and Jones (1992). Areas to be surveyed would be those with intact *Oculina* habitat (i.e., Jeff's and Chapman's Reefs) and artificial habitats constructed in the Sebastian Pinnacles area. Two experimental deployments of clusters of over 100 Reefballs each were set out in 2000 and 2001 at Sebastian Pinnacles. The experimental arrangement of these structures was designed to evaluate the importance of cluster size and internal complexity in supporting fish populations, especially of economically important fishes. One year after the first deployment in 2000 researchers observed a significant number of groupers on these Reefball clusters and some of the observed fish behavior suggested that these sites might support spawning aggregations. Now that 3 to 4 years have passed since deployment, Reefball habitats should be surveyed along with the natural habitat during the spawning season of gag and scamp to determine the size and extent of the spawning aggregations. Monitoring could be conducted using both mobile (Autonomous Underwater Vehicle) and stationary (observatory) surveys using passive acoustics, high resolution sonar and cameras. It is of critical importance to investigate the recruitment dynamics of grouper associated with the remaining *Oculina* reef stands at Jeff's Reef and Chapman's Reef. It is very fortunate that most of the historical grouper spawning activity was documented at these two reef formations and they appear to be among the few that remain in good condition today. For this reason, it is very timely to set up long-term observation sites at known historical grouper aggregation sites at these reef formations and track their

> population dynamics and precise moment of spawning. A single harem of scamp grouper in the "grotto" on the north side of Jeff's Reef was documented on a sub dive in 2001 (G. Gilmore, personal observation). This site should be examined carefully. Spawning activity should be monitored in association with oceanographic conditions at this site. This would give considerable information on larval transport from these sites to the inner continental shelf and further north into the south Atlantic bight. It is extremely important to compare historical observations with present observations at long-term monitoring sites know to support grouper spawning aggregations to accurately determine what is happening to grouper populations within the *Oculina Experimental Closed Area*. The "remote observatory" concept is extremely important as groupers spawn during the winter-spring transition when sea states severely limit ocean activities making these operations very unpredictable and extremely expensive.

The following is an excerpt detailing the potential use of a passive acoustic monitoring system at Jeff's reef in the *Oculina* Experimental Closed Area from a proposal titled "Innovative Technologies for Detection, Classification, Enumeration of Coastal Fish and Invertebrate Populations" prepared by Dr. Grant Gilmore and the Florida Space Authority. References were omitted and are available in original proposal document.

One technique that has proven effective in isolating species presence or absence and nekton abundance is the passive recording of species specific sounds produced by soniferous fish. The majority of calls are produced in association with social and spawning activities and are therefore used to call mates of the same species or announce territorial boundaries in competitive interactions. Thus calls are used for intra-specific communication, often to attract mates. Most fish sound production is produced during evening crepuscular and nocturnal mating periods. Thus crepuscular and early nocturnal periods are most effective in revealing species identity, and potential enumeration. However, this is most often limited to periods of spawning activity and social interactions. Spawning is one of the most critical life history events for any marine organism. Spawning call intensity and duration is directly proportional to the number of eggs and larvae in the water column. Therefore, remote, continuous in situ assessment of species numbers of individuals at spawning sites, and their behavior is critical for determining species presence or absence, as well as critical habitat for effective reproduction. Passive Acoustic Monitoring System developed by NASA and NOAA have been deployed at all prospective study sites and have recorded fish spawning calls at these sites. Feeding sounds are often evident, particularly with reef fishes and many pelagic carnivores, but are not always diagnostic. Social calls are most diagnostic.

The combination of high resolution sonars, such as DIDSON system and passive acoustic hydrophone arrays at fish mating sites has potential in not only determining which species are present, but enumerating the species through reflected sound images. Preliminary field trials with DIDSON at sciaenid spawning sites in the Indian River Lagoon indicates that this may be possible.

Ultra low light camera systems have recently been developed that can detect light levels to minima of 10-6 lux. The EITS camera is capable of recording fish species, numbers and activity in shallow water at night, under lunar or starlight illumination and fish revealed via bioluminescence or far red lights (6856nm wavelength) in shallow nocturnal or deep dark water (depths <1000 m). The EITS system is based on an ITT Industries Gen 3 Instensified CCD Camera with Auto-Gating ISA-780/1180 allowing a resolution of 752 x 485 pixels at 0.0000001 lux. These cameras may not be able to see morphological details for species identification under all circumstances, i.e. distances > 5-7 m, but in combination with passive acoustics and high resolution sonar, species may be identified. Stations instrumented with extreme low light cameras, passive acoustics and high resolution sonar have the greatest potential to produce invisible sensor networks to assess and study fish populations.

Deploying these technologies as underwater observatories offers several advantages over most fishery assessment techniques. More data can be obtained with real time continuously operating systems in situ, particularly if sensors are placed at locations where critical fish habitat has been isolated. Critical fish habitat can be determined using long term historical classical fishery assessments, various fish capture techniques and in situ observations using manned vehicles, unmanned vehicles or scuba, and passive acoustic transects. Sonar transects that isolate recurrent concentrations of fish at specific sites are also capable of isolating critical fish habitat. Water visibility makes no difference with acoustic technologies. Their ability to take large volumes of data and make it accessible is unparalleled. A long history of subsea sensor deployment has revealed that equipment maintenance, bio-fouling and corrosion, are the greatest practical problems associated with established sensor sites.

- Deliverables and timing: Quantify spawning aggregations of target fishery species (3-yrs) and the diversity of fishery species within boundaries of the *Oculina* Experimental Closed Area (groupers, snappers, porgies, jacks, mackerels, tuna).
- Opportunities: We know the location of the aggregations and have developed long-term monitoring stations within the *Oculina* Experimental Closed Area (G. Gilmore, personal communication). We also have quantitative information on the historical condition of gag and scamp spawning aggregations (Koenig et al. 2000). Technology and collaborators are also available through partnership with Dr. Grant Gilmore of Estuarine, Coastal and Ocean Science, Inc. Detailed protocols have been developed in a proposal titled “Innovative Technologies for Detection, Classification, Enumeration of Coastal Fish and Invertebrate Populations” prepared by Dr. Grant Gilmore and the Florida Space Authority. Some of the deliverables identified in the proposal apply directly to the *Oculina* Experimental Closed Area. Additional opportunities exist through partnering with the local fishing community.

Objective 2: Track fish movement.

- Proposed Methodology: Fish inside the *Oculina* Experimental Closed Area must show strong site fidelity. That is, if fish readily move in and out of the *Oculina* Experimental Closed Area, there will be no building of fish populations within, as fish will be lost to fishing outside. However, there is always some movement, so "spillover" effects should occur. An example of this movement would be with gag grouper; females move to and from spawning aggregations over ranges much greater than the size of the *Oculina* Experimental Closed Area. The problem at present in the *Oculina* Experimental Closed Area is that intact habitat is severely limited (only about 20 acres known). Any work done on site fidelity of fish will have to be done in that intact habitat or on artificial structures. New telemetry tools are valuable for estimating site fidelity of large fish species. Transmitters with a 4-year battery life can be placed in a fish's body cavity and these telemetered fish can be tracked by either on-board or in situ recording receivers. Fish may be captured and tagged internally with telemetry tags which emit an individually coded signal (supplied by Vemco Inc. Nova Scotia). In situ receivers tied to moorings record telemetry signals within a radius of about 0.1 Nautical Mile, so that the presence of the tagged fish is archived on the receiver, which can be later downloaded to a laptop computer. However, in water depths of the *Oculina Experimental Closed Area*, special methods must be employed to ensure that captured fish do not die from swimbladder embolism. All captured fish should be tagged with conventional external tags. One type will indicate the presence of internal telemetry tags, and another type will be used on non-telemetered fish to indicate export of adults (spillover) from the *Oculina* Experimental Closed Area through tag reporting.
- Deliverables and timing: Site fidelity and home range may be determined if an array of receivers is deployed in suitable habitat within the *Oculina* Experimental Closed Area (3-5 yrs). 3-5 years with seasonal surveys; target known spawning periods for species known to spawn within the *Oculina* Experimental Closed Area historically.
- Opportunities: We have known locations of spawning aggregations and fishery species from past surveys. Utilize multi-disciplinary observatories co-funded by federal and state agencies; use fisheries landings, accurate GPS on capture sites; fishery community for capture. The fishery community cannot be used for tagging in these water depths because over 90 percent of the captured fish would die from swim-bladder embolism. The tagging must be done by researchers using special techniques to ensure survival of the fish. National Oceanic and Atmospheric Administration's Marine Fisheries Initiative should support such work which will take at least 3 years to complete. A combination of focused approaches within the National Science Foundation Ocean Research Interactive Observatory Networks observatories and the sustained, larger scale, Integrated Ocean Observing System should be also considered. Detailed protocols for tracking movements of fish have been developed in a proposal titled "Innovative Technologies for Detection, Classification, Enumeration of Coastal Fish and Invertebrate Populations" prepared by Dr. Grant Gilmore and the Florida Space

Authority. Some of the deliverables identified in the proposal apply directly to the *Oculina* Experimental Closed Area.

Funding sources: (competitive) National Undersea Research Center, Marine Fisheries Initiative, NSF (Ocean Research Interactive Observatory Networks), National Oceanic and Atmospheric Administration Coral Reef Initiative, Sea Grant; (non-competitive) South Atlantic Fishery Management Council, Southeast Area Monitoring and Assessment Program, State of Florida.

Objective 3: Identify *Oculina* Experimental Closed Area fish population demographics (e.g., size and age structure, sex ratio,).
A major objective of the *Oculina* Experimental Closed Area is to provide areas where fish population demographics can recover to historical levels and thereby provide a reproductive haven which would contribute to grouper recruitment of the South Atlantic Bight. Recent studies (e.g., Berkeley et al. 2004) show that large old female fish not only produce greater numbers of eggs, they also produce higher quality eggs with a greater survival potential. Thus, protecting large old fish within the *Oculina* Experimental Closed Area will likely make a large contribution to fishery recruitment.

A significant decline in gag and scamp male:female sex ratios was noted in the Gulf of Mexico and the South Atlantic region in the 1990s (Coleman et al. 1996, McGovern et al. 1998). If the *Oculina* Experimental Closed Area protects fish from exploitation it may also protect sex ratio.

