# Existing and Developing Research and Monitoring Plans in the South Atlantic

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# Research and Monitoring in the Evaluation Plan for the Oculina Experimental Closed Area

**FINAL**

**Evaluation Plan**
**For the**
***Oculina* Experimental Closed Area**

**March 22, 2005**

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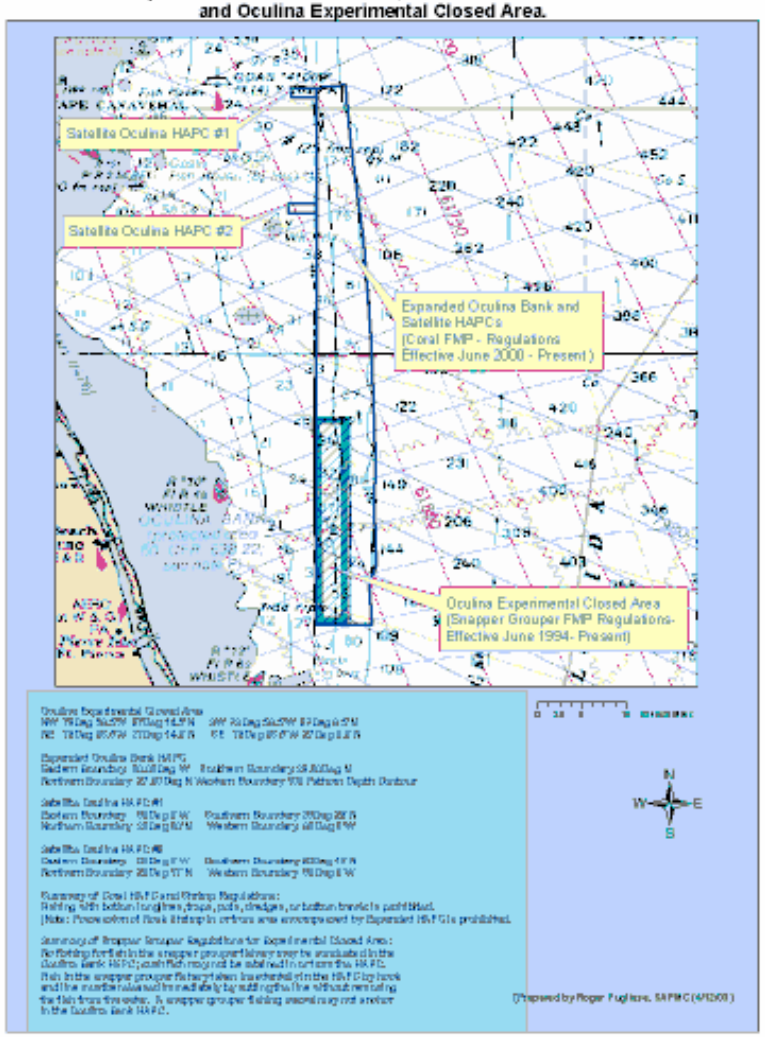
**Expanded Oculina Bank HAPC, Satellite Oculina HAPCs and Oculina Experimental Closed Area.**



## Oculina Research and Monitoring

In April 2004 the prohibition of fishing for species in the Snapper Grouper complex in the *Oculina* Experimental Closed Area was extended indefinitely.

Snapper Grouper Amendment 13A also requires:

(1) The size and configuration reviewed within three years of the implementation date and;

(2) A 10-year re-evaluation be conducted for the area.

(3) An Evaluation Plan be developed to address needed monitoring and research, outreach, and enforcement efforts within one year of implementation of the Amendment.

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 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | |

# Deepwater Coral Research and Monitoring Plan

## I. Mapping the distribution and abundance of deepwater corals

1. Identify the location of deepwater corals
2. Characterize the biotic components of deepwater coral ecosystems
3. Characterize the abiotic components and geological framework of deepwater coral habitats
4. Map human activities that may impact deepwater corals
5. Develop and coordinate mapping strategies

# Deepwater Coral Research and Monitoring Plan

## II. Biology of Deepwater Coral Ecosystems

1. Characterize physiological ecology of habitat-forming coral species
2. Characterize the ecology of deepwater coral communities
3. Biogeographic and taxonomic studies
4. Evaluate the condition of deepwater coral ecosystems

# Deepwater Coral Research and Monitoring Plan

## III. Paleo-climate Analysis

- 1. Understand previous environmental conditions to hypothesize historical fish populations
- 2. Link changes in biodiversity with climate changing
- 3. Investigate the use of paleo-climate data for climate modeling
- 4. Measure CO2 dissolution in the oceans
- 5. Teleconnections – complex feedback patterns involved in long-distance processes where the effect of an environmental event occurring in one place also shows up in another (e.g. African dust)
- 6. Model future climate change

# Additional Plans to be incorporated into the Fishery Ecosystem Plan

Sargassum Research and Monitoring Plan

Ocean Observing Systems to Support Fisheries Oceanography Research

Habitat Characterization and Mapping Strategy to Support the Coral, Coral Reef and Live/Hard Bottom Fishery Management Plan