Annual evaluation of size and age structure of fishery species inside vs. outside the *Oculina* Experimental Closed Area would provide another indication of whether or not the reserve is protecting large old spawners. The size/age structure of the fished population should remain the same over time, whereas it should increase within the *Oculina* Experimental Closed Area if fish remain within.

- Proposed Methodology: Fish can be measured underwater with lasers attached to submersibles, Remote Observing Vehicles, or by diver-held video cameras. Age must be determined from captured fish using either otoliths (from dead fish) or spines and rays (released fish). Sex ratio can be determined from gonad biopsies (or from whole gonads on dead fish) if fish have no sexually dimorphic characteristics.
- Deliverables and timing: Demographic changes over time within vs. outside the *Oculina* Experimental Closed Area. (5 years)
- Opportunities: This objective would be combined with Objective 2 so that captured fish could provide age information from spines and rays. Also, any Remote Observing Vehicle or submersible work should include laser evaluation of fish populations.

Objective 4: Determine pre-closure distribution of dominant harvested species in and outside the Closed Area, in order to provide historical context for subsequent assessments. Review landings; spill over effects (i.e., identify benthic and juvenile pathways, upwelling events, spill-over between deep and shallow reefs) (Note: this is not just spillover, the life histories of most of the fishery species require a variety of habitats separated by 10s to 100s of miles)

- Proposed Methodology: Review Vessel Monitoring System data, Remote Observing Vehicle and Autonomous Underwater Vehicle transects, fish counts (inside and outside), set up permanent fisheries point count sites and mobile Autonomous Underwater Vehicle transects with technologies, tagging (classic acoustic and satellite), home range studies.
- Deliverables and timing: Map lifecycle and habitat connections in- and outside of the reserve. This work would finally address the potential for significant fisheries impacts external to the *Oculina* Experimental Closed Area to influence fish numbers within the Closed Area. Report (1 year).
- Opportunities: National Oceanic and Atmospheric Administration Southeast Fisheries Science Center landings and Vessel Monitoring System databases; National Undersea Research Center and National Oceanic and Atmospheric Administration Ocean Exploration Remote Observing Vehicle transect data, collaboration with Florida Fish and Wildlife Research Institute in development of a South Atlantic Fishery Management Council Coral and Ecosystem webpage and Internet Mapping System, University of North Carolina at Wilmington National Undersea Research Program. Fishermen operating in the area around the *Oculina* Experimental Closed Area would be encouraged to report capture of tagged fish.

Objective 5: Determine age distribution, nursery grounds, migratory patterns, and mortality rates for dominant harvested fish stocks.

- Proposed Methodology: Otolith microchemistry, classic, acoustic & satellite tagging, genetics.
- Deliverables and timing: 5-10 years of continuous sampling and tagging.
- Opportunities: See Opportunities for Objective 1.

III. What is the population structure of corals?

Scleractinian corals pose problems for species discrimination for several reasons, and it is not surprising that confusion still exists within coral taxonomy. Species may be reproductively isolated, but exhibit much overlap in the relatively few morphological characters used to tell them apart (Lopez and Knowlton 1997). The prevalence of phenotypic plasticity (Willis 1985), slow rates of change in molecular markers (Romano and Palumbi 1996) and long generation times may all contribute to the difficulty in recognizing coral species. Species boundaries may be muddled by extensive and complex hybridization and speciation events (Veron 1995), which over time create patterns of reticulate evolution. The simplicity of coral morphology and development may contribute to successful hybridization between species that would not be possible in more complex organisms. For example, *Oculina varicosa* and *Oculina diffusa* from the nearshore ledges may be con-specific according to

preliminary genetic analysis of the ribosomal internal transcribed spacer genes (Brooke unpublished). Deep and shallow populations of *Oculina varicosa* were described as being con-specific using morphological features, meaning that the extreme morphological differences between deep and shallow populations are probably the result of environmentally mediated phenotypic plasticity. Alternatively, the different colony types may represent two or more distinct species or sub species. Conventional taxonomic methods have been augmented in recent years by molecular techniques, which describe intra- and inter-specific genetic relationships between corals without using morphological features (Stoddardt 1984; Romano and Palumbi 1996; Lopez and Knowlton 1997; Ayre and Hughes 2000; Le Goff-Vitry et al. 2004).

Genetic patterns may be generated by historical or recent processes, acting independently or together, at different spatial and temporal scales. An important limitation of genetic approaches that use spatial distribution of allele frequencies for inferring gene flow is the assumption that populations are in evolutionary equilibrium (Knowlton 2000). The deepwater *Oculina* is unlikely to be at genetic equilibrium because most of the original reef habitat has been destroyed. However, an analysis of genetic structure at Jeff's and Chapman's reefs will provide information on the level of genetic variability in an intact population. These studies would, among other things, evaluate the question of whether the dominant mode of reproduction is sexual or asexual (fragmentation). It would also provide insight into the source of new recruits and therefore link with the biophysical modeling objective. This work also fits into National Oceanic and Atmospheric Administration's Coral Initiative purview and would require several years.

Objective 1: Research population genetics of *Oculina varicose.*

- Proposed Methodology: Literature survey to identify range distribution of the Oculinidae. The most appropriate molecular technique to use is dictated by the nature of the question posed (Molecular Systematics by Hillis et al. for review). Microsatellite analysis would provide the highest resolution of population structure, but this method can be time-consuming and expensive. Identification of taxonomic status could be determined using cDNA libraries. Nuclear DNA could be used as a less expensive alternative to microsatellites and cDNA analysis if appropriate introns could be identified, but this is proving a challenge in shallow water corals (Toomey, personal communication)
- Deliverables and timing: 1-2 years
- Opportunities: Competitive funding sources. Sampling of coral could be done in concert with other priority studies described herein, but in addition to sampling approximately $75,000 would be needed for the analysis.

Objective 2: Identify cross-shelf relationships between shallow and deep *Oculina varicosa* populations.

- Proposed Methodology: This objective is a subset of the population genetic analysis question, but specifically addresses how the shallow and deep *Oculina varicosa* populations are connected. This is particularly relevant to the question of repopulation of the deepwater habitat. If the source of new recruits is limited to the remaining deepwater populations, there is potential for genetic bottleneck or larval limitation because the source areas are so small. If the shallow reefs also provide new recruits to the deepwater habitats, the probability of recolonization would be increased. High resolution circulation models with embedded particle tracking individual based models, developed within Southeast Atlantic Coastal Ocean Observing System / Integrated Ocean Observing System and/or National Science Foundation Ocean Research Interactive Observatory Networks can provide dispersal kernels for the study site. The dispersal kernels would account for seasonal and behavioral components.
- Deliverables and timing: 1-2 years
- Opportunities: Competitive funding sources. The Florida Fish and Wildlife Commission's artificial reef program is interested in deploying artificial structures in and around *Oculina* Experimental Closed Area to help promote re-colonization of *Oculina* coral and deter trawl gear.

Objective 3: Biogeography

- Proposed Methodology: The geographic boundaries of species within the Oculinidae are not currently well defined. A molecular investigation will help clarify the boundaries and geographic overlap of species within the Oculinidae, and provide insight into ecological and functional controls on their distribution.
- Deliverables and timing: 1-2 years
- Opportunities: Competitive funding sources. Build on information provided in Reed (2004) and National Oceanic and Atmospheric Administration State of Cold Water Corals Report (in prep. 2005).

IV. What are the stressors affecting the *Oculina* Experimental Closed Area?

It is well known that coastal pollution is a common problem in most areas of the US. Shallow water habitats are therefore potentially impacted by many stressors, including effluent from sewage outfalls, runoff of nutrients and pesticides from farms and urban areas that enter estuaries and eventually pass out inlets, sedimentation from beach "renourishment" or from dredging channels. The *Oculina* Banks are 16-30 miles offshore and are therefore less susceptible to direct influence from runoff than shallow water reefs; however, the Florida bedrock is very porous and pollution may reach the offshore marine environments via subterranean aquifers with similar detrimental results. The most obvious anthropogenic stressor to the deepwater *Oculina* habitat is physical impact from destructive fishing practices; however there are several areas of dead coral that are physically intact. Possible causes of this mortality include localized influx of freshwater or pollutants, prolonged coldwater upwelling events, benthic storms that may cause heavy sedimentation and smother corals, and disease. .It is important to identify sources and evaluate impacts from such stressors. The synergistic effect of anthropogenic and

non-anthropogenic stressors should also be evaluated since the effects of these stressors are not independent. For example, water quality can affect susceptibility of corals to various pathogens. This work could be supported by National Oceanic and Atmospheric Administration's Coral Initiative and would require several years for completion.

Objective 1: Identify natural and anthropogenic stressors (i.e., disease, gear impacts, poaching, enforcement). The approaches to this objective would be interdisciplinary and complicated. Water quality would be an important factor and would include nutrient content, suspended sediments, salinity, dissolved oxygen, temperature, and toxicant content. Another factor would be location of the coral colonies; evidence indicates that habitat quality is not uniform within the *Oculina* Experimental Closed Area. In concert with suspected stressors, the tolerance limits of the coral to various stressors must be evaluated.

- Proposed Methodology: Natural stressors may occur chronically at low levels (e.g. nutrient or pollutant seepage through subterranean aquifers), or as intensive shorter term events such as upwellings or benthic storms that occur sporadically. Long term data collection is necessary to identify sporadic events and to monitor spatial and temporal changes in water quality. A series of data collection stations would be an appropriate approach for this project. The stations would be equipped with an array of sensors (e.g., current, temperature, salinity, turbidity, oxygen and nutrients) with information either logged for later retrieval or transmitted to the surface for real-time data recovery via satellite. The first approach would require technical divers or Remote Observing Vehicle/Submersible time to periodically recover the data over multiple years. Ideally, time lapse cameras would be attached to the station to record both short term and long term response of the coral community to changes in the environment.
- Deliverables and timing: 6 months – 5 years. Information on water quality and coral pathogens would be the dominant deliverables from this work. Because of the difficulty and complexity of this work it would take at least 10 years to complete.
- Opportunities: National Oceanic and Atmospheric Administration's Coral Initiative and partnering with Environmental Protection Agency shallow coral program; Mote Marine Laboratory expertise.

Objective 2: Determine the frequency and severity of sedimentation induced by benthic storms.

- Proposed Methodology: This can be approached using a series of sediment traps deployed at various locations throughout the *Oculina* Experimental Closed Area or with the data logging turbidity sensors described in Objective 1. Either approach would require technical divers or Remote Observing Vehicle/Submersible time to periodically deploy and recover the equipment/information over multiple years. There is a need to have an Ocean Observing System in place to assess particle loads and transport mechanisms in a continuous manner and be able to capture the events when the occur; visual/video observations (including time-lapse from Ocean Observing System) of bed-forms; model to predict events and impacts.
- Deliverables and timing: 6 months – 5 Years. Part of long-term observing system (5-10 years to models).
- Opportunities: The Southeast Atlantic Coastal Ocean Observing System partners with specific expertise include The Coastal Ocean Research and Monitoring Program (North Carolina), Carolinas Coastal Ocean Observing and Prediction System (North Carolina and South Carolina).

Objective 3: Identify physiological tolerances of the coral to environmental stressors.

- Proposed Methodology: This question should be approached in two ways. Coral health in the field should be correlated with time-series data on environmental parameters and physiological tolerance to factors such as temperature, salinity, sedimentation, pollutants etc should be assessed experimentally in the laboratory. The former long term approach requires a series of sensors to measure relevant environmental factors (as described in Objective 1), and although the second may not replicate natural conditions it is a tractable approach with fast results and may be used to interpret long term field observations.
- Deliverables and timing: 6 months – 5 years
- Opportunities: Harbor Branch Oceanographic Institute

V. What are the key trophodynamic functional groups?

Trophic interactions including pelagic-benthic coupling is relatively unknown within the *Oculina* ecosystem. Studies on the trophic structure of coral-associated communities of mollusks and decapod crustaceans have shown a dynamic and diverse ecosystem (Reed et al. 1982; Reed and Mikkelsen, 1987; Reed 2002; George at al. in prep). This research should elucidate the functional importance of various fish species, such as antheids, serranids and pomacentrids which are numerically dominant within the intact coral habitat. This work would require several years to complete and might be supported by National Sea Grant or by National Science Foundation.

Objective 1: Identify food web structure and dynamics.

- Proposed Methodology: The classical approach to trophic studies is to capture fish and determine species and quantity of items comprising the stomach contents. Stomach content data provide a snap-shot of the diet of a species, so analyses must be done seasonally. An additional approach that integrates diet over time requires the analysis of stable isotopes in the tissues of the fish. Naturally occurring isotopic concentrations in various fish tissues identify sources of dietary components (e.g., from the plankton, or benthic sources) provided there is a good understanding of the isotopic signatures of various potential food sources. Thus, the proposed methods would include both stomach content analysis and isotope analysis to piece together the trophic interactions of the *Oculina* ecosystem. This work would require capture of fishes within the *Oculina* Experimental Closed Area, most likely diver or hook and line capture. Divers would be more effective due to pin point accuracy of capture site. It would be useful for comparison purposes to also capture fish outside the *Oculina* Experimental Closed Area. It has been established based on tag information (G. Gilmore, personal communication) that the grouper and large predator population of the *Oculina* Experimental Closed Area migrate considerable distances out of the Closed Area, in some cases hundreds of miles. Therefore, isotopic analyses might be complex and potentially reflect trophic conditions over a broad area. To avoid this, it would be prudent to focus on fish that are likely to spend their entire life cycle within the *Oculina* Experimental Closed Area such as the anthines and damselfish. Others to consider would be *Diplectrum sp.*, *Centropristes spp.*, *Plectranthias*, as these are often more common that damselfish and are intimately associated with the benthic *Oculina* community. Anthiine fishes are feeding on planktonic communities which may have exogenous food sources extralimital to the *Oculina* Experimental Closed Area and thus may not show *Oculina* based food source, but represent a means by which the *Oculina* community is importing energy from ocean currents and associated planktonic communities.
- Deliverables and timing: This work will provide important functional details of the trophic dynamics of this coral reef system. The work will take from 2 to 4 years to complete.
- Opportunities: The important field component of this work is capturing fish and invertebrates; the remainder is lab work; therefore, for efficiency the field component should be combined with other studies. Harbor Branch Oceanographic Institute.

VI. Develop index of physical and chemical parameters that characterize a healthy *Oculina* coral ecosystem.

Objective 1: Develop index for coral health (including structural damage, recruitment, genetics, physiology, life history).

- Proposed Methodology: Develop comprehensive index that is sensitive to benthic biological changes in such things as water quality parameters, ratio of live/dead coral, associated fish populations.
    1) Percent-cover analyses:

a) fixed transects: Remote Observing Vehicle, Autonomous Underwater Vehicle, manned subs, photography (video, still), acoustics (passive and active, high resolution sonar)), fluorescent pigment monitoring, CSTD*, dissolved oxygen*, pH*, nutrient sensors*, chemical sensors*, physical parameters, passive acoustics)

b) point sites: sensors include photography (video, still), and active (high resolution sonar), fluorescent pigment monitoring, CSTD, dissolved oxygen, pH, nutrient sensors, chemical sensors.

2) Fluorescent pigment monitoring for physiological condition.

3) Deploy recruitment substrates (deep-water settlement plates).

4) Collect coral samples for biomarker, physiological and genetic studies

5) Need index for community health for entire biota including coral (biodiversity, richness, biocomplexity).

6) Retrieval and maintenance of samples and equipment.

*these parameters should be collected in real-time.

- Deliverables and timing:

Timing - Within 3 years:

1. Establish transects:
   a) healthy coral reef – protected and non-protected,
   b) historical sites,
   c) protected rubble zones,
   d) open-sand-shell-mud bottoms.
2. Establish fixed sites, based on historic sites where dives have occurred.
3. Integrate latest technology (sensors, maps)
4. Develop sampling system (coring, suction, injectors, tagging)
5. Tele-communication systems from in situ sensors to monitor water quality and physical parameters.

Deliverables - Within 3 years:

1. Baseline data pertaining to community composition, species richness, biodiversity, and percent coral cover.
2. Population dynamics of selected finfish.

Timing - Within 10 years:

Expand transects as new technology and knowledge becomes available (e.g., map is developed)

Deliverables - Within 10 years:

Recognize patterns and trends in baseline data parameters.

- Opportunities:

1. Department of Homeland Security (John Cook) – acoustic array that would pick up intruders
2. National Oceanic and Atmospheric Administration (including Oceans U.S.)
3. Southeast Atlantic Coastal Ocean Observing System (Navy)
4. United States Geological Survey
5. Smithsonian
6. National Space Administration
7. Air Force (tie in with marine safety)

8. Florida Space Authority
9. Regional universities
10. State of Florida
11. Marine Fishery Independent Monitoring Program
12. Southeast Area Monitoring and Assessment Program
13. Private industry
14. Recreational/sportfishing interests.

Objective 2: Develop index of community health for entire biota including coral (biodiversity, richness, biocomplexity).

- Proposed Methodology: see proposed methodology for Objective 1
- Deliverables and timing: see deliverables and timing for Objective 1
- Opportunities: see Opportunities for Objective 1

Objective 3: Determine indicator species that are intimately tied with *Oculina* (invertebrates or vertebrates).

- Proposed Methodology: see proposed methodology for Objective 1. Consider these specific species that may have intimate association with coral structure: Rock shrimp, and *Plectranthias garrupellus* (a small bass, not commercially or recreationally targeted but lives in coral heads).
- Deliverables and timing: see deliverables and timing for Objective 1
- Opportunities: see Opportunities for Objective 1

Objective 4: What is the age of the coral substrate, and geological formations (last 15,000 years) (Death rates)? Also look at associated mollusks and other biota and their changes.

- Proposed Methodology: Obtain cores from selected areas.
- Deliverables and timing: Deliverables in 3 years: Age of coral and community, historic community composition.
- Opportunities:
  1. National Oceanic and Atmospheric Administration
  2. United States Geological Survey
  3. Smithsonian
  4. Regional universities
  5. State of Florida
  6. Southeast Area Monitoring and Assessment Program
  7. Private industry

Objective 5: Are paleo-data (age) associated with past climate and oceanographic conditions?

- Proposed Methodology: Addressed in Methods for Objective 1. Combine with existing data from elsewhere.
- Deliverables and timing: Deliverables in 3 years: Historic trends in some physical parameters such as temperature, salinity/pH
- Opportunities: see opportunities for Objective 1.

Objective 6: Are there other paleo-data from elsewhere in the world that will give perspective on *Oculina* growth? (ice cores, deep-water sediment cores)?

- Proposed Methodology: See proposed methodology for Objective 1. Combine with existing data from elsewhere.
- Deliverables and timing: See Deliverables and Timing for Objective 2.
- Opportunities: see opportunities for Objective 1.

VII. Conduct research on coral feeding ecology

- Proposed Methodology: As with the trophic studies on motile animals, the same methods can be used on corals and other sessile animals. If coral pieces are quickly preserved upon capture the content of the stomachs can be evaluated for size and type of plankton. And isotopic analysis can be done on coral tissues. Quantitative plankton sampling should be done in areas where coral survival is high, medium, and poor to evaluate the availability of food to the coral and to help define the factors contributing to habitat quality for the coral.
- Deliverables and timing: This work will provide information on particle size selection and type by the coral and it will also provide information on habitat suitability in terms of availability of food types.
- Opportunities: Samples of coral and quantitative plankton samples are best collected by National Undersea Research Center trimix divers. This work should be done in concert with Objective 1C, the study that identifies good and poor habitat for the coral.

4.3 Assessment Components

The following objectives and projects represent a comprehensive approach for addressing each goal. Projects are listed in general priority order based on preliminary input from researchers at the Deepwater Coral Research and Monitoring Workshop held in Cape Canaveral, Florida in August, 2004.

I. What is the effect of management measures in the *Oculina* Experimental Closed Area on the status of fishery stocks?

Objective 1: Characterize (including distribution and abundance patterns, size and age distribution, spawning aggregation presence, sex ratios, etc.) major fishery species within the *Oculina* Experimental Closed Area compared to reference sites.

- Proposed Methodology: Use transect and stationary point surveys with in situ visual/acoustic (sonar & hydrophones) surveys (submarine, Remote Observing Vehicle/Autonomous Underwater Vehicle, technical diving, remote observatory) to coincide with the timeframe for habitat characterization.
- Deliverables and timing: Three-year summary report to include fish density, size, age data. Data to be included in South Atlantic Fishery Management Council's Internet Mapping System and Coral Reef Information System and peer-reviewed publications, to include comparisons to reference sites.
- Opportunities: National Oceanic and Atmospheric Administration Coral Reef Conservation Program, Marine Fisheries Initiative, Marine Resources Monitoring, Assessment, and Prediction Program, Southeast Area Monitoring and Assessment Program, University partners, Fisheries participants: National Science Foundation; United States Geological Survey; State laboratories.

Objective 2: Characterize fish communities, inside and out, including habitat utilization patterns, trophic interactions, ontogenetic changes, predator-prey relationships, etc.

- Proposed Methodology: BACI design at permanent transects to be revisited bi-annually to coincide with important biological events (spawning aggregations). Some consideration must be given to the value of extractive sampling (e.g. sex and age); isotope studies.
- Deliverables and timing: See Deliverables and Timing for Objective 1.
- Opportunities: See Opportunities for Objective 1.

Objective 3: Connectivity to the broader seascape (larval sources and sinks, spill-over effects).

- Proposed Methodology: Otolith microchemistry, mathematical models, genetic markers, tagging studies
- Deliverables and timing: See Deliverables and Timing for Objective 1.
- Opportunities: See Opportunities for Objective 1.

II. What and where are the major habitat types in the *Oculina* Experimental Closed Area, the *Oculina* Bank Habitat Area of Particular Concern and adjacent hardbottom areas?

Objective 1: Complete high definition bathymetric mapping (1) within the *Oculina* Experimental Closed Area, (2) coral areas adjacent to the Habitat Area of Particular Concern, (3) within the Habitat Area of Particular Concern within coral zone 50-100 m., (4) soft bottom habitat east of the coral zone within the Habitat Area of Particular Concern and (5) suspected and known hard coral areas north and south of the Habitat Area of Particular Concern, specifically from Cape Canaveral to the north and from St. Lucie mound and Jupiter Inlet to the south.

- Proposed Methodology:
  1) Resample the 2002 multi-beam data at 1 m resolution
  2) New data collection and processing using multi-beam echo-sounder with backscatter to complete mapping of the priority areas
- Deliverables and timing: First 3 priority areas to be completed within 1 year; areas 4 and 5 to be completed within 3 years
- Opportunities: National Oceanic and Atmospheric Administration Ocean Exploration Program, National Oceanic and Atmospheric Administration Coral Reef Conservation Program, National Oceanic and Atmospheric Administration National Undersea Research Center at University of North Carolina at Wilmington, National Space Administration United Space Alliance support ships, Office of Naval Research, National Oceanic and Atmospheric Administration Protected Resources Division

Objective 2: Complete habitat characterization (1) within the *Oculina* Experimental Closed Area, (2) coral areas adjacent to the Habitat Area of Particular Concern, (3) in the Habitat Area of Particular Concern within coral zone 50-100 m., (4) soft bottom habitat east of the coral zone within the Habitat Area of Particular Concern and (5) suspected and known hard coral areas north and south of the Habitat Area of Particular Concern, specifically from Cape Canaveral to the north and from St. Lucie mound and Jupiter Inlet to the south.

- Proposed Methodology: Submersible and Remote Observing Vehicle video and photographic transects to ground-truth MBES acoustic map
- Deliverables and timing: Habitat maps within 3 years for areas 1-5.
- Opportunities: See Opportunities for Objective 1.

III. What are the magnitude and causes of changes in habitat structure and functionality over time?

Objective 1: Determine causes and timing of coral death.

- Proposed Methodology: Dating with isotopic analysis using high resolution isotopes to identify recent mortality events. Isotopic analysis of core samples to provide information on cycles of coral reef development and senescence. Mathematical models.
- Deliverables and timing: Long-term 5-10 years.
- Opportunities: Minerals Management Service

Objective 2: Origin and functional characterization of rubble zone.

- Proposed Methodology: Analyze video transects to identify components of macrofaunal (fish and invertebrate) community associated with rubble substrate. Take samples of rubble for identification of infaunal and meiofaunal community. Geological analysis of rubble substrate; i.e. identify percentage composition of different rubble components (live/dead coral, shell hash, limestone cobbles, sediment etc)
- Deliverables and timing: Long-term 5-10 years.
- Opportunities: Minerals Management Service, Florida State University

IV. How do oceanographic conditions and episodic events affect production, coral condition, reproduction and growth?

Objective 1: Quantify the extent, intensity and frequency of episodic events (upwelling, storms, etc).

- Proposed Methodology: In situ oceanographic observing systems
- Deliverables and timing: Long-term 5-10 years.
- Opportunities: Southeast Atlantic Coastal Ocean Observing System, National Oceanic and Atmospheric Administration, National Space Administration, Environmental Protection Agency

Objective 2: Assess the impact of episodic events (upwelling, storms, etc).

- Proposed Methodology: Impact of episodic events may be difficult to characterize since there could be a delay between the event and the discernable impact on the coral community. Events such as upwelling may produce immediate visible effects on organisms since temperature drop may cause torpidity, but to identify cause and effect, there must be a mechanism for rapid response to the event. The deployment of data collection stations with time lapse still or video imaging would be the most effective method of approaching this objective.

- Deliverables and timing:
- Opportunities: Southeast Atlantic Coastal Ocean Observing System, National Oceanic and Atmospheric Administration, National Space Administration, Environmental Protection Agency.

Objective 3: Optimize design of restoration efforts.

- Proposed Methodology: Refine methodology from restoration modules and Reefballs deployed between 1996 and 2001. These structures were deployed in replicated experimental configurations and analysis of coral and fish recruitment will provide information on the most effective restoration configuration for large scale efforts.
- Deliverables and timing: 3-5 years.
- Opportunities: Southeast Atlantic Coastal Ocean Observing System, National Oceanic and Atmospheric Administration, National Space Administration, Environmental Protection Agency, Florida State University.

Objective 4: Characterize impacts from anthropogenic sources of pollution (nutrients/sedimentation).

- Proposed Methodology: We currently have no information on status of nutrients/pollutants on the *Oculina* Banks. Nutrient sensors on the data collection stations will show changes in nutrient levels. Pollutants are difficult to monitor continuously, but when real time nutrient spikes are observed, water samples could be collected (using niskin bottles deployed from an inexpensive vessel) and tested for specific pollutants. This assumes that mechanisms of transport of anthropogenic nutrients and pollutants are the same.
- Deliverables and timing: 3-5 years.
- Opportunities: Southeast Atlantic Coastal Ocean Observing System, National Oceanic and Atmospheric Administration, National Space Administration, Environmental Protection Agency.

Table 2. Research and Monitoring planning table

	Cost	2004/ 2005	2005/ 2006	**2006/ 2007**	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	**2013/ 2014**
1. Develop a research, monitoring and evaluation component for the *Oculina* Evaluation Plan	Staff time	X									

Table 2. Research and Monitoring planning table (cont.)

	Cost	2004/ 2005	2005/ 2006	**2006/ 2007**	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	**2013/ 2014**
1. Will *Oculina* thicket habitat recover throughout the *Oculina* Experimental Closed Area without human intervention? What time frame will be needed for significant recovery? Will it be necessary to introduce artificial substrate to serve as an initial settlement surface? (TO BE COMPLETED BY YEAR 3)	$25-50K per year if using ROV			X							
Objective 1: Identify coral/fish recruitment pathways and compare settlement, growth, and survival rates on artificial substrate relative to settlement, growth, and survival rates on nearby unconsolidated coral rubble.			X---	X							
Objective 2: Model biophysical, chemical, and physiological characters. Previous studies have shown the benthic environment of the *Oculina* reefs to be very dynamic and widely fluctuating due to upwelling events and meandering of the Florida Current.			X---	X							
2. Determine and monitor the effect of the *Oculina* Experimental Closed Area on fish distribution and status? (TO BE COMPLETED BY YEAR 10)	$143K per year										X
Objective 1: Assess spawning aggregations of fishery species.			X			X					X
Objective 2: Track fish movement			X				X				X
Objective 3: Identify *Oculina* Experimental Closed Area fish population demographics											X

Table 2. Research and Monitoring planning table (cont.)

	Cost	2004/ 2005	2005/ 2006	**2006/ 2007**	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	**2013/ 2014**
Objective 4: Determine pre-closure distribution of dominant harvested species in and outside the reserve areas, in order to provide historical context for subsequent assessments. Review landings; spill over effects (i.e., identify benthic and juvenile pathways, upwelling events, spill-over between deep and shallow reefs)	TBD										X
Objective 5: Determine age distribution, nursery grounds, migratory patterns, and mortality rates for dominant harvested fish stocks.	$50K per year					X---	-----	-----	-----	-----	--X
3. What is the population structure of corals? (TO BE COMPLETED BY YEAR 10)	TBD										
Objective 1: Research population genetics of *Oculina varicosa*			X---	-----	-----	---X					
Objective 2: Identify cross-shelf relationships between shallow and deep *Oculina varicosa* populations.	TBD					X---	-----	-----	-----	-----	--X
Objective 3: Biogeography	TBD		X---	-----	-----	-----	-----	-----	-----	-----	--X
4. What are the stressors affecting the *Oculina* Experimental Closed Area? (TO BE COMPLETED BY YEAR 10)											X
Objective 1: Identify natural and anthropogenic stressors (i.e., disease, gear impacts, poaching, enforcement)	TBD		X			X					X
Objective 2: Determine the frequency and severity of sedimentation induced by benthic storms.	TBD										X
Objective 3: Identify physiological tolerances of the coral to environmental stressors	TBD					X					

Table 2. Research and Monitoring planning table (cont.)

	Cost	2004/ 2005	2005/ 2006	**2006/ 2007**	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	**2013/ 2014**
5. What are the key trophodynamic functional groups? (TO BE COMPLETED BY YEAR 5)			X---	-----	-----	---X					
Objective 1: Identify food web structure and dynamics	$80K		X---	-----	-----	---X					
6. Develop index of physical and chemical parameters that characterize a healthy *Oculina* coral ecosystem. (TO BE COMPLETED BY YEAR 10)											X
Objective 1: Develop index for coral health (including structural damage, recruitment, genetics, physiology, life history)	$20K										X
Objective 2: Develop index of community health for entire biota incl. coral (biodiversity, richness, biocomplexity).	$20K					X					
Objective 3: Determine indicator species that are intimately tied with *Oculina* (invertebrates or vertebrates)	$10K		X---	---X							
Objective 4: What is the age of the coral substrate, and geological formations (last 15,000 years) (Death rates)? Also look at associated mollusks and other biota and their changes.	$25K				X						
Objective 5: Are paleo-data (age) associated with past climate and oceanographic conditions?	$15K						X				
Objective 6: Are there other paleo-data from elsewhere in the world that will give perspective on *Oculina* growth? (ice cores, deep-water sediment cores)?	$10K								X		

Table 2. Research and Monitoring planning table (cont.)

	Cost	2004/ 2005	2005/ 2006	**2006/ 2007**	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	**2013/ 2014**
7. Conduct research on coral feeding ecology (TO BE COMPLETED BY YEAR 10)	$20K per year					X					X
Objective 1: Define feeding dynamics											

Table 3. Assessment planning table

	Cost	2004/ 2005	2005/ 2006	**2006/ 2007**	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	**2013/ 2014**
1. What is the effect of management measures in the *Oculina* Experimental Closed Area on the status of fishery stocks? (HIGHEST PRIORITY TO BE COMPLETED BY YEAR 10)	$300K										X
Objective 1: Characterize (including distribution and abundance patterns, size and age distribution, spawning aggregation presence, sex ratios, etc) major fishery species within the *Oculina* Experimental Closed Area compared to reference sites.			X			X					X
Objective 2: Characterize fish communities, inside and out, including habitat utilization patterns, trophic interactions, ontogenetic changes, predator-prey relationships, etc.			X				X				X
Objective 3: Connectivity to the broader seascape (larval sources and sinks, spill-over effects)	$150K										X

Table 3. Assessment planning table

	Cost	2004/ 2005	2005/ 2006	**2006/ 2007**	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	**2013/ 2014**
2. What and where are the major habitat types in the *Oculina* Experimental Closed Area, the *Oculina* Bank Habitat Area of Particular Concern and adjacent hardbottom areas? (HIGHEST PRIORITY TO BE COMPLETED BY YEAR 3)											
Objective 1: Complete high definition bathymetric mapping 1) within the *Oculina* Experimental Closed Area; 2) coral areas adjacent to the Habitat Area of Particular Concern; 3) in Habitat Area of Particular Concern within coral zone 50-100 m; 4) soft bottom habitat east of the coral zone within the Habitat Area of Particular Concern and 5) suspected and known hard coral areas north and south of the Habitat Area of Particular Concern, specifically from Cape Canaveral to the north and from St. Lucie mound and Jupiter Inlet to the south	$300K-75K year 1, 125K year 2, 100K year 3		X (#1)	X (#3 & #4)	X (#2 & #5)						
Objective 2: Complete habitat characterization 1) within the *Oculina* Experimental Closed Area; 2) coral areas adjacent to the Habitat Area of Particular Concern; 3) in Habitat Area of Particular Concern within coral zone 50-100 m; 4) soft bottom habitat east of the coral zone within the Habitat Area of Particular Concern and 5) suspected and known hard coral areas north and south of the Habitat Area of Particular Concern, specifically from Cape Canaveral to the north and from St. Lucie mound and Jupiter Inlet to the south	Same as above		Same as above	Same as above	Same as above						

Table 3. Assessment planning table

	Cost	2004/ 2005	2005/ 2006	**2006/ 2007**	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	**2013/ 2014**
3. What are the magnitude and causes of changes in habitat structure and functionality over time? (TO BE COMPLETED BY YEAR 3)				X							
Objective 1: Determine causes and timing of coral death	$20K			X							
Objective 2: Origin and functional characterization of rubble zone	Cost associated with overall habitat charact. above			X							
4. How do oceanographic conditions and episodic events affect production, coral condition, reproduction and growth? (TO BE COMPLETED BY YEAR 10)	Cost associated with dev. of OOS capabilities										
Objective 1: Quantify the extent, intensity and frequency of episodic events (upwelling, storms, etc)								X			
Objective 2: Assess the impact of episodic events (upwelling, storms, etc)					X						
Objective 3: Optimize design of restoration efforts			X					X			
Objective 4: Characterize impacts from anthropogenic sources of pollution (nutrients/sedimentation)										X	

5.0 Future Action and the *Oculina* Evaluation Team

5.1 Future Action

While considering extending the regulations that prohibit fishing for or retention of species in the snapper grouper fishery management plan, the Council heard many reservations and misgivings from local constituents about continuing such regulations. There was some question and discussion as to the value in continuing to restrict fishing in areas where the *Oculina* coral had been reduced to rubble. At the time the Council took action they felt they lacked the scientific basis at that time for changing the boundaries of the *Oculina* Experimental Closed Area to encompass only those areas where healthy, intact coral stood. In an effort to show the public that the Council intends to do a better job of managing the closed area they committed to review the size and configuration of the *Oculina* Experimental Closed Area within three years of the publication date of the final rule (by March 26, 2007).

The Council also decided that all measures applicable to the *Oculina* Experimental Closed Area will be will be re-evaluated after 10 years (2014). In the span of the ten year time frame the Council feels it will have the scientific information necessary to determine whether the *Oculina* Experimental Closed Area is successfully meeting its purpose to provide continued protection of snapper grouper species and associated *Oculina* coral and whether that protection is still necessary.

5.2 *Oculina* Evaluation Team

Public perception is often that closed areas are created and then left un-enforced, un-monitored and un-questioned. Clearly the Council intends to change this perception by reviewing and re-evaluating the measures in place within the closed area as outlined in this Evaluation Plan. As an additional way to gain public confidence the Council has created an *Oculina* Evaluation Team. The purpose is to bring together a group of individuals knowledgeable about the *Oculina* Experimental Closed Area who will be presented with and review the most recent information on the effectiveness of the closed area. This group will make recommendations to the Council anytime during the fishery management process but especially before the Council takes significant action concerning the closed area (i.e., before the 3 year and 10 year re-evaluation periods).

The Evaluation team will meet as necessary. This team will have representatives from the following groups who are knowledgeable of the *Oculina* Experimental Closed Area:

- Law Enforcement
- Research scientists
- Commercial fishermen
- Recreational fishermen
- Outreach experts
- Non-governmental Organizations
- Council staff

A report, written by the team, will be presented to all relevant Advisory Panels (Habitat, Coral, Snapper Grouper, Information and Education, Law Enforcement, and Marine Protected Areas Advisory Panels) and the Council's Scientific and Statistical Committee. Those groups will be asked to forward their recommendation to the Council.

Timing

The Evaluation Team will deliver its first report to the Council by the **March 2007** Council meeting in order for the Council to make its determination on whether or not it is necessary to change the size and configuration of the Closed Area. The Team will submit its second report by **March 2014** in order for the Council to re-evaluate all regulations within *Oculina* Experimental Closed Area.

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Appendix A

Project Report
Oculina Habitat Area of Particular Concern Outreach Program
Public Information Meetings, June 27-30, 2004
Fort Pierce and Cape Canaveral, FL

PROJECT OVERVIEW

An outreach strategy is being developed for the *Oculina* Bank area through cooperative efforts between NOAA Fisheries, NOAA National Undersea Research Center at the University of North Carolina-Wilmington (NURC/UNCW), the South Atlantic Fishery Management Council (Council), Harbor Branch Oceanographic Institution, and other partners. The area includes the *Oculina* coral reef, a 90-mile strip of reefs off the central East Coast of Florida. This effort is part of a larger outreach project to raise public awareness, support, and conservation for deepwater corals found throughout the South Atlantic region.

Meetings with local constituents were held in June 2004 to help identify resource issues and receive stakeholder input towards the strategic development of outreach method and materials for the *Oculina* HAPC and Experimental Closed Area. This report provides an overview of the meetings, summary recommendations from area constituents, and a listing of meeting participants. Information received from these meetings will form the basis for future outreach efforts and will be incorporated into a comprehensive strategic plan for the *Oculina* HAPC and the *Oculina* Experimental Closed Area.

Three types of meetings were held over four days in two locations, Ft. Pierce and Cape Canaveral, FL:

1. *Canvas Meetings:* informal meetings with local businesses; objectives include discussions on information they currently have about OHAPC and the most effective means to reach their customers. Targets included marinas, boat ramps, bait and tackle shops, seafood dealers, processors, boat rental companies, charter fishing operations, and other local businesses and public offices;
2. *Planning Meetings:* to present and review OHAPC outreach plan with local scientists, managers, and outreach specialists; present input on OHAPC research and monitoring plan and long-term *Oculina* Outreach Plan; identify partnerships and opportunities;
3. *Local Constituent Forum:* information exchange and dinner for invited public participants including local fisherman and related businesses; presentations, followed by an open forum and input on proposed outreach plan. Meeting participants received information packets containing fact sheets, maps, an *Oculina* photo gallery CD, publications from the South Atlantic Fishery Management Council, and a summary of a draft *Oculina* outreach plan.

MEETING SCHEDULE/OVERVIEW

Monday June 28, 2004:
Location: Ft. Pierce

- **3:00 p.m. - 5:00 p.m.: Planning Meeting at Harbor Branch Oceanographic Institute**
  Presentations: Andy Shepard, NURC/UNCW—*Research, Monitoring and Outreach Plans for the OHAPC*; Jennifer Schull, NOAA/SEFSC—*NOAA Coral Initiatives and OHAPC Outreach Contract*; Kim Iverson, SAFMC—*Council Perspective on OHAPC and Preliminary Stakeholders Outreach Survey Results*

Meeting Summary:
Andy Shepard (NURC) provided an overview of past research and monitoring in the *Oculina* HAPC and Experimental Closed area and outlined future needs, including habitat mapping, mulit-disciplinary ecological research (i.e. rubble ecology, grouper biology, taxonomy, etc.), long-term monitoring and research, restoration and technology development. He explained that Roger Pugliese, Sr. Staff Biologist with the SAFMC will be coordinating research and monitoring efforts through future meetings to be held in 2004. Jennifer Schull (NOAA Fisheries) explained the initial funding source for outreach efforts currently underway and the possibility of future funds for implementing the education and outreach plan for the *Oculina* Bank and Deep Sea Corals. Kim Iverson (SAFMC) provided an overview of the Council's role in management of the *Oculina* HAPC and Experimental Closed Area, including Amendment 13A to the Snapper Grouper Fishery Management Plan that extended the Closed Area indefinitely. It was explained that the focus of these initial meetings regarding outreach, from the Council's

perspective, would focus on the need to increase awareness of the Closed Area and regulations affecting area fishermen.

- **6:30 p.m.- 8:30 p.m.: Local Constituent Forum – Radisson, Ft. Pierce**
  Presentations: John Reed, HBOI—*OHAPC Exploration and Research*; Richard Chesler, Special Agent, NOAA Fisheries—*OHAPC Enforcement Efforts*; Kim Iverson, SAFMC—*Council Perspective on OHAPC and New Outreach Efforts*.

Meeting Summary:
John Reed (HBOI) provided an overview of the location, life history and biodiversity of the coral, and importance of the *Oculina* Bank area as habitat. He also included a general description of past research and monitoring efforts and management. Richard Chesler (NOAA Law Enforcement) provided an overview of the size and configuration of the HAPC and Closed Area, management measures enacted by the Council for the area, current regulations, and the recent increase in law enforcement activity in the *Oculina* Bank area. Kim Iverson (SAFMC) explained the need for the constituent meetings regarding the development of an outreach strategy and solicited input from participants.

Tuesday, June 29, 2004:
Travel from Ft. Pierce to Port Canaveral – canvas meetings

Location: Port Canaveral

- **3:00 p.m.-5:00 p.m.: Planning Meeting at Florida Space Port Authority**

Presentations: Andy Shepard, NURC/UNCW—*Research, Monitoring and Outreach Plans for the OHAPC*; Jennifer Schull, NOAA/SEFSC—*NOAA Coral Initiatives and OHAPC Outreach Contract*; Kim Iverson, SAFMC—*Council Perspective on OHAPC,* Chris Combs, FL Sea Grant Extension - *Preliminary Stakeholders Outreach Survey Results*

Meeting Summary:
Andy Shepard, Kim Iverson, Jennifer Schull, Mac Currin, Chris Combs and Richard Chesler attended a meeting at the Florida Spaceport Authority with U.S. Air Force and NASA representatives, FL Space Port Authority personnel, and other invited participants to discuss partnership opportunities with agencies to promote awareness of the *Oculina* Bank area. Presentations were made regarding past joint projects in acoustical monitoring with NASA, current activities regarding Homeland Security efforts including use of ROVs and sonar. Discussions included outreach efforts regarding port security and space shuttle launch information to fishermen. An overview of current outreach planning efforts was provided and participants were asked to provide recommendations.

Wednesday, June 30, 2004:
Location: Port Canaveral

Continue canvas meetings during the day.

- **6:30-8:30: Local Constituent Forum – Radisson, Port Canaveral**
  Presentations: Dr. Grant Gilmore, Estuarine, Coastal, and Ocean Science, Inc.—*OHAPC Exploration and Research*; Richard Chesler, Special Agent, NOAA Fisheries—*OHAPC Enforcement Efforts*; Kim Iverson, SAFMC—*Council Perspective on OHAPC and New Outreach Efforts*.

Meeting Summary:
Dr. Grant Gilmore (ECOS) presented an overview of research and monitoring for the *Oculina* HAPC, focusing on acoustical monitoring of fish species found in the area. Richard Chesler (NOAA Law Enforcement) provided an overview of the size and configuration of the HAPC and Closed Area, management measures enacted by the Council for the area, current regulations, and the recent increase in law enforcement activity in the *Oculina* Bank area. Chris Combs (FL Sea Grant) provided a brief explanation of the *Oculina* Awareness Survey currently being conducted and provided preliminary results. Kim Iverson (SAFMC) explained the need for the constituent meetings regarding the development of an outreach strategy and solicited input from participants.

- **Canvas Meetings – June 28 – June 30, 2004 - Ft. Pierce and Port Canaveral**

Summary:
Informal contacts were made with area fishermen, businesses, and others in both Ft. Pierce and the Port Canaveral area as part of this outreach initiative to collect stakeholder input. A wide variety of contacts were made during these canvassing efforts.

A visit was made to the Smithsonian Marine Station in Ft. Pierce to tour the facility and discuss possible future partnerships regarding their aquarium display and interpretive area for *Oculina* coral. Thousands of students come through this facility annually. Also, contact was made in Ft. Pierce with a new local banking business, the "*Oculina* Bank" regarding future outreach efforts. Bank executives expressed an interest in a possible local partnership to disseminate information. The bank currently donates $1.00 to Harbor Branch Oceanographic Institute for *Oculina* research for every new account opened there.

In addition to in-person contacts, public boat ramp facilities were visited from Ft. Pierce north to Port Canaveral and photos taken to document any current display kiosks or possible sites for additional interpretive information. A trip was made to the St. Lucie County Tax Office to photograph possible display opportunities as suggested during the constituent meeting in Ft. Pierce. Boat registration and fishing licenses are issued from the tax office. Contacts were also made at marinas, bait & tackle dealers, and fish processing facilities in Ft. Pierce and Port Canaveral. It should be noted that time constraints did not allow for canvassing of fishing related businesses between the two cities, included fishing communities associated with the Sebastian Inlet area.

While time did not allow visits to all suggested locations, networking provided additional contacts and sites for future visits. These include the following local organizations and locations:

Organizations:
CCA Florida
OFF – Organized Fishermen of Florida
The Conservation Alliance – an NGO in Ft. Pierce
Waterfront Council – NGO for port and coastal development
Ft. Pierce Chamber of Commerce
Cape Canaveral Chamber of Commerce

Boat ramps/marinas/businesses:
Stan Bum Memorial Boat Ramp
Little Jim Bait and Tackle
Inlet Seafood
Harbortown Marina
Yacht Club Boat Ramp
Main St. Boat Ramp and Pier
Fins Marina
Sebastian River Marina and Boat Yard

Summary of Recommendations Received From
***Oculina* HAPC/Experimental Closed Area Outreach Meetings, June 2004.**

The following is a summary listing of recommendations and comments received during outreach meetings held in the Ft. Pierce and Port Canaveral areas. While these are not listed in specific order of priority, a note is made after each comment designating if the suggestion was heard at more than one meeting.

P1 = Planning meeting – Harbor Branch
C1 = Constituent meeting – Ft. Pierce
P2 = Planning meeting – Port Canaveral
C2 = Constituent meeting – Port Canaveral
CA = Canvassing

Printed Materials

Provide **posters** with catchy slogan, before and after photos of healthy *Oculina* coral and impacts associated with fishing, map of area and restrictions. i.e., "Indian River Lagoon isn't the only valuable resource in your back yard." Place in marinas, bait & tackle stores, fish houses; Have a poster with informational brochures available. Post these at bait & tackle stores and fish houses. Use **rack cards** with posters to distribute information.
P1, C1, CA

Reprint **SAFMC regulations brochure** that includes *Oculina* information and distribute to all area law enforcement officers (FWC, USCG and NOAA); Reprint the SAFMC Regulations brochure. "These are very popular with fishermen." P1, C1, CA

Consolidate **regulations** into a **single-page handout**; Print regulations on waterproof paper or have laminated sheets. Reduce the information to be specific for targeted fishermen, i.e., recreational separate from commercial, with separate handout for *Oculina* area. C1, C2

Incorporate information about *Oculina* coral, the OHAPC, and the Experimental Closed Area in the Florida State Fishing Regulations brochure; **Piggyback information** about the area with the **FL State Recreational Regulations** brochure. P1, C1, C2, CA

Compile a **listing of all areas that are closed** or limited to fishing off the coast of Florida and distribute the listing as a single sheet with FL Fish & Wildlife Conservation Commission **mailings for all fishing permits and recreational licenses**. (note: if rack cards are printed specifically for *Oculina* area, they could be the same size as a legal envelope and include in mailing). P1, C1, C2, CA

Distribute the 2-sided *Oculina* **Fact Sheet** to law enforcement officers (including Capt. Thomas on the C.T. Randall patrol vessel) to distribute to fishermen. Have this available as a PDF on Council's web site. P1, C2

Print **a color brochure** with photos of *Oculina* coral, maps and restrictions with a simple explanation of the need to protect the resource. C2

Use stickers, magnets, koozies and other items to get message out and publicize web site. CA

Produce waterproof or **laminated cards for charter captains** to reference with maps, regulations, information, and photos of *Oculina* coral. Some captains may be willing to distribute to customers. CA

Provide the Sea Grant *Oculina* Awareness Survey to the Coast Guard Auxiliary for distribution. P1

(General suggestions for printed materials)

Provide loran numbers as well as Lat/Long coordinates. Most fishermen, both commercial and recreational, still reference loran numbers when discussing areas. Also, local fishermen refer to the area as the "cones". Make reference to local names when referencing "*Oculina*" in publications; Use the Loran (TD) numbers. Local fishermen reference those. "Everyone here (Port Canaveral) knows that you can't throw hooks past the Copper Wreck, 7431 and 8237." C-1, C2, CA

Need a standard general description of the area, including the HAPC and Closed Area to use rather that just the coordinates, i.e., "The *Oculina* HAPC extends 15 miles offshore from Ft. Pierce to Stuart, is approximately 10 miles wide, with the Experimental Closed Area reaching from …."; Keep the description of the area simple, i.e., "between Ft. Pierce and Sebastian Inlet, in 150-600 ft water depth." P1, C2

Media

Target **news articles that link recent interest in the Indian River Lagoon system** with *Oculina* habitat. Stress the interconnectivity between the Indian River Lagoon and *Oculina* as essential fish habitat; Spotlight a single species (e.g., gag grouper) and highlight link between Indian River Lagoon and *Oculina* Bank as part of EFH. P1, P2

Take advantage of all **newsworthy stories for media** distribution, including **research** (i.e., acquisition of new ROV/AUV for deepwater observations), **law enforcement** activities and **upcoming meetings**. Made note of the 2005 International Coral Symposium in Miami and the Gulf & Caribbean Fisheries Institute Meetings, where coral issues will be discussed. Highlight technology being used for research and monitoring including ROVs. Note: NASA recently partnered with NOAA to set up an ROV demonstration with the S.C. Aquarium that was very well received). P1, P2

Increase publicity related to law enforcement patrols and cases as they are made, e.g., post in local newspapers' crime sections. This would increase "word of mouth" awareness of increased activity and therefore an increase in compliance. Communication to media is key. Provide information directly and in a timely manner regarding law enforcement activity. "The best deterrents for enforcement is to get it in the news. We need to information now, not 6 months after a case has been made"; The law enforcement cases must be prosecuted and publicized. "It only takes one or two high profile cases to scare them out of there"; Advertise the Joint Law Enforcement Agreement between federal and state agencies as a way to emphasize the possible federal nature of violations (give violations "more teeth).
C1, C2, CA

Promote the **law enforcement** work of the *C.T. Randall* patrol vessel – highlight in "**special feature**" page of local newspaper (it was noted that reporter Joy Hill of Ocala produces a weekly report in her area). C2

Provide **video footage** and high-resolution **photos** to media for use with stories. P1, P2

Produce a professional **video program** (e.g., 12 min. Fast Focus program on *Oculina* Banks and acoustic research shown at meetings) and provide to **local governments**. "If people don't have empathy, there won't be compliance"; Produce **Public Service Announcements** and **short documentary** of OHAPC (e.g., Fast Focus program) for radio and TV outlets. Utilize local Space Coast TV Channel. C1, P2

Use local radio shows: LeRoy Creswell (Sea Grant) has a 1/2 hour Sunday morning show, in Stuart, FL there is an "Ocean Hour" weekly radio show. Also, Capt. Joe Wharten has a local fishing radio show (2 minutes on NPR), and "Snook Nook" a Jensen Beach radio and TV show. P1, CA

Use "**famous geeks**" to deliver the message. Involve high profile fishermen to do Public Service Announcement and/or other endorsements that other media may distribute. P1

Use "**talking heads**" for media – use quotes for printed media and identify key contacts for in person interviews. P2

Use "**letters to the editor**" to increase awareness of the unique habitat; link to recent interest and articles in local papers regarding threats to the Indian River Lagoon habitat. P1

Partner with NASA Public Affairs office to disseminate information regarding the *Oculina* HAPC through their established network of local media contacts. P2

Contact Florida Sportsman, Coastal Angler Magazine (Rodney Smith), and FL Spaceport Authority publications director to provide information for **feature articles** on *Oculina* coral as a unique habitat, research and monitoring efforts, and the fishing restrictions for the area. Note: the Port Authority publication has a recreational fishing section that would be suitable for this. C2

Web

Link to Florida Sportsman's Web site. Use the Florida Sportsman web site to post *Oculina* information directly on their web site. Utilize the "online community" to publicize law enforcement activity in the area. P1, C2

Communicate need and promote **establishment of a real-time oceanographic observing system** in the OHAPC with major observing programs in the region (e.g., NOAA COOPS, NDBC C-Man, Homeland Security, SEACOOS). P1,

Establish a **Web site** for information relevant to *Oculina* and deep sea corals. Using "*Oculina*.org" may not be effective because "*Oculina*" is not a readily identifiable word; include information useful to fishermen, i.e., real time weather, wind, wave, and current data. It was noted there is no buoy currently in the OHAPC to provide such information

(closest is C-Man station off Canaveral). Include a video. Received law enforcement support because if waves/wing/currents are too strong, fishermen won't go. P1, C1

Other

Use **kiosks at boat ramps**. These should have photos of coral, charted location of *Oculina* HAPC and Closed Area, and restrictions. Contact the Florida Inland Navigation District (LeRoy Creswell has contact information); Have information kiosks at all area boat ramps. "The Orlando crowd who trailer their boats is not aware of what is out here." P1, C1, C2, CA

Network with **fishing tournament** directors to provide information to tournament participants. For tournaments, provide 2-sided card with *Oculina* map and coordinates that could be distributed in tournament "goody bags";Prefer a waterproof card. Other ditty bag items might include *Oculina* CD or mug with OHAPC map and coral pics on it. P1, C1, C2,

Provide written information to local hotels during large tournament times to include in rooms where tournament fishermen have blocks of rooms reserved. Coordinate with tournament directors. CA

Contact **fishing map manufacturers** in order to have *Oculina* area more clearly marked in future publications/maps. (Homeport Charts and Top Spot Charts were two major distributors identified); Provide self-sticking notes to place on currently marketed fishing charts that would highlight fishing restrictions in *Oculina* HAPC and Closed Area, including coordinates. (Note: fishing charts being sold at local marinas and marine stores do not clearly define the area or restrictions). The self-sticking notes could be displayed in the racks next to the charts for sale. Cards should be index card size with removable backs; Make a self-stick, index-card size information card to use with waterproof fishing charts and NOAA charts. P1, C2, CA

Work with **electronics manufacturers** to show *Oculina* area restrictions on "Sea Card" and "Northstar" map data chips used for GPS navigation. (some cards show the area as a "fish haven"); Work with electronics manufacturers to clearly mark area on data cards for GPS use. C1, C2.

Target children and school groups – use visual aids. "Local people have a tendency to take for granted what they've grown up with."; Campaign to kids – i.e., science contests, poster contests, ties to rock shrimp fishery with a trip to Dixie Crossroads Restaurant, etc.; Incorporate school children into outreach efforts. Emphasize the history of the *Oculina* Bank area and the uniqueness. C1, P2, C2

Develop **portable display** for use at, for example, meetings, trade shows, tournaments or festivals, i.e., Space Coast Wildlife Festival. Include variety of handout materials. P2, C2

Increase fines and penalties for violators of regulations in the *Oculina* Bank area; Increase the fines for those fishermen who are caught in the area. Tie the violations to the boat captain. Recreational fishermen who are repeat violators should have their vessels seized. [Note: The Council does not have jurisdiction for law enforcement activities or penalty schedules. The Council has requested repeatedly that the maximum penalty be applied for violations occurring in the *Oculina* Experimental Closed Area.] C1, CA

Incorporate **local governments** in outreach efforts. Local governments are starting to realize the economic importance of the recreational and tournament fishermen. Create a cooperative program with local governments. Local government representatives in attendance pledged their support for these endeavors. C1

Place any handout materials concerning *Oculina* at the St. Lucie **County Tax Office** (public fishing licenses and boat registrations are handled at the this office, rack brochures are distributed there.) C1

Work closely with the new **Smithsonian Marine Station** to further develop the *Oculina* display at facility (Note: they currently have a small aquarium display with live *Oculina* coral). Develop traveling exhibit for use in other informal science centers. C1

Conduct an **advertising contest** for *Oculina* promotion – possibly through schools. (FL Today Newspaper holds an annual contest and the products are used for promotional materials with good results). P2

FL Spaceport Authority has submitted a **National Science Foundation proposal** for "non-traditional" marine research and this could be tied to *Oculina* outreach. Conduct related education activities at Space Coast Birding and Wildlife Festival held in November. P2

Use local tourism and cruise ship industry to increase awareness. Explore possible underwater excursions to *Oculina* Bank area. P2

Partner with **Homeland Security** (referenced new port security laws) measures for better monitoring, enforcement, and subsequent awareness of area. CA

Incorporate information about *Oculina* in the **Port Canaveral Charter Captain's Association brochure**. Over 20,000 copies distributed by the Port Authority and the Tourism Council to area hotels, restaurants from Sebastian north to Daytona and the Orlando area. (Note: An effort to incorporate this information into the next reprinting is underway and, with permission from the Association, will be included in the reprinted brochures in the next few weeks).

A special note of thanks and acknowledgement is extended to all of the meeting participants who made this effort possible. A complete listing of participants is included in the attached tables.

Table 1. *Oculina* Outreach Program: Invited Participants at Planning and Public Information Meetings, June 27-30, 2004

Table 1a. Planning Committee and Program Presenters

Andy Shepard	NOAA Undersea Research Center University of NC - Wilmington	5600 Marvin Moss Lane Wilmington, NC 28409 sheparda@uncw.edu, 910-962-2446 (ph) 910/962-2446 (Fax)
Kim Iverson	South Atlantic Fishery Management Council – Public Information Officer	One Southpark Circle Suite 306 Charleston, SC 29407-4699 Kim.iverson@safmc.net, 843-571-4366 (ph) 843/769-4520 (Fax)
Jennifer Schull	Fishery Biologist, NOAA Fisheries Southeast Fisheries Science Center	NOAA / SEFSC 75 Virginia Beach Drive Miami, FL 33149 Jennifer.schull@noaa.gov, 305-361-4204
Special Agent Richard Chesler	NOAA Law Enforcement	Richard.Chesler@noaa.gov, 321-269-0004
Leroy Creswell	FL Sea Grant Extension – St. Lucie County	8400 Picos Road, Suite 101 Ft. Pierce, FL 34945-3945 LCreswell@ifas.ufl.edu 772/462-1660
Chris Combs	FL Sea Grant Extension – Brevard County	1455 Treeland Blvd. SE Palm Bay, FL 32909-2212 321/952-4536 Ext. 24 Chris.Combs@ifas.ufl.edu
Mac Currin	South Atlantic Fishery Management Council – NC Member Chair – Information & Education Committee	801 Westwood Dr. Raleigh, NC 27607 919/881-0049 (ph) mcurrin@wans.net
John Reed	Harbor Branch Oceanographic Institute	jreed@hboi.edu 772/465-2400 (ph)
Dr. Grant Gilmore	Estuarine, Coastal, & Ocean Science, Inc.	5900 First St. SW Vero Beach, FL 32968 772/562-9156 (ph) rggilmorej@aol.com

Table 1b. Ft. Pierce Planning Meeting - 6/28/04

Andy Shepard	NOAA Undersea Research Center	Wilmington, NC
Kim Iverson	SAFMC – Public Information Officer	Charleston, SC
Jennifer Schull	NOAA Fisheries	Miami, FL
Special Agent Richard Chesler	NOAA Law Enforcement	Titusville, FL
Leroy Creswell	Sea Grant Extension	Ft. Pierce, FL

Mac Currin	SAFMC – Member I&E AP Chairman	Raleigh, NC
John Reed	Harbor Branch Oceanographic Institute	jreed@hboi.edu 772/465-2400 (ph)
Mr. John Holt	Conservation Alliance	holteki@aol.com 772-465-5844
Mark Schrope	HBOI Media Specialist	schrope@hboi.edu 772-465-2400
Margaret Miller	NOAA Fisheries	Margaret.w.miller@noaa.gov,
Sandra Brooke	Oregon State Univ.	sbrooke@oimb.uoregon.edu (541) 888-2581 x318

Table 1c. *Oculina* Outreach Constituent Forum, June 28 (Evening), Ft. Pierce

Andy Shepard	NOAA Undersea Research Center	Wilmington, NC
Kim Iverson	SAFMC – Public Information Officer	Charleston, SC
Jennifer Schull	NOAA Fisheries	Miami, FL
Special Agent Richard Chesler	NOAA Law Enforcement	Titusville, FL
Mac Currin	SAFMC – Member I&E AP Chairman	Raleigh, NC
Leroy Creswell	Sea Grant Extension	Ft. Pierce, FL
John Reed	Harbor Branch Oceanographic Institute	Ft. Pierce, FL
Jim Wharton	Public Programs Specialist Smithsonian Marine Station	701 Seaway Drive Ft. Pierce, FL 34949 wharton@sms.si.edu 772/215-6232 or 772/465-9994
Charlie Schaefer	NOAA Fisheries Biologist	P.O. Box 3478 Tequesta, FL 33469 Charles.Schaefer@noaa.gov 561/575-4461
Michelle Gamby	NOAA Fisheries Port Sampler	P.O. Box 3478 Tequesta, FL 33469 Michelle.Gamby@noaa.gov 561/675-4461
Robert Cardin	SAFMC Snapper/Grouper Advisory Panel member, Commercial Fisherman	5106 Palm Drive Ft. Pierce, FL 43982 Finchaser357@aol.com 772/460-2105
Scott Crippen	Recreational Fisherman	18603 Mach One Drive Port St. Lucie, FL 34987 772/462-0258, 772/201-1697 (cell) scrippen@outdrs.net

Ed Killer (unable to attend)	Ft. Pierce News Tribune – Freelance outdoor columnist	2847 N.E. Cold Spring Dr. Jensen Beach, FL 34957 eekiller@hotmail.com 772/285-1666
Steve Grubish	SAFMC Snapper/Grouper Advisory Pane, Commercial Fisherman	P.O. Box 2298 Sebastian, FL 32978 sidewindersebfla@comcast.net 772/581-4197
Beau Bryan	President. – Ft. Pierce Sportfishing Club Owner of St. Lucie Outboard, Inc.	1811 South US1 Ft. Pierce, FL 34950 bocphest@aol.com 772/464-1440 (wk)
Craig Kilgore	Dockmaster – Ft. Pierce City Marina Charter Captain,	242 Julian Drive Ft. Pierce, FL 34946 craigkilgore@webtv.net 772/519-6749 (cell)
Suzanne Wentley (No, but leave on contact list)	Environmental writer/reporter for local newspapers	suzanne.wentley@scripps.com 772/221-4215
Mayor Robert J. Benton, III	Mayor of Ft. Pierce, recreational fisherman	City of Ft. Pierce P.O. Box 1480 Ft. Pierce, FL 34954 MaritzaSuarez@city-ftpierce.com 772/460-2200 Ext. 303
Doug Coward	St. Lucie County Commissioner District 2	coward@st-lucie.fl.us 772/462-1412
Steven W. Wyde	Law Enforcement FL Fish & Wildlife Conservation Commission	2630 12th SQ S.W. Vero Beach, FL 32968 savshouse@comcast.net 772/562-7090
Frank Bolin (could not attend)	Outdoor Writer Florida Sportsman	2700 S. Kanner Hwy. Stuart, FL 34994 frankb@floridasportsman.com 722/219-7400 ext. 108
Libby Wells (could not attend)	Environmental Reporter – Stuart office of Palm Beach Post	772/223-3561 (wk) 772/485-7902 (cell) (note: replace with Rachel Harris as of July) rachel_harris@pbpost.com

Table 1d. Cape Canaveral Planning Meeting, 6/29/04

Andy Shepard	NOAA Undersea Research Center	Wilmington, NC
Kim Iverson	SAFMC – Public Information Officer	Charleston, SC
Jennifer Schull	NOAA Fisheries	Miami, FL
Special Agent Richard Chesler	NOAA Law Enforcement	Titusville, FL
Chris Combs	FL Sea Grant Extension – Brevard County	Palm Bay, FL
Mac Currin	SAFMC	Charleston, SC
Dr. Grant Gilmore	Estuarine, Coastal, & Ocean Science, Inc., Researcher	Vero Beach, FL
Laurilee Thompson	Dixie Crossroads Restaurant	Laurileethompson@aol.com
Mr. & Mrs. Rodney Thompson	Rock Shrimp Fisherman, Member of SAFMC Rock Shrimp AP, Owners of Dixie Crossroads Restaurant	860 Singleton Ave. Titusville, FL 32796 321/268-5000 or 321/269-5950
Pete Gunn	Director, Safety and Security Florida Space Authority	p.gunn@floridaspaceauthority.com, cell 321-749-0460, off. 321-730-5301 x1104
Jack Mullen	United Space Alliance	Jack.mullen@usago.ksc.nasa.gov, (321) 853-4032
Stacey Harter	NOAA Fisheries- Panama City	Stacey.harter@noaa.gov
Joe Bartoczek	Kennedy Space Center NASA New Business Development	Joseph.S.Bartoszek@nasa.gov
Steve Van Meter	Engineer/ Outreach Specialist NASA/KSC	Steven.VanMeter-1@ksc.nasa.gov, (321) 867-7287
Mark Ward	Media Contractor Infotainment, Inc.	markeward@aol.com, (407) 254-0840
Mike Lane	NASA/Kennedy Space Center	mike.lane-1@ksc.nasa.gov, (321) 867-7287
Cheryl Bartoczek	Science and Technology Education Coordinator, St. Lucie County	331 Ramp Road Cocoa Beach, FL 32931-2566 hshtdir@bellsouth.net 321/784-9008 (ph)

Table 1e. *Oculina* Outreach Constituent Forum, June 30 (Evening) - Port Canaveral

Andy Shepard	NOAA Undersea Research Center	Wilmington, NC
Kim Iverson	SAFMC – Public Information Officer	Charleston, SC
Jennifer Schull	NOAA Fisheries	Miami, FL
Special Agent Richard Chesler	NOAA Law Enforcement	Titusville, FL
Chris Combs	FL Sea Grant Extension – Brevard County	Palm Bay, FL
Mac Currin	SAFMC	Charleston, SC
Dr. Grant Gilmore	Estuarine, Coastal, & Ocean Science, Inc., Researcher	Vero Beach, FL
Bill Sargent	FL Today Newspaper	Gannett Plaza P.O. Box 419000 Melbourne, FL 32941-9000 bsargent@flatoday.net 321/242-3697 or 800/633-8449
Jim Waymer (could not attend)	FL Today Newspaper	1 Gannett Plaza Melbourne, FL 32941-9000 jwaymer@flatoday.net 321/242-3663
Don Forbes (could not attend)	WKMG Channel 6 (CBS)	WKMG Brevard Bureau 1980 N. Atlantic, Suite 1002 Cocoa Beach, FL 32931 dforbes@wkmg.com 321/427-6912 (cell) 800/683-9279 (assignment)
Scott Chandler	Recreational Fisherman, Active with local tournaments	976 Brevard Ave. Rockledge, FL 32955 sdchandler@ft.newyorklife.com 321/632-0010 or 321/543-8153 (cell)
Mitch Needelman (unable to attend)	Representative – retired FWC Law Enforcement	1400 Palm Bay Road Suite C Palm Bay, FL 32905 needelman.mitch@ myfloridahouse.com 321/984-4848
Keith Smith (unable to attend – interviewed during canvas meetings)	General Manager Bluepoint Intl. Fisheries	727 Scallop Drive Cape Canaveral, FL 32920 bpoint2@aol.com 321/799-2860 (ph) 321/784-9377 (Fax)
Marc Epstein	US Fish & Wildlife, SAFMC Habitat AP	P.O. Box 6504 Titusville, FL 32782 marc_epstein@fws.gov 321/861-2369 (ph)
Brock Anderson	Charter Captain	Bottom Dollar Charter Fishing BottomDollar@cfl.rr.com 321/536-0802 (boat)

Lt. Steve Thomas	FL Fish & Wildlife Cons. Commission Capt. of C.T. Randall patrol boat	FL Fish & Wildlife Cons. Commission 1-A Max Brewer Mem. Pky. Titusville, FL 32796 steve.thomas@fwc.state.fl.us 321/383-2740 (office) 321/863-7005 (cell)
Jeannie Adame (unable to attend)	Dir. of Env. Plans & Programs – Port Canaveral Authority	P.O. Box 267 Cape Canaveral, FL 32920 321/783-7831 (ph) jadame@portcanaveral.org
Ming Lee (unable to attend)	FWCC – Commercial Fisheries Outreach Program	FWC Div. Of Marine Fisheries Management 620 S. Meridian St. Box MF-MFS Tallahassee, FL 32399 850/922-4340 Ext. 204 ming.lee@fwc.state.fl.us
Kim Amendola (unable to attend)	FWCC – Recreational Fisheries Outreach Program	FWC Div. of Marine Fisheries Management 100 8th Avenue SE St. Petersburg, FL 33701 727/896-8626 (ph) 727/638-1010 (cell)

Table 1f. Participants in Canvas Meetings

Mac Currin	SAFMC – Member	Raleigh, NC
Kim Iverson	SAFMC – Public Information Officer	Charleston, SC
Jennifer Schull	NOAA Fisheries	Miami, FL
Jeffrey Maffett / Andy Brown	President and CEO/ Vice-President	*Oculina* Bank 1100 Colonnades Drive Ft. Pierce, FL 34949 772/465-3200 (ph) abrown@*Oculina*bank.com
Karen Seaman (left materials but did not meet)	Cape Marina	800 Scallop Drive Port Canaveral, FL 32920 321/783-8410 (ph)
Chuck Stanwyck	Captain Jack's Tackle	780 Mullet Road Port Canaveral, FL 32920 321/783-3694 (ph), 321/783-7490 (Fax) captainjacks@bellsouth.net
Robin Roark	General Manager Sunrise Marina	505 Glen Cheek Dr. Port Canaveral, FL 32931 321/783-9535 (ph) robinroark@sunrisemarina.com
Keith Smith	General Manager Bluepoints International Fisheries, Inc.	727 Scallop Dive Cape Canaveral, FL 32920 321/799-2860 (ph); 321/784-9277 (Fax) bpoint2@aol.com